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THE POPULAR SCIENCE MONTHLY.

SUPPLEMENT

OBSERVATION IN SOCIAL SCIENCE.¹

By ALEXIS DELAIRE.

AS the Count Molé ironically observed, on receiving into the French Academy the author of "Chatterton," "Every epoch has a literature of its own; but among the writings which give brilliancy to an epoch we have to distinguish two classes. The one, possessing comparative merit, and being adapted to the greater number of readers, receives loud applause; this is contemporaneous success. The other class, fed from the sources of undying truths, is at first less cordially received, and awaits the judgment of the *élite* of our race." If the writings of Alfred de Vigny were scornfully classed by the great statesman in the first category, surely we must place in the second the work whose title is given below.² This work, though it was written at the request of François Arago, and under the stress of the disquietude produced in 1848 by the "Organisation du Travail;" and though it was crowned by the Academy of Sciences at its first publication, nevertheless has attracted hardly any attention save from a select few. And yet, inasmuch as it abounds in well-established facts, and, above all, is sober and moderate in its conclusions, it offered valuable material for study to all parties, liberals, economists, or communists, alike. But, being too impartial in its deductions to please any party without qualification, it was rather slighted by all. Besides, a man does not readily give up a pet theory, nor is it an easy thing to throw off the yoke of preconceived opinions, and

with docile mind to have recourse to the scientific observation of facts. Here, again, was verified the old saying that no man is a prophet in his own country; but, on the other side of the ocean, the Americans, with their practical sense, have understood better the meaning of these studies on the private life, the moral habits, and the occupations, of the laboring population. During the last two years several official commissions, instead of adopting the often misleading processes of bureaucratic statistics, have attempted, according to the method of "family monographs," the solution of those social problems which arise in the New World as in the Old. In these monographs (which, however, do not equal the models given in the "Ouvriers Européens") are described nearly four hundred households of working people living under various conditions. At last, too, the wish expressed by the Academy of Sciences in 1856 has been fulfilled. That learned body, adopting the conclusions of its commissioner, Baron Charles Dupin, characterized M. Le Play's method as a model one, and expressed a desire that "a low-priced edition of the whole work in small form might be published, so as to bring within the means of all purchasers a statistical work treating of interests so numerous and so important." The first volume of this new edition, enriched with the results of the author's continued researches, is now at the disposition of the public. Hence it may be interesting briefly to consider, in its origin and its essence, the method which, in Europe as in America, has been followed in the compilation of such voluminous works.

I. UTILITY OF SCIENTIFIC METHOD IN SOCIAL STUDIES.—One of the best notes of the present

¹ Translated from the *Revue des Deux Mondes* (with some abridgment), by J. Fitzgerald, A. M.

² "Les Ouvriers Européens: Études sur les Travaux, la Vie domestique et les Habitudes morales des Populations ouvrières de l'Europe," par M. F. Le Play. 2^e édition, 1877, 1^{re} livraison: *Les Ouvriers de l'Orient*.

age is the general effort at submitting to the ordeal of enlightened criticism and scientific methods studies that before were wont to deal rather with sentiments or tastes, theoretic ideas, or the caprices of art. This significant change may be seen in the researches which have for their end to unearth extinct civilizations, and to trace to its source the life of nations. Only the other day M. Villemain, in one of his most piquant lectures, while enumerating the qualities necessary for an historian, very coolly placed in the background truthfulness and exactitude, and gave prominence only to the art of literary composition. In his opinion, writing history means skillfully constructing an emotional drama, attending to the stage perspectives, and so ordering the action of the piece as to produce the most striking effect.

Great masters, no doubt, have been able by the inspiration of genius to divine, so to speak, the physiognomy of the past, and with exquisite skill to recall to life all unchanged worlds that have perished. Thus, in the narrative of Augustin Thierry, we have pictured the gloomy period of the Merovingians; in the romances of Walter Scott, the struggles of Saxon and Norman; in the sparkling pages of Michelet, one or another aspect of the middle ages. Still, how dangerous a thing it is to blend fables with truth, and how faint is the distinction between the dramaturgist and the historian! One writer, sharpening his fine irony to gratify the wits, yields to the temptation of portraying the men of his time in the transparent colors of an antique picture, and thus more or less sacrifices to the enticing mirage of allusions either the likeness of the past or the exactitude of the present. Another excels as a composer of eloquent speeches, and in his eyes the annals of a people contain nothing but jousts of oratory: the fate of empires, according to him, depends on the harangue of a general on the battle-field, or of a tribune in the public place of some little borough. They both forget the mass of the people, and personify in a small number of individuals the societies they describe. Besides, they look at these societies only from the outside, from the point of view of their public life; they are like travelers who judge of a strange country from their observations during a flying visit to a few of its seaports. In man, "fluctuating and variable" as he is, they observe only that which changes least—his virtues, his vices, his caprices; and it is their delight to excite emotion by over and over again describing the strife of the self-same passions; but the inner life, the unambitious life, the homes of the past, they do not no-

tice at all. They hardly ever step beyond the threshold of the palace, or halt before the artisan's workshop or the laboring-man's hut; still it is here that we get at the very conditions of national life—the organization of the family, the institution of property, the laws of labor, the private ethics and the moral habits of a people. Fortunately, we can restore sundry traits of the effaced picture, thanks to patient research. A monument turns up which, after much ingenious discussion, enables us to understand the sacred uses of fire in ancient states, or the importance of luxury in the ancient mother-cities of Asia; again, some charter or some inventory gives plain evidence of the harmony and well-being of the rural classes in the middle ages; or some *livre de raison* (book of accounts) gives us an insight into the inner life of some obscure family in the past.

Still these are only the too rare pages of a damaged book, the leaves of which will never be all found. But if we must make up our minds to remain in ignorance of much of the past, can we not at least collect all needed information regarding the present? Something more than vain curiosity should stimulate us here; indeed, may we not expect to find in this kind of researches the solution of the difficulties which weigh most heavily on modern civilization? Humanity, even on the privileged shores of Greece and Italy, is not intended for the luxurious indolence of a life of opulence, or for the fruitless agitations of the political world. Labor is its law; and for nations more truly even than for animal species is the "struggle for life" decreed by Fate. Hence the true history of societies must embrace the history of the transformations undergone in time and space by the institution of property, whether collective or private, and by the conditions of industry, whether rural or manufacturing, under the influence of the natural environment and the increasing wants of the population. But the most attractive prizes of progress—as wealth, intellectual culture, political power—are perilous gifts; nations, like individuals, seldom enjoy Fortune's favors without being intoxicated thereby. It is too easy to abuse them; and a nation's prosperity, however fair its exterior, is gravely compromised when its moral is slower than its material progress.

The West is in our time passing through a painful ordeal. Coal and steam have revolutionized the world. Great inventions, machinery, steam-engines, and railroads, have turned topsyturvy the usages of labor, and in part substituted manufacture on the large scale for home-industry

If one result has been an energy of production that has created unheard-of wealth, another result is no less evident, namely, the infliction of evils that, owing to their continuity, are more formidable than the most cruel ravages ever wrought in times past by famines and other temporary scourges. Formerly, the working-population, simple in their desires and frugal in their lives, were contented with their lot. This is still the case in many regions of Europe, wherever the soil is not strictly measured out to them, and especially in the Mussulman countries of which we know so little. Not only is this fact established by the precise observations of travelers, but we daily see confirmation of it in the letters of newspaper correspondents. Indeed, no "special correspondent," however frivolous he may be, can fail being struck, in the East, by two plain tokens of the well-being and tranquillity of the people, viz., that every one, however humble, owns his home, and that no one, even the poorest, is reduced to absolute destitution. But in the West, despite the augmentation of wealth, and the wonderful progress that has been made, the working-classes are restless under suffering, and utter only cries of hatred. In the manufacturing centres of Great Britain this suffering manifests itself in a degree of wretchedness which, according to the official reports, reduces the working-people to the level of beasts. Incomparably better was the lot of the slave in ancient times, of the *puer*, the child of the family; or that of the mediæval serf, the tranquil possessor of his lowly paternal cabin. True, our French factories are, in some respects, not so ill organized, but nevertheless the evil exists among us under a different form, and in a greatly aggravated character, as social antagonism and political instability. As for the moral corruption, they who have seen what it is, in the low quarters of our cities, know that the most highly-drawn pictures of it fall far short of the hideous reality. Finally, in Germany, the self-same iniquity is causing society to rock upon its old feudal foundations, which are falling to ruin under the attacks of doctrinarian socialism. It seems as though, by the invention of the "fire-machine," modern civilization had repeated the bold theft of Prometheus, with all its dread consequences:

"Post ignem ætherea domo
Subductum, maecis et nova febrium
Terris incubuit cohors;
Semotique prius tarda necessitas
Leti corripuit gradum."¹

In France, more than in any other country, the people seem to have lost the secret of order which nations are wont to retain while gradually improving their social constitution—a certain agreement of ideas concerning religion, the family, property, labor, and the organization of the state. The progress of the physical sciences, though the way was prepared for it by long-continued application to the experimental method, has of late been especially rapid, owing to certain discoveries unparalleled in the past. From an erroneously-assumed analogy between the material relations of things and the moral relations of men, it has been inferred that the social state might be suddenly bettered by means of certain new-fangled theories which should break with old traditions. So far from regarding as worthy of respect institutions that have received the "consecration of time," men have come to consider those to be least commendable which have stood longest. According to Karl Marx, the accumulation of capital in the hands of a few will inevitably lead to that social liquidation so eagerly longed for by many, and which will make common property of all the instrumentalities of production. In the opinion of Mr. Herbert Spencer, property and capital are nothing but historic categories; that is to say, transitory forms which will be swept away in the fatal evolution of progress. Some there are who hope, in spite of the experiences of 1848 and many more recent failures, that coöperation will free them from the yoke of the employer, and do away with the oppression of capital. Others, like the Katheder-Socialisten, would fain see in state intervention a middle term between the *laissez-faire* doctrine and the most advanced tendencies. Again, moralists and positivists agree in maintaining that the beneficent influence of property is not so well assured under the constraint of laws of succession dictated by the Revolution as under the *régime* of liberty which prevails in America and England. They who do not content themselves with mere words are asking whether the arts and trades corporations that were dissolved a century ago should not be resuscitated in such forms as might best suit our times.

In view of opinions so conflicting, can we still, with a learned academician, hold economic principles to be the only firm basis of morality? Is not one rather prepared, with an eminent

sumption and a new train of fevers settled upon the earth. and the slow-approaching necessity of death, which, till now, was remote, accelerated its pace.—(Smart's "Horace," Ode III.)

¹ After fire was stolen from the celestial mansions, con-

member of the Political Economy Club, on the occasion of the centenary of Adam Smith, to hold that the *role* of the political economist is now ended? At the very least we must agree with Mr. Stanley Jevons, that never before were we so far from having clear ideas of political economy, and that the science has become utterly chaotic. In this new Babel one voice alone could make itself heard amid the uproar raised by conflicting passions and systems—the voice of Experience. At the same time we must guard against attributing to experience any conventional language, or making it subservient to our own preconceived ideas. When, under the influence of the extension of exchanges, increase of production, and development of the state, political economy was founded in France during the past century, it took color from the “classical” spirit then in the ascendant. Like all other crude sciences, it has more than once yielded to the temptation of hastily generalizing an isolated fact, or of putting forward abstract principles, and then seeking at most merely an *a posteriori* verification of them in experience. Thus, for example, one distinguished author, instead of inquiring how things stand in countries where plenty and peace are the rule, sententiously declares that “wealth must be consumed according to the principles of sound reason;” never dreaming that he reminds us of the doctors in Molière who wished their patients to digest “according to the principles of sound reason.” The truly scientific method is very different from this. Science first clears the field of all prejudgment, and admits no *a priori* principle; it interrogates the facts and allows them to answer with their own rude eloquence. Thanks to this method, which of itself corrects errors of ratiocination and saves us from being led astray by the imagination, the sciences have in less than two centuries made enormous progress, and this instead of growing slower is being accelerated. From early times philosophers had no end of disputes about chemical and physical theories, without ever being able to agree. Thus it was that during the whole of the eighteenth century chemists were divided into two camps and warred for or against *phlogiston*, the “inflammable earth” contained in bodies, which combustion alone could drive out. When minds of a more positive turn, instead of restricting themselves simply to the external appearances of facts, and considering only the qualitative aspect of phenomena, began to make note of all the observations, and to study the quantitative relations, they were not long in finding out the

baselessness of the notion of *phlogiston*. Soon, by means of precise measurements and exact analysis, a theory was established which is itself simply the expression of the facts. Then it was that chemistry, which before Lavoisier scarcely existed, became the wonderful science which it now is.

We might almost say the same of geology and biology—to name only the last-comers—sciences which were founded only the other day, but which are already rich in positive results. All of these sciences have followed one and the same method—collecting a multitude of isolated facts, determining the degree of generalization they are capable of, establishing the natural law, i. e., the formula which covers each group of facts, and, finally, subjecting these results to manifold tests. Social science, called by M. de Bonald the science of sciences, could attain this phase of evolution only after the others: it was of necessity the last to submit to the stern rule of exactitude. But now the time has come when it, too, must quit the region of vague hypotheses and hollow theories, elect for itself a certain method of observation, and lay its foundations in the solid ground of facts.

II. THE METHOD TO BE CHOSEN.—FAMILY MONOGRAPHS.—The methodical verification of social facts presents peculiar difficulties. In most of the physical sciences, if we gather the teachings of Nature by observation, we also elicit the same by experiment; and these two processes mutually assist each other. In the study of social phenomena, on the other hand, there is clearly no room for scientific experimentation. No man can reproduce, under circumstances judiciously chosen and varied at will, the phenomena of human society. It is not that venturesome spirits have hesitated to push society off the beaten paths, at the risk of leading it into a *cul-de-sac*, or over the face of a precipice. They would fain compare society to an ingenious piece of mechanism, and their purpose has been, not so much by their experiments to discover its springs as by their improvements to perfect the working of the mechanism. How many are the plans proposed by Utopians, and condemned by common-sense; above all, what mischief and ruin have been caused by the awakening of illusory fancies and by repeated failures, without the credit of the system-makers being impaired! The best of men have paid tribute to this passion for innovation. In the last century, even Turgot, who executed so many beneficial reforms, gave himself up to this sort of enthusiasm, and set about insuring

the happiness of the working-men; but, instead of reconstructing established institutions, corporations, or guilds, he broke them up violently without listening to the pleas of the parties interested. The result was, that the masters freed themselves from all obligations to their men, and the workmen lost the rights which had been theirs for centuries. About the same period Adam Smith, after ten years of solitary meditation in a place remote from workshops, explained better than any writer had ever explained before the part played by labor in the production of wealth, and formulated the famous law of supply and demand. This law, though valid with respect to prices of commodities, cannot be applied, except by a palpable fallacy, to the relations between master and workman, since the labor of the workman, or, in other terms, the daily life of his family, is not capable of being accelerated or suspended according to the fluctuations of the market, and herein differs from merchandise. Sundry other writers have advocated an absolute *laissez-faire*: enamored of sounding phrases, and heeding little the stern reality of facts, they even in our own day proclaim "the individual freedom of labor" as the only solution possible. We hear much of the benefits to be derived from association, free competition, participation (sharing in the profits), from syndicates, and from coöperation. One cannot be too wary of such experiments. Being inspired by generosity, by Utopianism, or by ambition, rather than by experience, they always end in suffering where they fail, and sometimes even lead to bloodshed. It is not with the mutual relations subsisting between men as with the relations between man and the physical world. The latter, being modified by material progress, are ever assuming new forms; but the former, being closely connected with man's moral nature, are hardly subject to change. The experience of ages has firmly established the fundamental principles of social life, and has passed judgment on the few combinations of which they are susceptible. In truth, there remain no discoveries to be made, whether as to the regulation of the family at home, or the usages of labor in the workshop. Nor is there anything novel in the much-lauded schemes of reform. Many of them were known long ago, tried, and abandoned; and most of the difficulties which we ourselves are striving to overcome have been obviated or solved in divers ways, according to the time and the place. Why should we go on squandering our means on experiments that our predecessors or our rivals have already made at their own expense?

In a dialogue preserved for us by Xenophon, Pericles asks how might the Athenians regain their ancient virtues, and the reply of Socrates was: "There is nothing like mystery here; let them adopt the customs of their forefathers . . . else let them at all events follow the example of the nations that are now dominant." And Montesquieu says the same thing. Thus, then, the counsel of the wisest thinkers, as well as the history of modern science, warns us against theoretical speculation and invites us to direct observation of facts; by these means only can we reach definite results, or conclusions that will stand. But human society is a vast field, in which we shall be certain to lose our way, unless we have a guide. What guide can we trust, and what method shall we choose?

First of all, we have to reject that method, however plausible it may appear, which would fain discover in the anatomical constitution of tissues or in the embryogenic evolution of organs the cause of man's moral faculties, or even the secret of the laws of society. We cannot but regret the waste of energy and of talent on the part of those ingenious philosophers who set up the principles of sociology on so questionable an experimental basis as this. We can understand the ground of their error: many of them are of opinion that "in order profitably to apply to social science the habits of mind produced by studying all the other sciences, it suffices to master the main ideas furnished by each." Considering how some of these writers handle scientific processes, one is tempted to say that they are easily satisfied, like Figaro when he mastered the "main ideas" of government and of the English language. Does any one suppose that, by isolating the ganglia of an ant, or by placing under a microscope the nerve-cells of a bee, he is enabled to understand in their causes and in their details the habits of ants or the structure of the honeycomb? Who would dream of preferring such work as this to the wonderfully instructive, direct observations of such men as Réaumur or Huber? And surely it were still more preposterous to suppose that, from anatomical dissection of the dead body, or even from a psychological analysis of the living subject, we could infer the laws of human societies—laws still more delicate and complex, inasmuch as here the fixity of instinct is superseded by the free play of will.

Nor would recourse to statistics alone be of any greater avail. How should we find, in the abstract units and behind the nameless totals, the man of flesh and blood who lives, loves, and suffers?

And do not statistical tables oftentimes conceal from the observer the very things it concerns him to know—the thoughts and the inmost feelings, whereof manners and institutions are only the outer forms? True it is that in statistics we possess data of inestimable value, but their contents are not all of equal weight by any means. Even when they have been collected with the utmost care, such data are not strictly comparable among themselves, inasmuch as they differ in their mode of collection, in the purposes for which they are brought together, and in the methods of their calculation. "There is no kind of information," says the "Sixth Annual Report of the Massachusetts Bureau of Statistics of Labor," "so valuable to the worker in problems of social science as the statistical, when it is derived from original investigation, honestly made by competent persons; but, when any of these requisites are wanting, it is the most misleading and worthless." The same "Report" points out the defects of the system too commonly employed, which consists in sending out blank tables to be filled up by different hands and then sent back to a central bureau. All that then remains for the bureau to do is to make additions of its own, to calculate averages which oftentimes are erroneous, and finally to publish documents whose authority is always questionable. The Massachusetts Bureau, however, combining practice with precept, adopts the method of direct investigation and actual observation. Its officers seem, like M. Le Play, to be inspired by the counsels of Descartes: "I abandoned entirely," writes the author of the "*Discours sur la Méthode*," "the study of letters. I devoted the remainder of my youthful years to traveling, and associating with people of different moods and conditions. . . . For it appeared to me that I should find far more truths in the reasonings of men concerning their own affairs, where mistakes carry their own penalties, than in the reasonings of a man of letters in his cabinet, upon speculations that produce no effect, and whose only consequence is, that perhaps they inflate their author's vanity in proportion as they depart from common-sense, inasmuch as it needs art and skill to make such arguments plausible."

When, in a personal research like this, we abandon theoretical speculation and deal with facts, we quickly discover that, if we would gain correct ideas as to the status of a society, or even if we would understand the special condition of a working-population, it is not enough to study in that organism the atom, that is to say, the individual isolated from his surroundings: we have

to observe the living cell; in other words, the family, which is the true social unit. A people is not made up of citizens that were born foundlings and that will die celibates. Memory of ancestors, interest in descendants, care of infancy, and protection of old age, attachment to the home and domestic occupations, all conspire to make the family a little world of sentiments and interests—the type and at the same time the groundwork of the nation. The families of working-people, and more especially of the rural population, would naturally be chosen by the observer as subjects for investigation; there, in fact, is to be found the very root of the nation. Being less exposed than the higher classes to social fluctuations, and more subordinated in their physical life and activity to the climate and the productions of the soil, the working-classes, by that very fact, present the best characteristics of the nationality and the plainest impress of the local genius. While the traditions of the past, ancient manners, superannuated usages, and forgotten *prouis*, are here more persistent, at the same time the slightest changes produced by progress do not fail to manifest themselves in modifications of land-tenure, of factory-management, of family-customs, of class-relations, and of state-institutions. A thousand minute details of social relations, that would hardly be noticed even by an attentive observer, will be found reflected in the home-life of the family. Housing, food, clothing, rents, taxes, insurance, religion, education, sanitary police, recreation, revenues, salaries, commonage, poor-law relief—whatever concerns the moral needs or the economic interests of the household, has its corresponding debit or credit in money or in kind. Finally, the savings of a family furnish the best criterion for judging whether it is capable of rising, by its virtues, in the social scale. Hence the main thing in the "family monograph" is to fix the annual budget: this is the distinguishing characteristic of the method set forth, both in theory and in practice, by the author of "*Les Ouvriers Européens*." Let us briefly examine this method:

In the first place, a "family monograph," if it is to be of any use, must be inspired by a sincere love of science, which leads to investigation of truth and scrupulous exactitude in noting down facts. It is not to be denied that an author will oftentimes set about his work with the purpose of demonstrating an erroneous principle with which he is in sympathy; yet, even so, impartial application of the method will suffice to distinguish for him the true from the false. Then we

must know how to win the confidence of the modest households that we would describe. No remuneration could induce a family for eight or ten days to admit an outside observer to all the secrets of its home-life; but, on the other hand, if it is understood that the only object of the inquiry is the improvement of the status of the working-classes by first getting at the actual facts of the case, the family will not object to answering the minutest questions. There is a further difficulty, which can only be overcome by the most patient sagacity. Not only is the attention of the family wearied by a long process of questioning, but oftentimes these worthy people have never thought at all about how they live; and, when they have to reply to the questions touching the minutiae of the housekeeping account, we only get a repetition of the dialogue of "The Cobbler and the Financier" ("Le Savetier et le Financier"):

F.—Well, how much do you earn a day?

C.—Sometimes more, sometimes less.

In the lives of these people, monotonous as they appear at the first glance, there are ever occurring a thousand events that disturb the uniformity—sickness, a marriage, a baptism, a season of idleness, a loss of cattle, the acquisition of a bit of land. Hence it is a work of much difficulty to draw up the balance-sheet of an average year. Around each of the budgets thus made out will be grouped a multitude of observations showing the natural conditions of the climate and the soil; the occupations and industries of the family, its habits and mode of life, its history, and its moral wants. Next come more general observations on the elements of the social constitution of the country, as exhibited in the monographs—as spontaneous products of Nature; methods of husbandry; mode of procuring laborers; civil and commercial legislation; ancient communities and modern associations, from the *artels* of Russia or the *bergslags* of Sweden to the trades-unions of England; patriarchal rule, feudal institutions, serfdom, emigration, etc. The most interesting facts are precisely those of which the family itself is unconscious, and which statistics as usually collected do not touch. As illustrative of this sort of facts, we might name "subventions" of all kinds, such as the free enjoyment of a house, a garden-plot, or a field; the allowances made by employer or landlord for doctors' fees or schooling; free pasturage, fuel; the right to fish or to hunt. Then there comes the satisfying of moral wants, very indefinitely expressed under the general term of "sundry expenses,"

and embracing such subjects as support of churches, education of children, mutual-aid societies, books, newspapers, and recreation.

It would appear as though nothing could fail to be noted where this method is employed. The plan of the "family monograph," as elaborated and improved by the labors of twenty years, and tested by many subsequent works, fixes in advance the compartments to which the various results of observation belong. Besides—and this is indispensable for documents that are designed to be of any scientific value—all monographs drawn up in this uniform shape are strictly comparable one with another.

III. GENERALIZATION OF THE METHOD, AND THE OBJECTIONS URGED AGAINST IT.—He surely would make a notable discovery, who, in deciphering some forgotten palimpsest, should bring to light a monograph of this kind relating to life in ancient times; who should make us acquainted with the lowly history of some boatman on the Nile, some fisher in the Ægean, some Etrurian potter, or Phœnician trader; some artisan of Herculaneum, or laborer in Latium; some Cantabrian miner, or Gaulish goldsmith. If we could scrutinize in its minutest details the daily life of working-people in all times, we should be enabled thus better than by any other method to get at the *centrum vitale* of all societies, namely, the relations of the protecting classes to the protected. It would be interesting to sit by the fireside of the serf attached to the glebe, or to enter the shop of the burgher proud of his communal liberties, to live their life and think their thoughts. In the absence of statistical documents, would that we possessed some little interior views painted by the hands of masters in olden time! Thus, when Froissart writes, "I awoke again and went into my smithy, there to work and forge away on the high and noble matter with which I had been busied aforetime," one is disposed to regret that this incomparable story-teller finds room in his tales only for the feats of high and mighty barons, but concerns himself not about a less noble matter to which his genius would have lent an incomparable charm. One of the most prominent of M. Le Play's disciples has shown us how interesting successive studies of one and the same family may be. He has followed, step by step, in the varying fortunes of their period of decline, and in their last struggles, the Melagas, a family of peasants living in the Pyrenees, an instructive account of whose history was given some time ago in these pages.¹ No less interesting would be a

¹ *Revue des Deux Mondes*, 1-72, 15 Avril, article "La Famille et la Loi de Succession en France."

series of monographies describing one and the same social type at different epochs. By thus observing in each walk of life the reflection of the transformation of society, we should gain much valuable instruction. Thus, for instance, we should find that in carrying on the sea-coast fishery, where but little capital is required, and hardly anything but physical strength is contributed to the common store, coöperation has always been the rule, while in other occupations it has no place. On the other hand, we should find the system of rural communities has gradually declined, and that this form of communism, far from embodying the promise of the future, is but an antiquated relic of the past. We might find in the history of a family during several generations a firm experimental basis for many an interesting study. Thus, to quote one instance, Mr. R. L. Dugdale has based on a monography of a family of thieves, the Jukes, a very useful inquiry into the subject of crime and pauperism in the State of New York.¹ The author of this essay on social pathology traces the genealogy and the history of this unfortunate family: he shows from facts what a fearful heritage of debauch and disease, of misery and crime, was theirs ever since the close of the last century; finally, he deduces from observation the reforms that are needed, laying special stress on the extension of the family system throughout all correctional institutions for the young. Many other aspects of our social problems might be better understood, were it possible to make inquiries of this kind into the distant past.

Fortunately, we can find in space what is denied us in time. As was remarked by M. Charles Dupin, in the "Report" already quoted, "the simultaneous study of the lot of the working-classes in countries lying in the east, the centre, and the west of Europe, is, in fact, equivalent to the study of three distinct epochs—the ancient, the transition, and the modern states of those realms which to-day are most advanced in industry, arts, and sciences." Hence we can, without much risk of error, discover in the present age most of the social systems of the past: the patriarchal constitution in Turkey, the *régime* of rural communities in Russia, feudal institutions in Hungary, and so on. By analyzing the transformations going on before our eyes in different countries, we throw light on the origin and history of modern society. Sundry observers have described the "working people of two hemispheres," thus enlarging

on the plan of the monographies in the "Ouvriers Européens." In this way many curious types—the miner of the placers of California, the Chinese peasant, the freedman muleteer of Réunion, the perfumer of Tunis, the Canadian farmer—have been brought together; but there is still much to be done. Even in Europe many a monography will have to be written before we can be said to know certain regions; in particular Italy, a country so diversified in its natural characters. And a knowledge of the family-life of Slavs, Greeks, Latins, and Mussulmans, in the provinces of European Turkey, would throw light on the present situation and on the future lot of those countries in which the fortunes of the world are now undergoing the arbitrament of war.

Still some writers of note have urged against the generalization of the monography method certain objections which we must notice. The objection most commonly raised has reference to the minuteness of the details of family accounts. "Where is the use," it is asked, "of knowing just what quantity of worthless utensils is owned by each household? What good is it to know the exact weight of salad or of pepper consumed in a year? Why note down, one by one, each article belonging to a bride's outfit?" Perhaps it might suffice, and certainly it were easier, to be content with general statements and to put down in one gross sum the total of each kind of receipts or expenditures. But the author of "Les Ouvriers Européens" is not a man to be so easily satisfied. As a mining engineer and professor of metallurgy, he has long been familiar with the precise methods of weighing employed in chemical analyses, and he would import into the study of social phenomena a like precision. It must be admitted that in arithmetic there is no such thing as semi-exactness, and that a balance-sheet loses all its value if it is based on approximations. Besides, this descending to the minutest details necessitates on the part of the observer scrupulous exactitude in his researches, saves him from many a mistake, and not unfrequently leads to unexpected discoveries. The make-up of the household furniture, the preparation of the national dish, the description of antiquated costumes, the ceremonies of betrothal, and other like pictures of national manners and customs, serve to relieve the dullness and dryness of statistics. Then, too, the comparative study of one and the same item of the family accounts through different monographies, while it awakens the attention of the observer, brings to light many an instructive fact—as, for

¹ "The Jukes, a Study in Crime, Pauperism, Disease, and Heredity; also, Further Studies on Criminals."

instance, the considerable profits made from home-industries, the importance of woman's domestic work, the improvidence of the working-classes. Popular recreations exhibit a curious aspect of local manners.* Thus, on the steppes of Russia, when neighbors come together to assist one of their number in performing some extraordinary work, a liberal board is always spread, and the occasion becomes a regular festival. Such gatherings are known among the Bashkirs as *heum-min*, and among the peasants of Orenburg as *pomotch*; and they have their counterparts in the *dévès-bras* of the Brétons and the *grandes-journées* of the Béarnais peasants. Then we have the popular amusements of country-fairs, family anniversaries, fireside gatherings in winter for story-telling and courtship, the harvest-home, and the like. These modest recreations of rustics are a very different thing from the costly pleasures which in great cities too often absorb no small portion of the yearly earnings. In taking note of these and similar aspects of life among the laboring-populations, the author of "Les Ouvriers Européens" does but follow the example set by Vauban, "who," says Fontenelle, "carefully informed himself about the value of soils, their products, the manner of cultivating them, the means possessed by the peasants, their ordinary diet, their daily earnings; details which, though apparently of no importance, nevertheless form part of the art of government."

In the next place, it is charged that the author of "Les Ouvriers Européens" has chosen to write in an abstract, geometrical style, bristling with technicalities and formulas, and difficult to understand. This criticism, which, in our opinion, was hardly justified by the first edition of the work, will probably be passed also on the second. True, we have here nothing like that elegant and superficial language of the drawing-room in which Diderot used to discuss, *currente calamo*, the highest social problems, without disconcerting even those whose studies had not gone beyond their prayer-books. But is not this a necessity? When we quit venturesome generalizations for the firm ground of experience, it is clear that we must adapt the exactitude of our language to the precision of our thoughts. The sciences as they develop can hardly comply with Buffon's precept of giving to things only the most generic names; they must have a nomenclature and a vocabulary of their own. The science of society, in proportion as it becomes more clearly formulated, must, without ceasing to be literary,

restrict itself to the use of terms that are rigorously defined, as is the case with the physical sciences.

Finally, it has often been said that, instead of devoting time and labor to family monographs, we should boldly face the burning questions of the day, and attack our most difficult problems. But while it *seems* as though by such a course we should more quickly gain a knowledge of general laws, the reverse is shown to be the fact by the history of the development of the sciences. Thus geology, for example, for a long time fluctuated between the systems of the philosophers and the fictions of the poets: the first researches which won for it a solid basis did not have for their object the solution of any general question, and were restricted to closely analyzing, in a circumscribed locality, a small number of very definite facts. It was thus that, by his modest observations, a potter and a genius, Bernard Palissy, outstripped the *savants*, and in his "Discours Admirables" explained the laws which had regulated the formation of sedimentary *terrains*, and the circulation of subterraneous waters. In like manner, the fruitful conception of substitution, which has opened such broad horizons in organic chemistry, suggested itself to Dumas while making a minute examination of the reactions of chlorine with hydrogen carburets. And the domain of knowledge is still daily being enlarged rather by painstaking analyses of details than by brilliant surveys of the whole field. It will be the same with social science: it will make real progress only in proportion as it follows in the track of the sciences which have gone before.

It is incumbent, especially on statistical congresses and geographical societies, to encourage the use of family monographs in the discussion of economic problems and in describing foreign peoples. Already, as we have said, the Boston Bureau of Statistics of Labor, while adopting as its method of investigation personal observations, at the same time borrowed from the monographies at least the principal divisions of their plan. The truth is that, instead of painting with a firm hand a few complete pictures, the commissioners have chosen rather to present a very large number of slight sketches, and hence have left out many details; thus, under the head of "Receipts," neither "subventions" nor the fruits of home-industries are mentioned. But, defective though they are, these monographies, being accompanied with reports on the different sections of the family budgets, lead to important

conclusions. Thus, more than half of the households studied were making savings; the majority of them had comfortable homes, substantial food, and decent attire; in hardly a single instance was the mother of the family employed in any work outside of her house; while, on the contrary, the labor of the younger members contributed largely to the receipts.

Geography is not less interested than statistics in developing the method of social research. Nothing could show more clearly than does the monograph the preponderant influence on the social constitution of a race of the extent of wild land at its disposal, and the amount of spontaneous products offered by its territory. For the author of "*Les Ouvriers Européens*" these two elements, the importance of which is shown by figures in the family budgets, are decisive with respect to the organization of the family, the institution of property, the labor-market, and emigration. Hence it is to be desired that the attention of travelers be directed toward a methodical observation of social facts, so as constantly to test and to apply to new territories the results of prior researches; we thus meet one of the most urgent needs of our time. In England, and also in the United States, vigorous social-science associations are already concerning themselves with important researches, and by their publications and annual meetings are making the people familiar with economic questions. In France, the *Société d'Économie Politique* and the *Société d'Économie Sociale* combine their efforts for a common object, but they enjoy neither the same means nor the same publicity as similar bodies in England and the United States.

IV. APPLICATION OF THIS METHOD TO THE STUDY OF ORIENTAL WORKMEN.—Inasmuch as the new edition of Le Play's work offers for criticism only monographies of Eastern countries, it were as yet premature to discuss the general conclusions to which the author of "*Les Ouvriers Européens*" has been led by his long-continued studies. The scheme of social reform with which Le Play's name is identified, though, according to him, it is firmly based on strict observation of facts, gives rise to considerable difference of opinion among the best minds. Hence to defend or to attack its principles would necessitate a thorough-going discussion. This task we cannot undertake, and must confine ourselves to a consideration of the actual developments of the method from the special point of view adopted by the Academy of Sciences when it labored to encourage the application of this system of in-

vestigation. "Are the researches original? Is their object an important one? Have facts been carefully observed; are they set forth methodically; and, above all, are they stated fairly?" These are the only considerations which we have to take into account. If the method of investigation is rigorous, and employed with scientific impartiality, then the facts set down will carry their own logical conclusions. Still, in order to give a better idea of the value and interest of these family monographies, it will be well to indicate a few of the principal facts brought into relief by the methodical study of the workmen of the East.

There exists, as one might say, a "home (*patrie*) of virtue," or, in other words, an *ensemble* of natural conditions, which make it easier for a man to discharge his duty; whereas, in other regions, on the contrary, the manner of life increases the difficulty of well-doing, and requires of a man a higher and, in so far, a rarer degree of virtue. For M. Le Play this "native land of virtue" is the great steppe—the vast region of grassy plains which constitutes Southern Russia, and which extends far into Asia. Devoid of trees, intersected by few streams, and they deeply embanked; exposed to all meteorological influences, this grassy region is hardly inhabitable during the droughts of summer or the colds of winter, with the exception of some few sheltered districts lying at the foot of hills. In spring, however, grasses and flowers grow there in abundance, and horses and oxen, camels and tents, disappear, buried in an ocean of verdure. From time immemorial this has been the home of nomads; the patriarchal life still subsists here in Biblical majesty, and with a serene moral elevation. The results yielded by the study of sundry families living on the Siberian slope of the Ural Mountains have been confirmed by independent and competent authors, as by the Abbé Hue in Mongolia, and by General Vlangaly in Peking. The simplicity of manners, the correctness of relations, the haughtiness of character, which characterize the nomads, have been lauded by all the writers of ancient times—by poets, geographers, and historians, from Homer to Horace, from Herodotus to Strabo and Justin.

When we leave the grassy plains and travel toward Europe through Russia, we observe the various phases of social transformation which have been brought about in the West by the clearing of woodland and the development of sedentary life. M. Le Play selects for publication five monographies of Russian families. First, we

have a family of Bashkirs, inhabiting a country that is renowned for the beauty of its vernal season: they are still half nomadic, spurn agricultural labor, and live upon the milk of their young mares like the Hippomulgæ and Galactophagæ of antiquity. Then comes a family of laborers employed in the gold-washings and the iron-works of the Ural: these devote themselves to the work of making clearings and garden-patches in the midst of the woods. Next come regular cultivators of the soil, peasants of the "black land" of Orenburg, who are attached to the seigniorial demesne by a system of *corvées* (husbandry-service). Still farther to the west, and especially in districts where, as in the basin of the Oka, the peasants are able to increase their little store by periodical emigrations of young laborers to the towns, the plan of rent (*obrok*) takes the place of husbandry-service. The social constitution which among nomads makes each head of a family a sort of petty sovereign has here been supplanted by the feudal system; still the patriarchal spirit has survived. Prior to the reforms of 1861, the landed proprietor exercised a paternal authority over his laborers, and the young were taught to respect the ancient traditions. Land-owners and fictory-proprietors were held morally responsible for the well-being of their subordinates, and master and workman were united by feelings of solidarity that resembled the ties of family. The transition from husbandry-service to rent was the prelude to emancipation, which would have come about spontaneously by the gradual evolution of interests, had it not been hastened by the generous initiative of the sovereign. Among the good results of emancipation, M. Le Play enumerates increased industry, increased savings, more ambition among the better class of laborers, less absenteeism on the part of the rural proprietors, and an increase of comfort for both of these classes in the fertile regions. But, on the other hand, weak or improvident families have parted with their traditional well-being; a pauper class is springing up, and the inferior nobility, especially those of that class whose estates were encumbered with debt, have been reduced to penury. Then, too, the compulsory suppression of seigniorial authority has dealt a blow at Russian nationality by weakening the moral influences which were wont to uphold religious belief and respect for authority. Finally, the trade in spirituous liquors has suddenly reached a considerable development, the consequence being here, as elsewhere, a degradation of the race. The best assurance for the future of Russia is to be found in

the rural communities, which have been wisely strengthened by the provisions of the emancipation act. These institutions, while they do but little to stimulate the energies of the peasants, and oftentimes check the career of eminent individualities, nevertheless insure to the great majority of the people a competency. At the same time they serve to prepare these populations for the enjoyment of the benefits of individual property.

The monography of the Jobajjy family, living on the banks of the Theiss, presents in miniature the old feudal régime of Hungary. The concession of the seigniorial lands, at first only a usufruct, had become, by force of custom and under the influence of material progress, strict property almost. The peasant could freely transmit landed property, in accordance with the local usage; but he could not mortgage it, neither could he parcel it out beyond a certain fixed limit. When a family became extinct, its inheritance did not go to increase the reserve of the proprietary, but was granted to other peasants. The rent was paid either in kind or in service. Some lands were held in fee by peasants, or even by day-laborers, thus showing the degree of foresight reached by the population. All the taxes, except the church tithes, were collected gratuitously with the rent of the estate by the proprietary, who also bore the expenses of police and of courts of justice; furthermore, he was required by self-interest still more than by custom always to assist his tenants. The Revolution of 1848 put an end to these institutions, and now from among its manifold complicated and contradictory results there are a few that are easily recognized. As a rule, the redemption of the enforced husbandry-service and of the tithe has benefited all classes, whether proprietaries or peasants: there is now more industry, agriculture is more prosperous, and wealth brings better returns. But some of the changes have been of benefit only to the proprietors: the taxes, which they used to collect without charge to the treasury, and in such a way as to cause the least possible distress to the tax-payers, are now levied by the fiscal authorities with all the rigor of officialism. Patrimonial justice is succeeded by public tribunals, which are oftentimes strangers to the local usages or are held in distant places, but are always costly, especially on account of the necessity of hiring lawyers. But what most seriously compromises the economic future of the middle classes is the endless division of small estates, resulting in social degradation of the peasantry,

and the alarming progress of usury, which threatens the ruin of improvident landlords.

Long ago, in France as also in England, the emancipation of the serfs was brought about by the same economic causes, but under circumstances far more favorable than at present attend the transformation of the feudal system in Hungary and in Russia. Instead of occurring prematurely, as the result of social revolution or theoretic speculations, this change of social relations was the gradual product of time, and its realization was due far less to the progress of the idea of freedom, the political efforts of legists, or the civilizing influence of the clergy, than to the free play of interests. Kings, no doubt, wishing to reduce the powers of the nobles and to enlarge those of the crown, issued many a decree of enfranchisement, but these had again and again to be renewed; and the serfs, far from looking on freedom as a deliverance, oftentimes shunned it as a burden and an expense. To cite one instance among many, consider how the serfs of Pierrefond, emancipated by Philip the Bold, straightway went and married serf-women, so that they might have ground for demanding of the Parliament a return to the glebe. Feudalism has always rested on the necessities of the weak, who offered their services in exchange for protection. So long as the rich and the powerful possessed forests and other wild lands, it was to their interest to attach to themselves the peasantry and their descendants. Thanks to these new relations between tenants and landlords, the latter saw the produce of their domains steadily augmenting, while the former, insured against untoward accidents, found ample resources in the cultivation of their patrimonial properties or in the enjoyment of the rights of usage. This condition of well-being everywhere underwent a change when disposable land began to be scarce. The proprietors, instead of insisting on their right of keeping their tenantry on their native soil, saw the advantage of being freed from the obligation of supporting them, which custom required them to do, but which had now become more difficult, owing to the complete occupation of the land. Finally, the evolution of society, which by degrees substituted in lieu of husbandry-service payment first in kind and then in money, ultimately resulted in quit-rent leases. Long before the turmoil of the Revolution, the tenants had been gradually becoming actual proprietors, and the facts developed by the new school of history, from study of documents, have a flood of light thrown upon them by the anal-

ysis of the conditions still existent in Russia and Hungary.

As for Turkey, sundry monographies of working-people's families exhibit in their details a constitution of society as yet patriarchal. The Mussulmans have always rejected feudal institutions as a means of relieving the wants of the improvident families that multiply by the crowding together of sedentary populations. Their religion teaches the equality of all Mussulmans, and they hold that, as compared with the poor man who practises the divine law, the rich man is but the steward of goods that belong to God. Hence the institution of the *wakfi*—lands forming a great part of Turkey, the revenues of which are saved for the benefit of the poor. A few examples will exhibit in a favorable light the relations between masters and servants. There is, for instance, the quasi-perpetual debt, without interest, contracted by the Christian Bulgarians of the iron-works in the Balkans toward their Mussulman employers. So far from regarding this as a burdensome obligation, the workmen are rather inclined to be vain of the large amount of their debt, as showing the confidence reposed in them by their masters. Then we must note the sort of family relationship subsisting between slave and master. Stimulated by their religious sentiments to emancipate at least one slave in each generation, some believers, even though they be not at all wealthy, willingly devote their first savings to the purchase of a slave, who soon becomes the companion and the equal in all respects of their own children. Without in the least cloaking the vices which have transformed the ancient manners of Turkey, the monographies do thus bring out clearly many a useful lesson in social harmony, that other nations might study with profit.

Facts like these might be multiplied, but the foregoing will suffice to show how the author has reached the conclusions which he now submits for criticism and correction. In his opinion, the well-being enjoyed undisturbed by the lower classes in the East—a state of things which offers so sharp a contrast to the sufferings and the complaints of the laboring-populations of the West—has hitherto been dependent on three causes, viz. : 1. The fact that both among the Mussulmans and the Christians, whether Orthodox or Catholic, the observance of the moral law is firmly based on religious belief; 2. The institution of the patriarchal family, which brings all the descendants under the strong authority of the father, and checks

the ambition of the more gifted members for the benefit of the greater number; 3. The free use of uncultivated land and of the spontaneous products of the earth, which is permitted to all. The first of these causes is not the exclusive privilege of any one age or country; the second is capable of being advantageously modified under the influence of economic and moral progress; the third alone is fated to disappear, as land is more and more completely occupied for culture. Now that the study of the working-people in the East has shown the social importance of this element of well-being, it is for other family monographies to exhibit the means whereby the ruling classes have at all times endeavored to fill its place and to maintain harmony by insuring to the lower classes

equivalent resources. It is not enough to show that societies have everywhere found, in the continuous nature of the engagements between employer and workman, strong guarantees against antagonism and suffering. It has still to be shown, with the clearness characteristic of the method of observation, how model workshops may, by harmonizing apparently conflicting interest, and without impairing any of the rights either of employer or employed, produce that stability of relations which formerly in the West, as still in the East, was based on a system of constraint. Knowledge of these processes is of the highest importance for the solution of the problems which now vex all manufacturing nations. On this point we demand of the author full and definite information.

DAVID, KING OF ISRAEL.¹

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DAVID, beloved son of Jesse, second King of Israel, and founder of the dynasty which continued to reign at Jerusalem until the Babylonian captivity. According to the usual chronology, he reigned 1035-1015 B. C., but the computations which produce this date by counting back from the destruction of Jerusalem, 588 B. C., or the fall of Samaria, 722 B. C., contain numerous precarious elements. Ewald puts the date ten years earlier, but recent investigations, on the contrary, make it not improbable that David flourished as much as from thirty years to half a century later than is usually assumed.

David is the greatest of the kings of Israel, and his reign changed the whole face of Hebrew history. During the period of the Judges, the Hebrews were weakened by an exaggerated love of personal independence, divided by tribal jealousies, and oppressed by a succession of foreign enemies, of whom the latest and most dangerous were the Philistines, an immigrant people whose main settlements in the fruitful coast-land of Southern Canaan appear to have taken place after the Hebrews were established in the land. Forcing their way inland, the Philistines struck a decisive blow in the battle of Ebenezer (1 Samuel iv.), when the collapse of the ancient hegemony of Ephraim, and the destruction of the sanctuary of the ark at Shilo, left the Hebrews without na-

tional leaders and without a centre of national action. Then arose Samuel, whose prophetic activity rallied the Israelites around Jehovah God of hosts, and brought about a great national and religious revival. The struggle with the Philistines was renewed with better success, though without decisive issue, and at length the election of Saul as king embodied in a permanent institution the stronger sense of national unity which had grown up under Samuel. But Saul was not equal to the task set before him. He broke with the prophetic party, which was the mainstay of the national revival which the king was called to lead. He felt himself forsaken by Jehovah, and his last years were clouded by accessions of a furious melancholy which destroyed his vigor and alienated his subjects. When at length he was defeated and slain at Gilboa, the Philistines appeared to be absolute masters of the position. They even moved forward and occupied the cities in the plain of Jezreel and on the Jordan, which the Israelites forsook in terror—a movement which cut the country as it were in two, and apparently made it impossible for the Hebrews again to unite under a single head. From this humiliation David in a few years raised his country to the highest state of prosperity and glory, subduing his enemies on every side, and extending his suzerainty, as he expresses himself in Psalm xviii., even over nations that he had not known. To do this work, other qualities than mere mili-

¹ From the new edition of the "Encyclopædia Britannica," vol. vi.

tary capacity were required. David was not only a great captain—he was a national hero, who united in his own person the noblest parts of Hebrew genius, and drew to himself by an unflinching personal attraction the best valor, patriotism, and piety of the nation; while his political tact and inborn talent for rule enabled him to master the old tribal particularism, and to shape at Jerusalem a kingdom which, so long as he lived, represented the highest conception of national life that was possible under the rude social conditions then existing. The structure erected by David was, in truth, too much in advance of the times, and too wholly the creation of unique genius to be permanent. Under a successor whose wisdom lacked the qualities of personal force and sympathy with popular feeling, the kingdom of David began to decay, and in the next generation it fell asunder, and lived only in the hearts of the people as the proudest memory of past history, and the prophetic ideal of future glory.

The books of Samuel, which are our principal source for the history of David, show how deep an impression the personality of the king, his character, his genius, and the romantic story of his early years, had left on the mind of the nation. Of no hero of antiquity do we possess so life-like a portrait. Minute details and traits of character are preserved with a fidelity which the most skeptical critics have not ventured to question, and with a vividness which bears all the marks of contemporary narrative. But the record is by no means all of one piece. The history, as we now have it, is extracted from various sources of unequal value, which are fitted together in a way which offers considerable difficulties to the historical critic. In the history of David's early adventures the narrative is not seldom disordered, and sometimes seems to repeat itself with puzzling variations of detail, which have led critics to the almost unanimous conclusion that the first book of Samuel is drawn from at least two parallel histories. It is indeed easy to understand that the romantic incidents of this period were much in the mouths of the people, and in course of time were written down in various forms which were not combined into perfect harmony by later editors, who gave excerpts from several sources rather than a new and independent history. These excerpts, however, have been so pieced together that it is often impossible to separate them with precision, and to distinguish accurately between earlier and later elements. It even appears that some copies of the

books of Samuel incorporated narratives which other copies did not acknowledge. From the story of Goliath, the Septuagint omits many verses—1 Samuel xvii. 12–31, xvii. 55–xviii. 5. The omission makes the narrative consistent, and obviates serious difficulties involved in the Hebrew text. Hence some have supposed that the Greek translators arbitrarily removed passages that puzzled them. But this hypothesis does not meet the facts, and is inconsistent with what we know of the manner of this part of the Septuagint. There can be little doubt that both here and in other cases the shorter text is original, and that the disturbing additions came in later from some other document, and were awkwardly patched on to the older text. So, too, the history of the gradual estrangement of Saul from David is certainly discontinuous, and in the opinion of most critics the two accounts of David sparing Saul's life are duplicate narratives of one event. Even in the earlier part of the history these minor difficulties do not affect the essential excellence of the narrative preserved to us; and for the period of David's kingship the accounts are still better. All that relates to personal and family matters at the court of Jerusalem (2 Samuel xi.–xx.) seems to come from some writer who had personal cognizance of the events recorded. It does not appear that the plan of this author included the history of David's foreign campaigns. The scanty account of great wars in chapter viii. is plainly from another source, and in general our information is less adequate on public affairs than on things that touched the personal life of the king. The narrative is further enriched with poetical pieces, of which one at least (2 Samuel i. 19–27) is known to be extracted from an anthology entitled "The Book of the Upright." Several brief lists of names and events seem also to have been taken from distinct sources, and sometimes interrupt the original context (e. g., 2 Samuel iii. 2–5). Some important lists were still accessible to the author of Chronicles in a separate form. 1 Chronicles xi. 10–47 is fuller at the end than the corresponding list in 2 Samuel xxiii., and 1 Chronicles xii. contains valuable matter altogether wanting in Samuel. See also 1 Chronicles xxvii. Besides the books of Samuel (with 1 Kings i., ii.), and the parallel narrative of the Chronicler, we have a few hints for the history of David in 1 Kings xi. and in the titles of Psalms (especially Psalm vii. and lx.); and, of course, such psalms as can be made out to be really by David are invaluable additions to the Davidic poems incorporated in the books of Samuel.

Jesse, the father of David, was a substantial citizen of Bethlehem. He claimed descent through Boaz from the ancient princes of Judah (Ruth iv. 18, *seq.*), but the family connection was not of note in Israel (1 Samuel xviii. 18). As the youngest son of the house David spent his youth in an occupation which the Hebrews as well as the Arabs seem to have held in low esteem. He kept his father's sheep in the desert steppes of Judah, and there developed the strength, agility, endurance, and courage, which distinguished him throughout life, and are referred to in Psalm xviii. 32, *seq.* (compare 1 Samuel xvii. 34, xxiv. 2; 2 Samuel xvii. 9). There, too, he acquired that skill in music that led to his first introduction to Saul. Then he became Saul's armor-bearer, and in this capacity, according to the shorter and more consistent form of the narrative, David took part in the campaign in which he slew the Philistine champion Goliath, and became by one exploit a popular hero, and an object of jealousy to Saul. According to the Massoretic text of 1 Samuel, Saul's jealousy leaped at once to the conclusion that David's ambition would not stop short of the kingship. Such a suspicion would be intelligible if we could suppose that the king had heard something of the significant act of Samuel, which now stands at the head of the history of David in witness of that divine election and unction with the spirit of Jehovah on which his whole career hung (1 Samuel xvi. 1-13). But there is not the least trace in the history that even David and David's family understood at the time the meaning that underlay his unction by Samuel, which would naturally be taken as a special mark of favor and a part of the usual "consecration" of the guests in a sacrificial feast. The shorter text of 1 Samuel xviii., represented by the Septuagint, gives an account of Saul's jealousy, which is psychologically more intelligible. According to this text Saul was simply possessed with such a personal dislike and dread of David as might easily occupy his disordered brain. To be quit of his hateful presence he gave him a military command. In this charge David increased his reputation as a soldier, and became a general favorite. Saul's daughter, Michal, loved him; and her father, whose jealousy continued to increase, resolved to put the young captain on a perilous enterprise, promising him the hand of Michal as a reward of success, but secretly hoping that he would perish in the attempt. David's good fortune did not desert him; he won his wife, and in this new advancement continued to grow in the popular favor, and to gain fresh laurels in the field.

At this point it is necessary to look back on an episode which is found in the Hebrew text, but not in the Greek—the proposed marriage of David with Saul's eldest daughter Merab, who at the time when the proposal was made was already the wife of a certain Adriel. What is said of this affair interrupts the original context of chapter xviii., to which the insertion has been clumsily fitted by an interpolation in v. 21. We have here, therefore, a notice drawn from a distinct source, and of uncertain value. Merab and Michal are confounded in 2 Samuel xxi. 8, and perhaps the whole episode of Merab and David rests on a similar confusion of names.

As the king's son-in-law, David was necessarily again at court. He became chief of the body-guard, as Ewald rightly interprets 1 Samuel xxii. 14, and ranked next to Abner (1 Samuel xx. 25), so that Saul's insane fears were constantly exasperated by personal contact with him. On at least one occasion the king's frenzy broke out in an attempt to murder David with his own hand. At another time Saul actually gave commands to assassinate his son-in-law, but the breach was made up by Jonathan, whose chivalrous spirit had united him to David in a covenant of closest friendship (1 Samuel xix. 1-7). The circumstances of the final outburst of Saul's hatred, which drove David into exile, are not easily disentangled. The narrative of 1 Samuel xx., which is the principal account of the matter, cannot originally have been preceded by chapter xix. 11-24, for in chapter xx. David appears to be still at court, and Jonathan is even unaware that he is in any danger, while the preceding verses represent him as already a fugitive. It may also be doubted whether the narrative of David's escape from his own house by the aid of his wife Michal (chapter xix. 11-17) has any close connection with verse 10, and does not rather belong to a later period. David's daring spirit might very well lead him to visit his wife even after his first flight. The danger of such an enterprise was diminished by the reluctance to violate the apartments of women and attack a sleeping foe, which appears also in Judges xvi. 2, and among the Arabs. In any case it is certain that chapter xx. must be taken by itself; and it seems safer to conclude that chapter xix. 11-24 are fragments which have been misplaced by an editor, than to accept the opinion of those critics who hold that we have two distinct and quite inconsistent accounts of the same events.

According to chapter xx., David was still at court in his usual position, when he became cer-

tain that the king was aiming at his life. He betook himself to Jonathan, who thought his suspicions groundless, but undertook to test them. A plan was arranged by which Jonathan should draw from the king an expression of his feelings, and a tremendous explosion revealed that Saul regarded David as the rival of his dynasty, and Jonathan as little better than a fellow-conspirator. The breach was plainly irreparable. Jonathan sought out his friend, and after mutual pledges of unbroken friendship they parted, and David fled. His first impulse was, to seek the sanctuary at Nob, where he had been wont to consult the priestly oracle (chapter xxii. 15), and where, concealing his disgrace by a fictitious story, he also obtained bread from the consecrated table, and the sword of Goliath. It was, perhaps, after this that David made a last attempt to find a place of refuge in the prophetic circle of Samuel at Ramah, where he was admitted into the prophetic cenobium, and was for a time protected by the powerful and almost contagious influences which the religious exercises of the prophets exerted on Saul's emissaries, and even on the king himself. The episode now stands in another connection (chapter xix. 18 *et seq.*), where it is certainly out of place. It would, however, fit excellently into the break that plainly exists in the history at xxi. 10, after the affair at Nob. Deprived of the protection of religion as well as of justice, David tried his fortune among the Philistines at Gath. But he was recognized, and suspected as a redoubtable foe. Escaping by feigning madness, which in the East has inviolable privileges, he returned to the wilds of Judah, and was joined at Adullam by his father's house and by a small band of outlaws, of which he became the head. Placing his parents under the charge of the King of Moab, he took up the life of a guerrilla-captain, cultivating friendly relations with the townships of Judah (1 Samuel xxx. 26), which were glad to have on their frontiers a protector so valiant as David, even at the expense of the black-mail which he levied in return. A clear conception of his life at this time, and of the respect which he inspired by the discipline in which he held his men, and of the generosity which tempered his fiery nature, is given in 1 Samuel xxv. His force gradually swelled, and he was joined by the prophet Gad and by the priest Abiathar, the only survivor of a terrible massacre by which Saul took revenge for the favors which David had received at the sanctuary of Nob. He was even able to strike at the Philistines, and to rescue Keilah, in the low country of Judah, from

their attack. Had he been willing to raise the standard of revolt against Saul, he might probably have made good his position, for he was now openly pointed to as divinely designed for the kingship. But, though Saul was hot in pursuit, and though he lived in constant fear of being betrayed, David refused to do this. His blameless conduct retained the confidence of Jonathan (1 Samuel xxiii. 16), and he deserved that confidence by sparing the life of Saul. But at length it became plain that he must either resist by force or seek foreign protection. He went to Achish of Gath, and was established in the outlying town of Ziklag, where his troops might be useful in chastising the Amalekites and other robber tribes who made forays on Philistia and Judah, without distinction.

At Ziklag David continued to maintain amicable relations with his friends in Judah, and his little army received accessions even from Saul's own tribe of Benjamin (1 Chronicles xii. 1). At length, in the second year, he was called to join his master in a great campaign against Saul. The Philistines directed their forces toward the rich valley of Jezreel; and Saul, forsaken by Jehovah, already gave himself up for lost. It may be doubted whether the men of Judah took part in this war; and on his march David was joined by influential deserters from Israel (1 Chronicles xii.). The prestige of Saul's reign was gone; and the Hebrews were again breaking up into parties, each ready to act for itself. Under such circumstances, David might well feel that loyalty to his new master was his first duty. But he was providentially saved from the necessity of doing battle with his countrymen by the jealousy of the Philistine lords, who demanded that he be sent back to Ziklag. He returned to find the town pillaged by the Amalekites; but, pursuing the foes, he inflicted upon them a signal chastisement, and took a great booty, part of which he spent in politic gifts to the leading men of the Judean towns.

Meantime Saul had fallen, and Northern Israel was in a state of chaos. The Philistines took possession of the fertile lowlands of Jezreel and the Jordan; and the shattered forces of Israel were slowly rallied by Abner in the remote city of Mahanaim in Gilead, under the nominal sovereignty of Saul's son Ishbaal. The tribe of Judah, always loosely attached to the northern Hebrews, was in these circumstances, compelled to act for itself. David saw his opportunity, and advanced to Hebron, where he was anointed King of Judah at the age of thirty, and continued

to reign for seven years and a half. His noble elegy on the death of Saul and Jonathan, and his message of thanks to the men of Jabesh Gilead for their chivalrous rescue of the bodies of the fallen heroes, show how deeply he sympathized with the disasters of his nation; and even in Northern Israel many now looked to him as their only helper (2 Samuel iii. 17). But David was not lacking in the caution and even craftiness proper to an Oriental hero; and he appears to have been careful not to irritate the Philistines by any premature national movement. As he retained Ziklag, we must suppose that he had some agreement with his former suzerain Achish. Abner gradually consolidated the authority of Ishbaal in the north, and at length his forces met those of David at Gibeon. A sham contest was changed into a fatal fray by the treachery of Ishbaal's men, and in the battle which ensued, Abner was not only defeated, but, by slaying Asahel, drew upon himself a blood feud with Joab. The war continued. Ishbaal's party waxed weaker and weaker; and at length Abner quarreled with his nominal master, and offered the kingdom to David. The base murder of Abner by Joab did not long defer the inevitable issue of events. Ishbaal was assassinated by two of his own followers, and all Israel sought David as king.

The Biblical narrative is not so constructed as to enable us to describe in chronological order the thirty-three years of David's reign over all Israel. Let us look at (1) his internal policy, (2) his relations to foreign nations, (3) other events.

1. Under the judges all authority was at bottom local or tribal, and the wider influence wielded by the more famous of these rulers took the form of a temporary preëminence or hegemony of the judge's own tribe. The kingdom of Saul was not radically different in character. There was no national centre. Saul ruled as a Benjamite from his paternal city of Gibeah (*see* 1 Samuel xxii. 7). At the risk of alienating the men of Judah, who in fact appear as the chief malecontents in subsequent civil disturbances, David resolved to break through these precedents, and to form a truly national kingdom independent of tribal feeling. The success of so bold a conception was facilitated by the circumstance that, unlike previous kings, he was surrounded by a small but thoroughly-disciplined standing army, having gradually shaped his troop of freebooters into an organized force of six hundred "mighty men" (Gibborim), always under arms, and absolutely attached to his person. The king began the execution of his plan by a stroke

which at once provided a centre for future action, and gave the necessary prestige to his new kingdom. He stormed the Jebusite fortress of Jerusalem, which its inhabitants deemed impregnable, and here, in the centre of the country, on the frontier between Judah and Benjamin, he fortified the "city of David," the stronghold of Zion, and garrisoned it with his Gibborim. His next aim was to make Jerusalem the religious as well as the political centre of the kingdom. The ark of Jehovah, the only sanctuary of national significance, had remained in obscurity since its return from the Philistines in the early youth of Samuel. David brought it up from Kirjath-Jearim with great pomp, and pitched a tent for it in Zion, amid national rejoicings. No action of David's life displayed truer political insight than this. But the whole narrative (2 Samuel vi.) shows that the insight was that of a loyal and God-fearing heart, which knew that the true principle of Israel's unity and strength lay in national adherence to Jehovah (compare Psalms xv. and xxiv., one or both of which may refer to this occasion). It was probably at a later period, when his kingdom was firmly established, that David proposed to erect a permanent temple to Jehovah. The prophet Nathan commanded the execution of this plan to be delayed for a generation; but David received at the same time a prophetic assurance that his house and kingdom should be established forever before Jehovah.

In civil and military affairs David was careful to combine necessary innovations with a due regard for the old habits and feelings of the people, which he thoroughly understood and turned to good account. The six hundred Gibborim, and a small body-guard of foreign troops from Philistia (the Cherethites and Pelethites), formed a central military organization, not large enough to excite popular jealousy, but sufficient to provide officers and furnish an example of discipline and endurance to the old national militia, exclusively composed of foot-soldiers. In civil matters the king looked heedfully to the execution of justice (2 Samuel viii. 15), and was always accessible to the people (2 Samuel xiv. 4). But he does not appear to have made any change in the old local administration of justice, or to have appointed a central tribunal (2 Samuel xv. 2, where, however, Absalom's complaint that the king was inaccessible is merely factious). A few great officers of state were appointed at the court of Jerusalem (2 Samuel viii.), which was not without a splendor hitherto unknown in Israel. The palace was built

by Tyrian artists. Royal pensioners, of whom Jonathan's son Mephibosheth was one, were gathered round a princely table. The art of music was not neglected (2 Samuel xix. 35). A more dangerous piece of magnificence was the harem, which, though always deemed an indispensable part of Eastern state, did not befit a servant of Jehovah, and gave rise to public scandal as well as to fatal disorders in the king's household. Except in this particular, David seems to have ventured on only one dangerous innovation, which was undertaken amid universal remonstrances, and was checked by the rebukes of the prophet Gad and the visitation of a pestilence. To us, the proposal to number the people seems innocent or laudable. But David's conscience accepted the prophetic rebuke, and he tacitly admitted that the people were not wrong in condemning his design as an attempt upon their liberties, and an act of presumptuous self-confidence (2 Samuel xxiv.).

2. David's wars were always successful, and, so far as we can judge from the brief record, were never provoked by himself. His first enemies were the Philistines, who rose in arms as soon as he became king of all Israel. We read of two great battles in the valley of Rephaim, westward from Jerusalem (2 Samuel v.); and a record of individual exploits and of personal dangers run by David is preserved in 2 Samuel xxi. and xxiii. At length the Philistines were entirely humbled, and the "bridle" of sovereignty was wrested from their hands (chapter viii. 1, Heb.) But the long weakness of Israel had exposed the nation to wrongs from their neighbors on every side; and the Tyrians, whose commerce was benefited by a stable government in Canaan, were the only permanent allies of David. Moab, an ancient and bitter foe, was chastised by David with a severity for which no cause is assigned, but which may pass for a gentle reprisal if the Moabites of that day were not more humane than their descendants in the days of King Mesha. A deadly conflict with the Ammonites was provoked by a gross insult to friendly ambassadors of Israel; and this war, of which we have pretty full details in 2 Samuel x. 1-xi. 1, xii. 26-31, assumed dimensions of unusual magnitude when the Ammonites procured the aid of their Aramean neighbors, and especially of Hadadzezer, whose kingdom of Zoba seems to have held at that time a preëminence in Syria at least equal to that which was afterward gained by Damascus. The defeat of Hadadzezer in two great campaigns brought in the voluntary or forced submission of all the lesser kingdoms

of Syria as far as the Orontes and the Euphrates. The glory of this victory was increased by the simultaneous subjugation of Edom in a war conducted by Joab with characteristic severity. After a great battle on the shores of the Dead Sea, the struggle was continued for six months. The Edomites contested every inch of ground, and all who bore arms perished (2 Samuel viii. 13; 1 Kings xi. 15-17; Psalm lx., title). The war with Ammon was not ended till the following year, when the fall of Rabbah crowned David's warlike exploits. But the true culminating point of his glory was his return from the great Syrian campaign, laden with treasures to enrich the sanctuary; and it is at this time that we may suppose him to have sung the great song of triumph preserved in 2 Samuel xxii. (Psalm lviii.). Before the fall of Rabbah this glory was clouded with the shame of Bath-sheba, and the blood of Uriah.

3. As the birth of Solomon cannot have been earlier than the capture of Rabbah, it appears that David's wars were ended within the first half of his reign at Jerusalem, and the tributary nations do not seem to have attempted any revolt while he and Joab lived (compare 1 Kings xi. 14-25). But when the nation was no longer knit together by the fear of danger from without, the internal difficulties of the new kingdom became more manifest. The inveterate jealousies of Judah and Israel reappeared; and, as has been already mentioned, the men of Judah were the chief malcontents. In this respect, and presumably not in this alone, David suffered for the very excellence of his impartial rule. In truth, all innovations are dangerous to an Eastern sovereign, and all Eastern revolutions are conservative. On the other hand, David continued to tolerate some ancient usages inconsistent with the interests of internal harmony. The practice of blood-revenge was not put down, and by allowing the Gibeonites to enforce it against the house of Saul, the king involved himself in a feud with the Benjamites (compare 2 Samuel xxi. with chapter xvi. 8, which refers to a *later* date). Yet he might have braved all these dangers but for the disorders of his own family, and his deep fall in the matter of Bath-sheba, from which the prophet Nathan rightly foresaw fatal consequences, not to be averted even when divine forgiveness accepted the sincere contrition of the king. That the nation at large was not very sensitive to the moral enormities which flow from the system of the harem is clear from 2 Samuel xvi. 21. But the kingdom of David was strong by rising above the

level of ordinary Oriental monarchy, and expressing the ideal of a rule after Jehovah's own heart (1 Samuel xiii. 14), and in the spirit of the highest teaching of the prophets. This ideal, shattered by a single grievous fall, could be restored by no repentance. Within the royal family the continued influence of Bath-sheba added a new element to the jealousies of the harem. David's sons were estranged from one another, and acquired all the vices of Oriental princes. The severe impartiality of the sacred historian has concealed no feature in this dark picture: the brutal passion of Amnon, the shameless counsel of the wily Jonadab, the black scowl that rested on the face of Absalom through two long years of meditated revenge, the panic of the court when the blow was struck and Amnon was assassinated in the midst of his brethren. Three years of exile, and two of further disgrace, estranged the heart of Absalom from his father. His personal advantages, and the princely lineage of his mother, gave him a preëminence among the king's sons, to which he added emphasis by the splendor of his retinue, while he studiously cultivated personal popularity by a pretended interest in the administration of kingly justice. Thus ingratiated with the mass, he raised the standard of revolt in Hebron, with the malecontent Judeans as his first supporters, and the crafty Ahithophel, a man of Southern Judah, as his chief adviser. Arrangements had been made for the simultaneous proclamation of Absalom in all parts of the land. The surprise was complete, and David was compelled to evacuate Jerusalem, where he might have been crushed before he had time to rally his faithful subjects. Ahithophel knew better than any one how artificial and unsubstantial was the enthusiasm for Absalom. He hoped to strike David before there was time for second thoughts; and when Absalom rejected this plan, and acted on the assumption that he could count on the whole nation, he despaired of success and put an end to his own life. David, in fact, was warmly received by the Gileadites, and the first battle destroyed the party of Absalom, who was himself captured and slain by Joab. Then all the people, except the Judeans, saw that they had been deceived; but the latter were not conciliated without a virtual admission of that prerogative of kinship to the king which David's previous policy had steadily ignored. This concession involved important consequences. The precedence claimed by Judah was challenged by the northern tribes even on the day of David's solemn return to his capital, and a rupture ensued, which, but for the

energy of Joab, might have led to a second and more dangerous rebellion. The remaining years of David's life appear to have been untroubled, and according to the narrative of Chronicles the king was much occupied with schemes concerning the future temple. He was already decrepit and bedridden under the fatigues of seventy years, when the last spark of his old energy was called forth to secure the succession of Solomon against the ambition of Adonijah. It is noteworthy that, as in the case of Absalom, the pretensions of the latter, though supported by Joab and Abiathar, found their chief stay among the men of Judah (1 Kings i. 9).

The principles that guided David's reign are worthily summed up in his last words, 2 Samuel xxiii. 1, *seq.*, with which must be compared his great song of triumph, 2 Samuel xxii. The foundation of national prosperity is a just rule based on the fear of Jehovah, strong in his help, and swift to chastise wrong-doers with inflexible severity. That the fear of Jehovah is viewed as receiving its chief practical expression in the maintenance of social righteousness is a necessary feature of the Old Testament faith, which regards the nation rather than the individual as the subject of the religious life. Hence the influence upon his life of David's religious convictions is not to be measured by the fact that they did not wholly subdue the sensuality which is the chief stain on his character, but rather by his habitual recognition of a generous standard of conduct, by the undoubted purity and lofty justice of an administration which was never stained by selfish considerations or motives of personal rancor, and was never accused of favoring evil-doers, and finally by the calm courage, rooted in faith in Jehovah's righteousness, which enabled him to hold an even and noble course in the face of dangers and treachery. That he was not able to reform at a stroke all ancient abuses appears particularly in relation to the practice of blood-revenge; but even in this matter it is clear from 2 Samuel iii. 28, *seq.*, xiv. 1-10, that his sympathies were against the barbarous usage. Nor is it just to accuse him of cruelty in his treatment of enemies. Every nation has a right to secure its frontiers from hostile raids; and as it was impossible to establish a military cordon along the borders of Canaan, it was necessary absolutely to cripple the adjoining tribes. From the lust of conquest for its own sake David appears to have been wholly free.

The generous elevation of David's character is seen most clearly in those parts of his life

where an inferior nature would have been most at fault; in his conduct toward Saul, in the blameless reputation of himself and his band of outlaws in the wilderness of Judah, in his repentance under the rebuke of Nathan, and in his noble bearing on the revolt of Absalom, when calm faith in God and humble submission to his will appear in combination with masterly command over circumstances, and swift wisdom in resolution and action. His unfailing insight into character, and his power of winning men's hearts and touching their better impulses, appear in innumerable traits of the history (e. g., 2 Samuel xiv. 18-20; iii. 31-37; xxiii. 15-17). His knowledge of men was the divination of a poet rather than the acquired wisdom of a statesman, and his capacity for rule stood in harmonious unity with the lyrical genius that was already proverbial in the time of Amos (Amos vi. 5). To the later generations David was preëminently the Psalmist. The Hebrew titles ascribe to him seventy-three psalms; the Septuagint adds some fifteen more; and later opinion, both Jewish and Christian, claimed for him the authorship of the whole Psalter (so the Talmud, Augustine, and others). That the tradition of the titles requires careful sifting is no longer questionable, as is admitted in such cases as Psalms lxxxvi., lxix., cxli., even by the cautious and conservative Delitzsch. The biographer must, therefore, use the greatest circumspection

in drawing from the Psalter material for the study of David's life and character. On the other hand, the tradition expressed in the titles could not have arisen unless David was really the father of Hebrew psalmody. As a psalmist, he appears in 2 Samuel xxii., xxiii., in two poems, which are either Davidic or artificial compositions written in his name. If we consider the excellent information as to David, which appears throughout the books of Samuel, the intrinsic merits and fresh naturalness of the poems, and the fact that Psalm xviii. is an independent recension of 2 Samuel xxii., the hypothesis that these pieces are spurious must appear very forced, though it has received the support of some respectable critics, especially Kuenen, who maintains that the religion of David is far below the level of the Psalter. If we reject this position, which can hardly be made good without doing great violence to the narrative of the books of Samuel, we cannot well stop short of the admission that the Psalter must contain Davidic psalms, some of which at least may be identified by judicious criticism, such as has been exercised by Ewald with singular insight and tact in his "Dichter des Alten Bundes." Ewald claims for David Psalms iii., iv., vii., viii., xi., (xv.), xviii., xix., xxiv., xxix., xxxii., ci., and probably this list should rather be extended than curtailed. (Compare Hitzig's "Psalmen," Leipsic, 1863.)

A MODERN "SYMPOSIUM."

THE SOUL AND FUTURE LIFE.

LORD SELBORNE.—I am too well satisfied with Lord Blachford's paper, and with much that is in the other papers of the September number,¹ to think that I can add anything of importance to them. The little I would say has reference to our actual knowledge of the soul during this life—meaning by the soul what Lord Blachford means, viz., the conscious being which each man calls "himself."

It appears to me that what we know and can observe tends to confirm the testimony of our consciousness to the reality of the distinction between the body and the soul. From the necessity of the case, we cannot observe any manifestations of the soul except during the time of its association with the body. This limit of our ex-

perience applies, not to the "ego" of which alone each man has any direct knowledge, but to the perceptible indications of consciousness in others. It is impossible, in the nature of things, that any man can ever have had experience of the total cessation of his own consciousness; and the idea of such a cessation is much less natural and much more difficult to realize than that of its continuance. We observe the phenomena of death in others, and infer, by irresistible induction, that the same thing will also happen to ourselves. But these phenomena carry us only to the dissociation of the "ego" from the body, not to its extinction.

Nothing else can be credible if our consciousness is not; and I have said that this bears testimony to the reality of the distinction between

soul and body. Each man is conscious of using his own body as an instrument, in the same sense in which he would use any other machine. He passes a different moral judgment on the mechanical and involuntary actions of his body, from that which he feels to be due to its actions resulting from his own free-will. The unity and identity of the "ego," from the beginning to the end of life, is of the essence of his consciousness.

In accordance with this testimony are such facts as the following: that the body has no proper unity, identity, or continuity, through the whole of life—all its constituent parts being in a constant state of flux and change; that many parts and organs of the body may be removed with no greater effect upon the "ego" than when we take off any article of clothing; and that those organs which cannot be removed or stopped in their action without death are distributed over different parts of the body, and are homogeneous in their material and structure with others which we can lose without the sense that any change has passed over our proper selves. If, on the one hand, a diseased state of some bodily organs interrupts the reasonable manifestations of the soul through the body, the cases are, on the other, not rare in which the whole body decays and falls into extreme age, weakness, and even decrepitude, while vigor, freshness, and youthfulness, are still characteristics of the mind.

The attempt, in Butler's work, to reason from the indivisibility and indestructibility of the soul as ascertained facts, is less satisfactory than most of that great writer's arguments, which are generally rather intended to be destructive of objections than demonstrative of positive truths. But the modern scientific doctrine, that all matter and all force are indestructible, is not without interest in relation to that argument. There must at least be a natural presumption from that doctrine that, if the soul during life has a real existence distinct from the body, it is not annihilated by death. If, indeed, it were a mere "force" (such as heat, light, etc., are supposed by modern philosophers to be—though men who are not philosophers may be excused if they find some difficulty in understanding exactly what is meant by the term when so used), it would be consistent with that doctrine that the soul might be transmuted after death into some other form of force. But the idea of "force" in this sense (whatever may be its exact meaning) seems wholly inapplicable to the conscious being which a man calls "himself."

The resemblances in the nature and organiza-

tion of animal and vegetable bodies seem to me to confirm, instead of weakening, the impression that the body of man is a machine under the government of the soul, and quite distinct from it. Plants manifest no consciousness; all our knowledge of them tends irresistibly to the conclusion that there is in them no intelligent, much less any reasonable, principle of life. Yet they are machines very like the human body; not, indeed, in their formal development or their exact chemical processes, but in the general scheme and functions of their organism—in their laws of nutrition, digestion, assimilation, respiration, and especially reproduction. They are bodies without souls, living a physical life, and subject to a physical death. The inferior animals have bodies still more like our own; indeed, in their higher orders, resembling them very closely indeed; and they have also a principle of life quite different from that of plants, with various degrees of consciousness, intelligence, and volition. Even in their principle of life, arguments founded on observation and comparison (though not on individual consciousness), more or less similar to those which apply to man, tend to show that there is something distinct from, and more than, the body. But, of all these inferior animals, the intelligence differs from that of man, not in degree only, but in kind. Nature is their simple, uniform, and sufficient law; their very arts (which are often wonderful) come to them by Nature, except when they are trained by man; there is in them no sign of discourse of reason, of morality, or of the knowledge of good and evil. The very similarity of their bodily structure to that of man tends, when these differences are noted, to add weight to the other natural evidence of the distinctness of man's soul from his body.

The immortality of the soul seems to me to be one of those truths for the belief in which, when authoritatively declared, man is prepared by the very constitution of his nature.

CAXON BARRY.—Any one who from the ancient positions of Christianity looks on the controversy between Mr. Harrison and Prof. Huxley on "The Soul and Future Life" (to which I propose mainly to confine myself) will be tempted with Faulconbridge to observe, not without a touch of grim satisfaction, how, "from north to south, Austria and France shoot in each other's mouth." The fight is fierce enough to make him ask, *Tantene animis sapientibus ira?* But he will see that each is far more effective in battering the lines of the enemy than in strengthening his own. Nor will he be greatly concerned if

both from time to time lodge a shot or two in the battlements on which he stands, with some beating of that "drum scientific" which seems to me to be in these days always as resonant, sometimes with as much result of merely empty sound, as "the drum ecclesiastic," against which Prof. Huxley is so fond of warning us. Those whom Mr. Harrison calls "theologians," and whom Prof. Huxley less appropriately terms "priests" (for of priesthood there is here no question), may indeed think that, if the formidable character of an opponent's position is to be measured by the scorn and fury with which it is assailed, their ground must be strong indeed; and they will possibly remember an old description of a basis less artificial than "pulpit-stairs," from which men may look without much alarm, while "the floods come and the winds blow." Gaining from this conviction courage to look more closely, they will perceive, as I have said, that each of the combatants is far stronger on the destructive than on the constructive side.

Mr. Harrison's earnest and eloquent plea against the materialism which virtually, if not theoretically, makes all that we call spirit a mere function of material organization (like the *ἐμπνοία* of the "Phædo"), and against the exclusive "scientism" which, because it cannot find certain entities along its line of investigation, asserts loudly that they are either non-existent or "unknowable," is strong, and (*pace* Prof. Huxley) needful; not, indeed, against him (for he knows better than to despise the metaphysics in which he is so great an adept), but against many adherents, prominent rather than eminent, of the school in which he is a master. Nor is its force destroyed by exposing, however keenly and sarcastically, some inconsistencies of argument, not inaptly corresponding (as it seems to me) with similar inconsistencies in the popular exposition of the views which it attacks. If Prof. Huxley is right (as surely he is) in pleading for perfect freedom and boldness in the investigation of the phenomena of humanity from the physical side, the counter-plea is equally irresistible for the value of an independent philosophy of mind, starting from the metaphysical pole of thought, and reasoning positively on the phenomena which, though they may have many connections with physical laws, are utterly inexplicable by them. We might, indeed, demur to his inference that the discovery of "antecedence in the molecular fact" necessarily leads to a "physical theory of moral phenomena," and *vice versa*, as savoring a little of the *post hoc, ergo propter hoc*. Insepa-

rable connection it would imply; but the ultimate causation might lie in something far deeper, underlying both "the molecular" and "the spiritual fact." But still, to establish such antecedence would be an important scientific step, and the attempt might be made from either side.

On the other hand, Prof. Huxley's trenchant attack on the unreality of the positivist assumption of a right to take names which in the old religion at least mean something firm and solid, and to sublime them into the cloudy forms of transcendental theory, and on the arbitrary application of the word "selfishness," with all its degrading associations, to the consciousness of personality here and the hope of a nobler personality in the future, leaves nothing to be desired. I fear that his friends the priests would be accused of the crowning sin of "ecclesiasticism" (whatever that may be) if they used denunciations half so sharp. Except with a few sarcasms which he cannot resist the temptation of flinging at them by the way, they will have nothing with which to quarrel; and possibly they may even learn from him to consider these as claps of "cheap thunder" from the "pulpit," in that old sense of the word in which it designates the professorial chair.

The whole of Mr. Harrison's two papers may be resolved into an attack on the true individuality of man, first on the speculative, then on the moral side; from the one point of view denouncing the belief in it as a delusion, from the other branding the desire of it as a moral degradation. The connection of the two arguments is instructive and philosophical. For no argument merely speculative, ignoring all moral considerations, will really be listened to. His view of the soul as "a consensus of human faculties" reminds us curiously of the Buddhist "groups;" his description of a "perpetuity of sensation as the true hell" breathes the very spirit of the longing for *Nirvana*. Both he and his Asiatic predecessors are certainly right in considering the "delusion of individual existence" as the chief delusion to be got rid of on the way to a perfect Agnosticism, in respect of all that is not merely phenomenal. It is true that he protests in terms against a naked materialism, ignoring all spiritual phenomena as having a distinctive character of their own; but yet, when he tells us that "to talk about a bodiless Being thinking and loving is simply to talk of the thoughts and feelings of Nothing," he certainly appears to assume substantially the position of the materialism he denounces, which (as has been already said) holds

these spiritual energies to be merely results of the bodily organization, as the excitation of an electric current is the result of the juxtaposition of certain material substances. If a bodiless being is Nothing, there can be no such thing as an intrinsic or independent spiritual life; and it is difficult for ordinary minds to attach any distinct meaning to the declaration that the soul is "a conscious unity of being," if that being depends on an organization which is unquestionably discernible, and of which (as Butler remarks) large parts may be lost without affecting this consciousness of personality.

Now this is, after all, the only point worth fighting about. Mr. Hutton has already said with perfect truth that by "the soul" we mean that "which lies at the bottom of the sense of personal identity—the thread of the continuity running through all our checkered life," and which remains unbroken amid the constant flux of change both in our material body, and in the circumstances of our material life. This belief is wholly independent of any "metaphysical hypothesis" of modern "orthodoxy," whether it is, or is not, rightly described as a "juggle of ideas," and of any examination of the question (on which Lord Balfour has touched) whether, if it seem such to "those trained in positive habits of thought," the fault lies in it or in them. I may remark, in passing, that in this broad and simple sense it certainly runs through the whole Bible, and has much that is "akin to it in the Old Testament." For even in the darkest and most shadowy ideas of the *Sheol* of the other world, the belief in a true personal identity is taken absolutely for granted; and it is not a little curious to notice how in the Book of Job the substitution for it of "an immortality in the race" (although there not in the whole of humanity, but simply in the tribe or family) is offered, and rejected as utterly insufficient to satisfy either the speculation of the intellect or the moral demands of the conscience.¹ Now it is not worth while to protest against the caricature of this belief, as a belief in "man plus a heterogeneous entity" called the soul, which can be only intended as a sarcasm. But we cannot acquiesce in any statement which represents the belief in this immaterial and indivisible personality as resting simply on the notion that it is needed to explain the acts of the human organism. For, as a matter of fact, those who believe in it conceive it to be declared by a direct consciousness, the most simple and ultimate of all acts of consciousness.

¹ See Job xiv. 21, 22.

They hold this consciousness of a personal identity and individuality, unchanging amid material change, to be embodied in all the language and literature of man; and they point to the inconsistencies in the very words of those who argue against it, as proofs that man cannot divest himself of it. No doubt they believe that so the acts of the organism are best explained, but it is not on the necessity of such explanation that they base their belief: and this fact separates altogether their belief in the human soul, as an immaterial entity, from those conceptions of a soul, in animal, vegetable, even inorganic substances, with which Mr. Harrison insists on confounding it. Of the true character of animal nature we know nothing (although we may conjecture much), just because we have not in regard to it the direct consciousness which we have in regard of our own nature. Accordingly, we need not trouble our argument for a soul in man with any speculation as to a true soul in the brute creatures.

In what relation this personality stands to the particles which at any moment compose the body, and which are certainly in a continual state of flux, or to the law of structure which in living beings, by some power to us unknown, assimilates these particles, is a totally different question. I fear that Mr. Harrison will be displeased with me if I call it "a mystery." But, whatever future advances of science may do for us in the matter—and I hope they may do much—I am afraid I must still say that this relation is a mystery, which has been at different times imperfectly represented, both by formal theories and by metaphors, all of which by the very nature of language are connected with original physical conceptions. Let it be granted freely that the progress of modern physiological science has rendered obsolete the old idea that the various organs of the body stand to the true personal being in a purely instrumental relation, such as (for example) is described by Butler in his "Analogy," in the celebrated chapter on "The Future Life." The power of physical influences acting upon the body to affect the energies of thought and will is unquestionable. The belief that the action of all these energies is associated with the molecular change is, to say the least, highly probable. And I may remark that Christianity has no quarrel with these discoveries of modern science; for its doctrine is that for the perfection of man's being a bodily organization is necessary, and that the "intermediate state" is a state of suspense and imperfection, out of which, at the word of

the Creator, the indestructible personality of man shall rise, to assimilate to itself a glorified body. The doctrine of the resurrection of the body boldly faces the perplexity as to the connection of a body with personality, which so greatly troubled ancient speculation on the immortality of the soul. In respect of the intermediate "state," it only extends (I grant immeasurably) the experience of those suspensions of the will and the full consciousness of personality which we have in life, in sleep, swoon, stupor, dependent on normal and abnormal conditions of the bodily organization; and in respect of the resurrection, it similarly extends the action of that mysterious creative will which moulds the human body of the present life slowly and gradually out of the mere germ, and forms, with marvelous rapidity and exuberance of prolific power, lower organisms of high perfection and beauty.

But while modern science teaches us to recognize the influence of the bodily organization on mental energy, it has, with at least equal clearness, brought out in compensation the distinct power of that mental energy, acting by a process wholly different from the chain of physical causation, to alter functionally, and even organically, the bodily frame itself. The Platonic Socrates (it will be remembered) dwells on the power of the spirit to control bodily appetite and even passion (*τὸ θυμοειδές*), as also on its having the power to assume qualities, as a proof that it is not a mere *ἀψυχία*. Surely modern science has greatly strengthened the former part of his argument, by these discoveries of the power of mind over even the material of the body. This is strikingly illustrated (for example) to the physician, both by the morbid phenomena of what is called generally "hysteria," in which the belief in the existence of physical disease actually produces the most remarkable physical effects on the body; and also by the more natural action of the mind on the body, when in sickness a resolution to get well masters the force of disease, or a desire to die slowly fulfills itself. Perhaps even more extraordinary is the fact (I believe sufficiently ascertained) that during pregnancy the presentation of ideas to the mind of the mother actually affects the physical organization of the offspring. Hence I cannot but think that, at least as distinctly as ever, our fuller experience discloses to us two different processes of causation acting upon our complex humanity—the one wholly physical, acting sometimes by the coarser mechanical agencies, sometimes by the subtler physiological agencies, and in both cases connect-

ing man through the body with the great laws ruling the physical universe—the other wholly metaphysical, acting by the simple presentation of ideas to the mind (which may, indeed, be so purely subjective that they correspond to no objective reality whatever), and, through them, secondarily acting upon the body, producing, no doubt, the molecular changes in the brain and the affections of the nervous tissue which accompany and exhibit mental emotion. In the normal condition of the earthly life, these two powers act and react upon each other, neither being absolutely independent of the other. In the perfect state of the hereafter we believe that it shall be so still. But we do know of cases in which the metaphysical power is apparently dormant or destroyed, in which accordingly all emotions can be produced automatically by physical processes only, as happens occasionally in dreams (whether of the day or night), and in morbid conditions, as of idiocy, which may themselves be produced either by physical injury or by mental shock. I cannot myself see any difficulty in conceiving that the metaphysical power might act, though no doubt in a way of which we have no present experience, and (according to the Christian doctrine) in a condition of some imperfection, when the bodily organization is either suspended or removed. For to me it seems clear that there is something existent, which is neither material nor even dependent on material organization. Whether it be stigmatized as a "heterogeneous entity," or graciously designated by the "good old word soul," is a matter of great indifference. There it is; and, if it is, I cannot see why it is inconceivable that it should survive all material change. For here, as in other cases, there seems to be a frequent confusion between conceiving that a thing may be, and conceiving how it may be. Of course, we cannot figure to ourselves the method of the action of a spiritual energy apart from a bodily organization; in the attempt to do so the mind glides into quasi-corporeal conceptions and expressions, which are a fair mark for satire. But that there may be such action is to me far less inconceivable than that the mere fact of the dissolution of what is purely physical should draw with it the destruction of a soul that can think, love, and pray.

I do not think it necessary to dwell at any length on the second of Mr. Harrison's propositions, denouncing the desire of personal and individual existence as "selfishness," with a vigor quite worthy of his royal Prussian model. But history, after all, has recognized that the

poor grenadiers had something to say for themselves. Mr. Hutton has already suggested that, if Mr. Harrison had studied the Christian conception of the future life, he could not have written some of his most startling passages, and has protested against the misapplication of the word "selfishness," which in this, as in other controversies, quietly begs the question proposed for discussion. The fact is, that this theory of "altruism," so eloquently set forth by Mr. Harrison and others of his school, simply contradicts human nature, not in its weaknesses or sins, but in its essential characteristics. It is certainly not the weakest or ignoblest of human souls who have felt, at the times of deepest thought and feeling, conscious of but two existences—their own and the Supreme Existence, whether they call it Nature, Law, or God. Surely this humanity is a very unworthy deity, at once a vague and shadowy abstraction, and, so far as it can be distinctly conceived, like some many-headed idol, magnifying the evil and hideousness, as well as the good and beauty, of the individual nature. But, if it were not so, still that individuality, as well as unity, is the law of human nature, is singularly indicated by the very nature of our mental operations. In the study and perception of truth, each man, though he may be guided to it by others, stands absolutely alone; in love, on the other hand, he loses all but the sense of unity; while the conscience holds the balance, recognizing at once individuality and unity. Indeed, the sacredness of individuality is so guarded by the darkness which hides each soul from all perfect knowledge of man, so deeply impressed on the mind by the consciousness of independent thought and will, and on the soul by the sense of incommunicable responsibility, that it cannot merge itself in the life of the race. Self-sacrifice or unselfishness is the conscious sacrifice, not of our own individuality, but of that which seems to minister to it, for the sake of others. The law of human nature, moreover, is such that the very attempt at such sacrifice inevitably strengthens the spiritual individuality in all that makes it worth having. To talk of "a perpetuity of sensation as a true hell" in a being supposed capable of indefinite growth in wisdom, righteousness, and love, is surely to use words which have no intelligible meaning.

No doubt, if we are to take as our guiding principle either altruism or what is rightly designated "selfishness," we must infinitely prefer the former. But where is the necessity? No doubt the task of harmonizing the two is difficult. But

all things worth doing are difficult; and it might be worth while to consider whether there is not something in the old belief which finds the key to this difficult problem in the consciousness of the relation to One Supreme Being, and, recognizing both the love of man and the love of self, bids them both agree in conscious subordination to a higher love of God. What makes our life here will, we believe, make it up hereafter, only in a purer and nobler form. On earth we live at once in our own individuality and in the life of others. Our heaven is not the extinction of either element of that life—either of individuality, as Mr. Harrison would have it, or of the life in others, as in that idea of a selfish immortality which he has, I think, set up in order to denounce it—but the continued harmony of both under an infinitely increased power of that supreme principle.

MR. W. R. GREG.—It would seem impossible for Mr. Harrison to write anything that is not stamped with a vigor and racy eloquence peculiarly his own; and the paper which has opened the present discussion is probably far the finest he has given to the world. There is a lofty tone in its imaginative passages which strikes us as unique among negationists, and a vein of what is almost tenderness pervading them, which was not observed in his previous writings. The two combined render the second portion one of the most touching and impressive speculations we have read. Unfortunately, however, Mr. Harrison's innate energy is apt to boil over into a vehemence approaching the intemperate; and the antagonistic atmosphere is so native to his spirit that he can scarcely enter the lists of controversy without an irresistible tendency to become aggressive and unjust; and he is too inclined to forget the first duty of the chivalric militant logician—namely, to select the adversary you assail from the nobler and not the lower form and rank of the doctrine in dispute. The inconsistencies and weaknesses into which this neglect has betrayed him in the instance before us have, however, been so severely dealt with by Mr. Hutton and Prof. Huxley, that I wish rather to direct attention to two or three points of his argument that might otherwise be in danger of escaping the appreciation and gratitude they may fairly claim.

We owe him something, it appears to me, for having inaugurated a discussion which has stirred so many minds to give us on such a question so much interesting and profound, and more especially so much suggestive, thought. We owe him

much, too, because, in dealing with a thesis which it is specially the temptation and the practice to handle as a theme for declamation, he has so written as to force his antagonists to treat it argumentatively and searchingly as well. Some gratitude, moreover, is due to the man who had the moral courage boldly to avow his adhesion to the negative view, when that view is not only in the highest degree unpopular, but is regarded for the most part as condemnable into the bargain, and when, besides, it can scarcely fail to be painful to every man of vivid imagination and of strong affections. It is to his credit also, I venture to think, that, holding this view, he has put it forward, not as an opinion or speculation, but as a settled and deliberate conviction, maintainable by distinct and reputable reasonings, and to be controverted only by pleas analogous in character. For if there be a topic within the wide range of human questioning in reference to which tampering with mental integrity might seem at first sight pardonable, it is that of a future and continued existence. If belief be ever permissible—perhaps I ought to say, if belief be ever possible—on the ground that “there is peace and joy in believing,” it is here, where the issues are so vast, where the conception in its highest form is so ennobling, where the practical influences of the Creed are, in appearance at least, so beneficent. But faith thus arrived at has ever clinging to it the curse belonging to all illegitimate possessions. It is precarious, because the flaw in its title-deeds, barely suspected perhaps and never acknowledged, may any moment be discovered; misgivings crop up most surely in those hard and gloomy crises of our lives when unflinching confidence is most essential to our peace; and the fairy fabric, built up not on grounded conviction but on craving need, crumbles into dust, and leaves the spirit with no solid sustenance to rest upon.

Unconsciously, and by implication, Mr. Harrison bears a testimony he little intended, not, indeed, to the future existence he denies, but to the irresistible longing and necessity for the very belief he labors to destroy. Perhaps no writer has more undesignedly betrayed his conviction that men will not and cannot be expected to surrender their faith and hope without at least something like a compensation; certainly no one has ever toiled with more noble rhetoric to gild and illuminate the substitute with which he would fain persuade us to rest satisfied. The nearly universal craving for posthumous existence and enduring consciousness, which he depreciates with so harsh

a scorn, and which he will not accept as offering even the shadow or *simulacrum* of an argument for the Creed, he yet respects enough to recognize that it has its foundation deep in the framework of our being, that it cannot be silenced, and may not be ignored. Having no precious metal to pay it with, he issues paper-money instead, skillfully engraved and gorgeously gilded to look as like the real coin as may be. It is in vain to deny that there is something touching and elevating in the glowing eloquence with which he paints the picture of lives devoted to efforts in the service of the race, spent in laboring, each of us in his own sphere, to bring about the grand ideal he fancies for humanity, and drawing strength and reward for long years of toil in the anticipation of what man will be when those noble dreams shall have been realized at last—even though we shall never see what we have wrought so hard to win. It is vain to deny, moreover, that these dreams appear more solid and less wild or vague when we remember how close an analogy we may detect in the labors of thousands around us who spend their whole career on earth in building up, by sacrifice and painful struggles, wealth, station, fame, and character, for their children, whose enjoyment of these possessions they will never live to witness, without their passionate zeal in the pursuit being in any way cooled by the discouraging reflection. Does not this oblige us to confess that the posthumous existence Mr. Harrison describes is not altogether an airy fiction? Still, somehow, after a few moments spent in the thin atmosphere into which his brilliant language and unselfish imagination have combined to raise us, we—ninety-nine out of every hundred of us at the least—sink back breathless and wearied after the unaccustomed soaring amid light so dim, and craving, as of yore, after something more personal, more solid, and more *certain*.

To that more solid certainty I am obliged to confess, sorrowfully and with bitter disappointment, that I can contribute nothing—nothing, I mean, that resembles evidence, that can properly be called argument, or that I can hope will be received as even the barest confirmation. Alas! can the wisest and most sanguine of us all bring anything beyond our own personal sentiments to swell the common hope? We have aspirations to multiply, but who has any *knowledge* to enrich our store? I have of course read most of the pleadings in favor of the ordinary doctrine of the future state; naturally also, in common with all graver natures, I have meditated yet more; but these pleadings, for the most part, sound to anx-

ious ears little else than the passionate outcries of souls that cannot endure to part with hopes on which they have been nurtured, and which are intertwined with their tenderest affections. Logical reasons to *compel* conviction, I have met with none—even from the interlocutors in this actual Symposium. Yet few can have sought for such more yearningly. I may say I share in the anticipations of believers; but I share them as aspirations, sometimes approaching almost to a faith, occasionally, and for a few moments, perhaps rising into something like a trust, but never able to settle into the consistency of a definite and enduring creed. I do not know how far even this incomplete state of mind may not be merely the residuum of early upbringing and habitual associations. But I must be true to my darkness as courageously as to my light. I cannot rest in comfort on arguments that to my spirit have no cogency, nor can I pretend to respect or be content with reasons which carry no penetrating conviction along with them. I will not make buttresses do the work or assume the posture of foundations. I will not cry "Peace, peace, when there is no peace." I have said elsewhere, and at various epochs of life, why the ordinary "proofs" confidently put forward and gorgeously arrayed "have no help in them;" while, nevertheless, the pictures which imagination depicts are so inexpressibly alluring. The more I think and question, the more do doubts and difficulties crowd around my horizon, and cloud over my sky. Thus it is that I am unable to bring aid or sustenance to minds as troubled as my own, and perhaps less willing to admit that the great enigma is, and must remain, insoluble. Of two things, however, I feel satisfied—that the negative doctrine is no more susceptible of proof than the affirmative, and that our opinion, be it only honest, can have no influence whatever on the issue, nor upon its bearing on ourselves.

Two considerations that have been borne in upon my mind while following this controversy may be worth mentioning, though neither can be called exactly helpful. One is, that we find the most confident, unquestioning, dogmatic belief in heaven (and its correlative) in those whose heaven is the most unlikely and impossible, the most entirely made up of mundane and material elements, of gorgeous glories and of fading splendours¹—just such things as uncultured and un-

disciplined natures most envied or pined after on earth, such as the lower order of minds could best picture and would naturally be most dazzled by. The higher intelligences of our race, who need a spiritual heaven, find their imaginations fettered by the scientific training which, imperfect though it be, clips their wings in all directions, forbids their glowing fancy, and annuls that gorgeous creation, and bars the way to each successive local habitation that is instinctively wanted to give reality to the ideal they aspire to; till, in the effort to frame a future existence without a future world, to build up a state of being that shall be worthy of its denizens, and from which everything material shall be excluded, they at last discover that in renouncing the "physical" and inadmissible they have been forced to renounce the "conceivable" as well; and a dimness and fluctuating uncertainty gathers round a scene from which all that is concrete and definable, and would therefore be incongruous, has been shut out. The next world cannot, it is felt, be a material one; and a truly "spiritual" one even the saint cannot conceive so as to bring it home to natures still shrouded in the garments of the flesh.

The other suggestion that has occurred to me is this: It must be conceded that the doctrine of a future life is by no means as universally diffused as it is the habit loosely to assert. It is not always discoverable among primitive and savage races. It existed among pagan nations in a form so vague and hazy as to be describable rather as a dream than a religious faith. It can scarcely be determined whether the Chinese, whose cultivation is perhaps the most ancient existing in the world, can be ranked among distinct believers; while the conception of *Nirvana*, which prevails in the meditative minds of other Orientals, is more a sort of conscious non-existence than a future life. With the Jews, moreover, as is well known, the belief was not indigenous, but imported, and by no means an early importation. But what is not so generally recognized is that, even among ourselves in these days, the conviction of thoughtful natures varies curiously in strength and in features at different periods of life. In youth, when all our sentiments are most vivacious and dogmatic, most of us not only

cles, through which there unceasingly flows a river of gladness, and where jubilee is ever sung by a concord of seraphic voices."—*Dr. Chalmers's Sermons.*

"Poor fragments all of this low earth—

Such as in dreams could hardly soothe

A soul that once had tasted of immortal truth."

Christian Year.

¹ "There may be crowns of material splendor, there may be trees of unfading loveliness, there may be pavements of emerald, and canopies of the brightest radiance, and gardens of deep and tranquil security, and palaces of proud and stately decoration and a city of lofty pinnas

cling to it as an intellectual creed, but are accustomed to say and feel that, without it as a solace and a hope to rest upon, this world would be stripped of its deepest fascinations. It is from minds of this age, whose vigor is unimpaired and whose relish for the joys of earth is most expansive, that the most glowing delineations of heaven usually proceed, and on whom the thirst for felicity and knowledge, which can be slaked at no earthly fountains, has the most exciting power. Then comes the busy turmoil of our mid-career, when the present curtains off the future from our thoughts, and when a renewed existence in a different scene is recalled to our fancy chiefly in crises of bereavement. And, finally, is it not the case that in our fading years—when something of the languor and placidity of age is creeping over us, just when futurity is coming consciously and rapidly more near, and when one might naturally expect it to occupy us more incessantly and with more anxious and searching glances—we think of it less frequently, believe in it less confidently, desire it less eagerly, than in our youth? Such, at least, has been my observation and experience, especially among the more reflective and inquiring order of men. The life of the hour absorbs us most completely, as the hours grow fewer and less full; the pleasures, the exemptions, the modest interests, the afternoon peace, the gentle affections, of the present scene, obscure the future from our view, and render it, curiously enough, even less interesting than the past. To-day, which may be our last, engrosses us far more than to-morrow, which may be our FOREVER; and the grave into which we are just stepping down troubles us far less than in youth, when half a century lay between us and it.

What is the explanation of this strange phenomenon? Is it a merciful dispensation arranged by the Ruler of our life to soften and to ease a crisis which would be too grand and awful to be faced with dignity or calm, if it were actually realized at all? Is it that thought—or that vague substitute for thought which we call time—has brought us, half unconsciously, to the conclusion that the whole question is insoluble, and that reflection is wasted where reflection can bring us no nearer to an issue? Or, finally, as I know is true far oftener than we fancy, is it that three-score years and ten have quenched the passionate desire for life with which at first we stepped upon the scene? We are tired, some of us, with unending and unprofitable toil; we are satiated, others of us, with such ample pleasures as earth

can yield us; we have had enough of ambition, alike in its successes and its failures; the joys and blessings of human affection on which, whatever their crises and vicissitudes, no righteous or truthful man will cast a slur, are yet so blended with pains which partake of their intensity; the thirst for knowledge is not slaked, indeed, but the capacity for the labor by which alone it can be gained has consciously died out; the appetite for life, in short, is gone, the frame is worn and the faculties exhausted; and—possibly this is the key to the phenomenon we are examining—age CANNOT, from the very law of its nature, *conceive itself endowed with the bounding energies of youth*, and without that vigor, both of exertion and desire, renewed existence can offer no inspiring charms. Our being upon earth has been enriched by vivid interests and precious joys, and we are deeply grateful for the gift; but we are wearied with one life, and feel scarcely qualified to enter on the claims, even though balanced by the felicities and glories, of another. It may be the fatigue which comes with age—fatigue of the fancy as well as of the frame; but, somehow, what we yearn for most instinctively at last is *rest*, and the peace which we can imagine the easiest because we know it best is that of sleep.

REV. BALDWIN BROWN.—The theologians appear to have fallen upon evil days. Like some of old, they are filled with rebuke from all sides. They are bidden to be silent, for their day is over. But some things, like Nature, are hard to get rid of. Expelled, they “recur” swiftly. Foremost among these is theology. It seems as if nothing could long restrain man from this, the loftiest exercise of his powers. The theologians and the Comtists have met in the sense which Mr. Huxley justly indicates; he is himself working at the foundations of a larger, nobler, and more complete theology. But, for the present, theology suffers affliction, and the theologians have in no small measure themselves to thank for it. The protest rises from all sides, clear and strong, against the narrow, formal, and, in these last days, selfish system of thought and expectation, which they have presented as their kingdom of heaven to the world.

I never read Mr. Harrison's brilliant essays, full as they always are of high aspiration and of stimulus to noble endeavor, without finding the judgment which I cannot but pass in my own mind on his unbeliefs and denials, largely tempered by thankfulness. I rejoice in the passionate earnestness with which he lifts the hearts of his readers to ideals which it seems to me that

Christianity—that Christianity which as a living force in the apostles' days turned the world upside down, that is, right side up, with its face toward heaven and God—alone can realize for man.

I recall a noble passage written by Mr. Harrison some years ago: "A religion of action, a religion of social duty, devotion to an intelligible and sensible Head, a real sense of incorporation with a living and controlling force, the deliberate effort to serve an immortal Humanity—this, and this alone, can absorb the musings and the cravings of the spiritual man."¹ It seems to me that it would be difficult for any one to set forth in more weighty and eloquent words the kind of object which Christianity proposes, and the kind of help toward the attainment of the object which the Incarnation affords. And in the matter now under debate, behind the stern denunciation of the selfish striving toward a personal immortality which Mr. Harrison utters with his accustomed force, there seems to lie not only a yearning for, but a definite vision of, an immortality which shall not be selfish, but largely fruitful to public good. It is true that, as has been forcibly pointed out, the form which it wears is utterly vain and illusory, and wholly incapable, one would think, of accounting for the enthusiastic eagerness with which it appears to be sought. May not the eagerness be really kindled by a larger and more far-reaching vision—the Christian vision, which has become obscured to so many faithful servants of duty by the selfishness and vanity with which much that goes by the name of the Christian life in these days has enveloped it; but which has not ceased and will not cease, in ways which even consciousness cannot always trace, to cast its spell on human hearts?

Mr. Harrison seems to start in his argument with the conviction that there is a certain baseness in this longing for immortality, and he falls on the belief with a fierceness which the sense of its baseness alone could justify. But surely he must stamp much more with the same brand. Each day's struggle to live is a bit of the baseness, and there seems to be no answer to Mr. Hutton's remark that the truly unselfish action under such conditions would be suicide. But, at any rate, it is clear from history that the men who formulated the doctrine and perfected the art of suicide in the early days of imperial Rome belonged to the most basely selfish and heartless generation that has ever cumbered this sorrowful world. The love of life is, on the whole, a

noble thing, for the staple of life is duty. The more I see of classes in which, at first sight, selfishness seems to reign, the more am I struck with the measure in which duty, thought for others, and work for others, enters into their lives. The desire to live on, to those who catch the Christian idea, and would follow him who "came, not to be ministered unto, but to minister," is a desire to work on, and by living to bless more richly a larger circle in a wider world.

I can even cherish some thankfulness for the fling at the eternity of the tabor in which Mr. Harrison indulges, and which draws on him a rebuke from his critics the severity of which one can also well understand. It is a last fling at the *laus perennis*, which once seemed so beautiful to monastic hearts, and which, looked at ideally, to those who can enter into Mr. Hutton's lofty view of adoration, means all that he describes. But practically it was a very poor, narrow, mechanical thing; and base even when it represented, as it did to multitudes, the loftiest form of a soul's activity in such a sad, suffering world as this. I, for one, can understand, though I could not utter, the anathema which follows it as it vanishes from sight. And it bears closely on the matter in hand. It is no dead, mediæval idea. It tinctures strongly the popular religious notions of heaven. The favorite hymns of the evangelical school are set in the same key. There is an easy, self-satisfied, self-indulgent temper in the popular way of thinking and praying, and above all of singing, about heaven, which, sternly as the singers would denounce the cloister, is really caught from the monastic choir. There is a very favorite verse which runs thus:

"There, on a green and flowery mount,
Our weary souls shall sit,
And with transporting joys recount
The labors of our feet."²

It is a fair sample of the staple of much pious forecasting of the occupations and enjoyments of heaven. I cannot but welcome very heartily any such shock as Mr. Harrison administers to this restful and self-centred vision of immortality. Should he find himself at last endowed with the inheritance which he refuses, and be thrown in the way of these souls mooning on the mount, it is evident that he would feel tempted to give them a vigorous shake, and to set them with

¹ Mr. Martin's picture of "The Plains of Heaven" exactly presents it, and it is a picture greatly admired in the circles of which we speak.

² *Fortnightly Review*, vol. xii., p. 529.

some stinging words about some good work for God and for their world. And as many of us want the shaking now badly enough, I can thank him for it, although it is administered by an over-rough and contemptuous hand.

I feel some hearty sympathy, too, with much which he says about the unity of the man. The passage to which I refer commences on page 242 with the words "The philosophy which treats man as man simply affirms that man loves, thinks, acts, not that the ganglia, the senses, or any organ of man, loves, thinks, and acts."

So far as Mr. Harrison's language and line of thought are a protest against the vague, bloodless, bodiless notion of the life of the future, which has more affinity with Hades than with heaven, I heartily thank him for it. Man is an embodied spirit, and wherever his lot is cast he will need and will have the means of a spirit's manifestation to and action on its surrounding world. But this is precisely what is substantiated by the resurrection. The priceless value of the truth of the resurrection lies in the close interlacing and interlocking of the two worlds which it reveals. It is the life which is lived here, the life of the embodied spirit, which is carried through the veil and lived there. The wonderful powers of the gospel of "Jesus and the resurrection" lay in the homely human interest which it lent to the life of the immortals. The risen Lord took up life just where he left it. The things which he had taught his disciples to care about here, were the things which those who had passed on were caring about there, the reign of truth, righteousness, and love. I hold to the truth of the resurrection, not only because it appears to be firmly established on the most valid testimony, but because it alone seems to explain man's constitution as a spirit embodied in flesh which he is sorely tempted to curse as a clog. It furnishes to man the key to the mystery of the flesh on the one hand, while on the other it justifies his aspiration and realizes his hope.

Belief in the risen and reigning Christ was at the heart of that wonderful uprising and outburst of human energy which marked the age of the Advent. The contrast is most striking between the sad and even despairing tone which breathes through the noblest heathen literature, which utters perhaps its deepest wail in the cry of Epictetus, "Show me a Stoic—by Heaven, I long to see a Stoic!" and the sense of victorious power, of buoyant, exulting hope, which breathes through the word and shines from the life of

the infant Church: "As dying, and behold we live; as sorrowful, yet always rejoicing; as poor, yet making many rich; as having nothing, and yet possessing all things." The Gospel which brought life and immortality to light won its way just as dawn wins it way, when "jocund day stands tip-toe on the misty mountain-tops," and flashes his rays over a sleeping world. Everywhere the radiance penetrates; it shines into every nook of shade; and all living creatures stir, awake, and come forth to bask in its beams. Just thus the flood of kindling light streamed forth from the resurrection, and spread like the dawn in the morning sky; it touched all forms of things in a dark, sad world with its splendor, and called man forth from the tomb in which his higher life seemed to be buried, to a new career of fruitful, sunlit activity; even as the Saviour prophesied, "The hour is coming, and now is, when the dead shall hear the voice of the Son of God, and they that hear shall live."

The exceeding readiness and joyfulness with which the truth was welcomed, and the measure in which Christendom—and that means all that is most powerful and progressive in human society—has been moulded by it, are the most notable facts of history. Be it truth, be it fiction, be it dream, one thing is clear: it was a baptism of new life to the world which was touched by it, and it has been near the heart of all the great movements of human society from that day until now. I do not even exclude "the Revolution," whose current is under us still. Space is precious, or it would not be difficult to show how deeply the Revolution was indebted to the ideas which this gospel brought into the world. I entirely agree with Lord Balford that revelation is the ground on which faith securely rests. But the history of the quickening and the growth of Christian society is a factor of enormous moment in the estimation of the arguments for the truth of immortality. We are assured that the idea had the dullest and even basest origin. Man has a shadow, it suggested the idea of a second self to him! he has memories of departed friends, he gave them a body and made them ghosts! Very wonderful, surely, that mere figments should be the strongest and most productive things in the whole sphere of human activity, and should have stirred the spirit and led the march of the strongest, noblest, and most cultivated peoples; until now, in this nineteenth century, we think that we have discovered, as Miss Martineau tersely puts it, that "the theological belief of almost

everybody in the civilized world is baseless." Let who will believe it, I cannot.

It may be urged that the idea has strong fascination, that man naturally longs for immortality, and gladly catches at any figment which seems to respond to his yearning and to justify his hope. But this belief is among the clearest, broadest, and strongest features of his experience and history. It must flow out of something very deeply imbedded in his constitution. If the force that is behind all the phenomena of life is responsible for all that is, it must be responsible for this also. Somehow man, the masterpiece of the Creation, has got himself wedded to the belief that all things here have relations to issues which lie in a world that is behind the shadow of death. This belief has been at the root of his highest endeavor and of his keenest pain; it is the secret of his chronic unrest. Now Nature, through all her orders, appears to have made all creatures contented with the conditions of their life. The brute seems fully satisfied with the resources of his world. He shows no sign of being tormented by dreams; his life withers under no blight of regret. All things rest, and are glad and beautiful in their spheres. Violate the order of their nature, rob them of their fit surroundings, and they grow restless, sad, and poor. A plant shut out from light and moisture will twist itself into the most fantastic shapes, and strain itself to ghastly tenuity; nay, it will work its delicate tissues through stone-walls or hard rock, to find what its nature has made needful to its life. Having found it, it rests and is glad in its beauty once more. Living things, perverted by human intelligent effort, revert swiftly the moment that the pressure is removed. This marked tendency to reversion seems to be set in Nature as a sign that all things are at rest in their natural conditions, content with their life and its sphere. Only in ways of which they are wholly unconscious, and which rob them of no contentment with their present, do they prepare the way for the higher developments of life.

What, then, means this restless longing in man for that which lies beyond the range of his visible world? Has Nature wantonly and cruelly made man, her masterpiece, alone of all the creatures, restless and sad? Of all beings in the Creation must he alone be made wretched by an unattainable longing, by futile dreams of a visionary world? This were an utter breach of the method of Nature in all her operations. It is impossible to believe that the harmony that runs through all her spheres fails and falls into discord

in man. The very order of Nature presses us to the conviction that this insatiable longing which somehow she generates and sustains in man, and which is unquestionably the largest feature of his life, is not visionary and futile, but profoundly significant; pointing with firm finger to the reality of that sphere of being to which she has taught him to lift his thoughts and aspirations, and in which he will find, unless the prophetic order of the Creation has lied to him, the harmonious completeness of his life.

And there seems to be no fair escape from the conclusion by giving up the order, and writing Babel on the world and its life. Whatever it is, it is not confusion. Out of its disorder, order palpably grows; out of its confusion arises a grand and stately progress. Progress is a sacred word with Mr. Harrison. In the progress of humanity he finds his longed-for immortality. But, if I may repeat in other terms a remark which I offered in the first number of this review, while progress is the human law, the world, the sphere of the progress, is tending slowly but inevitably to dissolution. Is there discord again in this highest region? Mr. Harrison writes of an immortal humanity. How immortal, if the glorious progress is striving to accomplish itself in a world of wreck? Or is the progress that of a race born with sore but joyful travail from the highest level of the material creation into a higher region of being, whence it can watch with calmness the dissolution of all the perishable worlds?

The belief in immortality is so dear to man because he grasps through it the complement of his else unshaped and imperfect life. It seems to be equally the complement of this otherwise hopelessly jangled and disordered world. It is asked triumphantly, "Why, of all the hosts of creatures, does man alone lay claim to this great inheritance?" Because in man alone we see the experiences, the strain, the anguish, that demand it, as the sole key to what he does and endures. There is to me something horrible in the thought of such a life as ours, in which for all of us, in some form or other, the cross must be the most sacred symbol, lived out in that bare, heartless, hopeless world of the material, to which Prof. Clifford so lightly limits it. And I cannot but think that there are strong signs in many quarters of an almost fierce revulsion from the ghastly dreariness of such a vision of life.

There seems to me to run through Mr. Harrison's utterances on these great subjects—I say it with honest diffidence of one whose large range

of power I so fully recognize, but one must speak frankly if this Symposium is to be worth anything—an instinctive yearning toward Christian ideas, while that faith is denied which alone can vivify them and make them a living power in our world. There is everywhere a shadowy image of a Christian substance; but it reminds one of that formless form, wherein "what seemed a head, the likeness of a kingly crown had on." And it is characteristic of much of the finest thinking and writing of our times. The saviour Deronda, the prophet Mordecai, lack just that living heart of faith which would put blood into their pallid lineaments, and make them breathe and move among men. Again I say that we have largely ourselves to thank for this saddening feature of the higher life of our times—we who have narrowed God's great kingdom to the dimensions of our little theological sphere. I am no theologian, though intensely interested in the themes with which the theologians occupy themselves. Urania, with darkened brow, may perhaps rebuke my prating. But I seem to see quite clearly that the sad strain and anguish of our life, social, intellectual, and spiritual, is but the pain by which great stages of growth accomplish themselves. We have quite outgrown our venerable, and in its time large and noble, theological shell. We must wait, not fearful, far less hopeless, while by the help of those who are working with such admirable energy, courage, and fidelity, outside the visible Christian sphere, that spirit in man which searches and cannot but search "the deep things of God," creates for itself a new instrument of thought which will give to it the mastery of a wider, richer, and nobler world.

DR. W. G. WARD.—Mr. Harrison considers that the Christian's conception of a future life is "so gross, so sensual, so indolent, so selfish," as to be unworthy of respectful consideration. He must necessarily be intending to speak of this conception in the shape in which we Christians entertain it; because otherwise his words of reprehension are unmeaning. But our belief as to the future life is intimately and indissolubly bound up with our belief as to the present; with our belief as to what is the true measure and standard of human action in this world. And I would urge that no part of our doctrine can be rightly apprehended, unless it be viewed in its connection with all the rest. This is a fact which (I think) infidels often drop out of sight, and for that reason fail of meeting Christianity on its really relevant and critical issues.

Of course, I consider Catholicity to be exclu-

sively the one authoritative exhibition of revealed Christianity. I will set forth, therefore, the doctrine to which I would call attention, in that particular form in which Catholic teachers enounce it; though I am very far indeed from intending to deny that there are multitudes of non-Catholic Christians who hold it also. What, then, according to Catholics, is the true measure and standard of human action? This is in effect the very first question propounded in our English elementary Catechism: "Why did God make you?" The prescribed answer is, "To know him, serve him, and love him in this world, and to be happy with him forever in the next." And St. Ignatius's "Spiritual Exercises"—a work of the very highest authority among us—having laid down the very same "foundation," presently adds that "we should not wish on our part for health rather than for sickness, wealth rather than poverty, honor rather than ignominy; desiring and choosing those things alone which are more expedient to us for the end for which we were created." Now, what will be the course of a Christian's life in proportion as he is profoundly imbued with such a principle as this, and vigorously aims at putting it into practice? The number of believers, who apply themselves to this task with reasonable consistency, is no doubt comparatively small. But in proportion as any given person does so, he will in the first place be deeply penetrated with a sense of his moral weakness; and (were it for that reason alone) his life will more and more be a life of prayer. Then he will necessarily give his mind with great earnestness and frequency to the consideration what it is which at this or that period God desires at his hands. On the whole (not to dwell with unnecessary detail on this part of my subject), he will be ever opening his heart to Almighty God; turning to him for light and strength under emergencies, for comfort under affliction; pondering on his adorable attributes; animated toward him by intense love and tenderness. Nor need I add how singularly—how beyond words—this personal love of God is promoted and facilitated by the fact that a Divine Person has assumed human nature, and that God's human acts and words are so largely offered to the loving contemplation of redeemed souls.

In proportion, then, as a Christian is faithful to his creed, the thought of God becomes the chief joy of his life. "The thought of God," says F. Newman, "and nothing short of it, is the happiness of man; for though there is much besides to serve as subject of knowledge, or motive for action, or instrument of excitement, yet the *affec-*

tions require a something more vast and more enduring than anything created. He alone is sufficient for the heart who made it. The contemplation of him, and nothing but it, is able fully to open and relieve the mind, to unlock, occupy, and fix our affections. We may indeed love things created with great intenseness; but such affection, when disjoined from the love of the Creator, is like a stream running in a narrow channel, impetuous, vehement, turbid. The heart runs out, as it were, only at one door; it is not an expanding of the whole man. Created natures cannot open to us, or elicit, the ten thousand mental senses which belong to us, and through which we really love. None but the presence of our Maker can enter us; for to none besides can the whole heart in all its thoughts and feelings be unlocked and subjected. It is this feeling of simple and absolute confidence and communion which soothes and satisfies those to whom it is vouchsafed. We know that even our nearest friends enter into us but partially, and hold intercourse with us only at times; whereas the consciousness of a perfect and enduring presence, and it alone, keeps the heart open. Withdraw the object on which it rests, and it will relapse again into its state of confinement and constraint; and in proportion as it is limited, either to certain seasons or to certain affections, the heart is straitened and distressed."

Now, Christians hold that God's faithful servants will enjoy hereafter unspeakable bliss, through the most intimate imaginable contact with him whom they have here so tenderly loved. They will see face to face him whose beauty is dimly and faintly adumbrated by the most exquisitely transporting beauty which can be found on earth; him whose adorable perfections they have in this life imperfectly contemplated, and for the fuller apprehension of which they have so earnestly longed here below. I by no means intend to imply that the hope of this blessedness is the sole or even the chief inducement which leads saintly men to be diligent in serving God. Their immediate reason for doing so is their keen sense of his claim on their allegiance; and, again, the misery which they would experience, through their love of him, at being guilty of any failure in that allegiance. Still the prospect of that future bliss, which I have so imperfectly sketched, is doubtless found by them at times of invaluable service in stimulating them to greater effort, and in cheering them under trial and desolation.

Such is the view taken by Christians of life in heaven; and, surely, any candid infidel will at

once admit that it is profoundly harmonious and consistent with their view of what should be man's life on earth. To say that their anticipation of the future, *as it exists in them*, is gross, sensual, indolent, and selfish, is so manifestly beyond the mark that I am sure Mr. Harrison will, on reflection, retract his affirmation. Apart, however, from this particular comment, my criticism of Mr. Harrison would be this: He was bound, I maintain, to consider the Christian theory of life *as a whole*; and not to dissociate that part of it which concerns eternity from that part of it which concerns time.

And now as to the merits of this Christian theory. For my own part, I am, of course, profoundly convinced that, as on the one hand it is guaranteed by revelation, so on the other hand it is that which alone harmonizes with the dicta of reason and the facts of experience, so far as it comes into contact with these. Yet I admit that various very plausible objections may be adduced against its truth. Objectors may allege very plausibly that by the mass of men it cannot be carried into practice; that it disparages most unduly the importance of things secular; that it is fatal to what they account genuine patriotism; that it has always been, and will always be, injurious to the progress of science; above all, that it puts men (as one may express it) on an entirely wrong scent, and leads them to neglect many pursuits which, as being sources of true enjoyment, would largely enhance the pleasurable-ness of life. All this, and much more, may be urged, I think, by antitheists with very great superficial plausibility; and the Christian controversialist is bound on occasion steadily to confront it. But there is one accusation which has been brought against this Christian theory of life—and that the one mainly (as would seem) felt by Mr. Harrison—which to me seems so obviously destitute of foundation that I find difficulty in understanding how any infidel can have persuaded himself of its truth: I mean the accusation that this theory is a *selfish* one. There is no need of here attempting a philosophical discussion on the respective claims of what are now called "egoism" and "altruism:" a discussion in itself (no doubt) one of much interest and much importance, and one, moreover, in which I should be quite prepared (were it necessary) to engage. Here, however, I will appeal, not to philosophy, but to history. In the records of the past we find a certain series of men, who stand out from the mass of their brethren, as having preëminently concentrated their energy on the

love and service of God, and preëminently looked away from earthly hopes to the prospect of their future reward. I refer to the saints of the Church. And it is a plain matter of fact, which no one will attempt to deny, that these very men stand out no less conspicuously from the rest in their self-sacrificing and (as we ordinary men regard it) astounding labors in behalf of what they believe to be the highest interests of mankind.

Before I conclude, I must not omit a brief comment on one other point, because it is the only one on which I cannot concur with Lord Blachford's masterly paper. I cannot agree with him that the doctrine of human immortality fails of being supported by "conclusive reasoning." I do not, of course, mean that the dogma of the Beatific Vision is discoverable apart from revelation; but I do account it a truth cognizable with certitude by reason, that the human soul is naturally immortal, and that retribution of one kind or another will be awarded us hereafter, according to what our conduct has been in this our state of probation. Here, however, I must explain myself. When theists make this statement, sometimes they are thought to allege that human immortality is sufficiently proved by *phenomena*; and sometimes they are thought to allege that it is almost intuitively evident. For myself, however, I make neither of these allegations. I hold that the truth in question is conclusively established by help of certain premises; and that these premises themselves can previously be known with absolute certitude, on grounds of reason or experience.

They are such as these: 1. There exists that Personal Being, infinite in all perfections, whom we call God. 2. He has implanted in his rational creatures the sense of right and wrong; the knowledge that a deliberate perpetration of certain acts intrinsically merits penal retribution. 3. Correlatively, he has conferred freedom on the human will; or, in other words, has made acts of the human will exceptions to that law of uniform sequence which otherwise prevails throughout the phenomenal world.¹ 4. By the habit of prayer to God we can obtain augmented strength for moral action, in a degree which would have been quite incredible antecedently to experience. 5. Various portions of our divinely given nature clearly point to an eternal destiny. 6. The conscious self or ego is entirely heterogeneous to the material world: entirely hetero-

geneous, therefore, to that palpable body of ours which is dissolved at the period of death.

I do not think any one will account it extravagant to hold that the doctrine of human immortality is legitimately deducible from a combination of these and similar truths. The anti-theist will of course deny that they *are* truths. Mr. Greg, who has himself "arrived at no conviction" on the subject of immortality, yet says that considerations of the same kind as those which I have enumerated "must be decisive" in favor of immortality "to all to whose spirits communion with their Father is the most absolute of verities."¹ Nor have I any reason to think that even Mr. Huxley and Mr. Harrison, if they could concede my premises, would demur to my conclusion.

MR. FREDERIC HARRISON.—[I have now, not so much to close a symposium, or general discussion, as to reply to the convergent fire of nine separate papers, extending over more than fifty pages. Neither time, nor space, nor the indulgence of the reader, would enable me to do justice to the weight of this array of criticism, which reaches me in fragments while I am otherwise occupied abroad. I will ask those critics whom I have not been able to notice to believe that I have duly considered the powerful appeals they have addressed to me. And I will ask those who are interested in this question to refer to the original papers in which my views were stated. And I will only add, by way of reply, the following remarks, which were, for the most part, written and printed, while I had nothing before me but the first three papers in this discussion. They contain what I have to say on the theological, the metaphysical, and the materialist aspect of this question. For the rest, I could only repeat what I have already said in the two original essays.]

Whether the preceding discussion has given much new strength to the doctrine of man's immaterial soul and future existence I will not pretend to decide. But I cannot feel that it has shaken the reality of man's posthumous influence, my chief and immediate theme. It seemed to me that the time had come, when, seeing how vague and hesitating were the prevalent beliefs on this subject, it was most important to remember that, from a purely earthly point of view, man had a spiritual nature, and could look forward after death to something that marked him off from the beasts that perish. I cannot see

¹ I shall not, of course, be understood to deny the existence and frequency of miracles.

¹ See his letter in the *Spectator* of August 25th.

that what I urged has been in substance displaced; though much criticism (and some of it of a verbal kind) has been directed at the language which I used of others. My object was to try if this life could not be made richer; not to destroy the dreams of another. But has the old doctrine of a future life been in any way strengthened? Mr. Hutton, it is true, has a "personal wish" for a perpetuity of volition. Lord Blachford "believes because he is told." And Prof. Huxley knows of no evidence that "such a soul and a future life exist;" and he seems not to believe in them at all.

Philosophical discussion must languish a little, if, when we ask for the philosophical grounds for a certain belief, we find one philosopher believing because he has a "personal wish" for it, and another "believing because he is told." Mr. Hutton says that, as far as he knows, "the thoughts, affections, and volitions, are not likely to perish with his body." Prof. Huxley seems to think it just as likely that they should. Arguments are called for to enable us to decide between these two authorities. And the only argument we have hitherto got is Mr. Hutton's "personal wish," and Lord Blachford's *ita scriptum est*. I confess myself unable to continue an argument which runs into believing "because I am told." It is for this reason that the *lazzarone* at Naples believes in the blood of St. Januarius.

My original propositions may be stated thus:

1. Philosophy as a whole (I do not say specially biological science) has established a functional relation to exist between every fact of thinking, willing, or feeling, on the one side, and some molecular change in the body on the other side.

2. This relation is simply one of correspondence between moral and physical facts, not one of assimilation. The moral fact does not become a physical fact, is not adequately explained by it, and must be mainly studied as a moral fact, by methods applicable to morals—not as a physical fact, by methods applicable to physics.

3. The moral facts of human life, the laws of man's mental, moral, and affective nature, must consequently be studied, as they have always been studied, by direct observation of these facts; yet the correspondences, specially discovered by biological science, between man's mind and his body, must always be kept in view. They are an indispensable, inseparable, but subordinate part of moral philosophy.

4. We do not diminish the supreme place of the spiritual facts in life and in philosophy by

admitting these spiritual facts to have a relation with molecular and organic facts in the human organism—provided that we never forget how small and dependent is the part which the study of the molecular and organic phenomena must play in moral and social science.

5. Those whose minds have been trained in the modern philosophy of law cannot understand what is meant by sensation, thought, and energy, existing without any basis of molecular change; and to talk to them of sensation, thought, and energy, continuing in the absence of any molecules whatever, is precisely such a contradiction in terms as to suppose that civilization will continue in the absence of any men whatever.

6. Yet man is so constituted as a social being that the energies which he puts out in life mould the minds, characters, and habits, of his fellow-men; so that each man's life is, *in effect*, indefinitely prolonged in human society. This is a phenomenon quite peculiar to man and to human society, and of course depends on there being men in active association with each other. Physics and biology can teach us nothing about it; and physicists and biologists may very easily forget its importance. It can be learned only by long and refined observations in moral and mental philosophy as a whole, and in the history of civilization as a whole.

7. Lastly, as a corollary, it may be useful to retain the words soul and future life for their associations; provided we make it clear that we mean by soul the combined faculties of the *living* organism, and by future life the subjective effect of each man's objective life on the actual lives of his fellow-men.

I. Now, I find in Mr. Hutton's paper hardly any attempt to disprove the first six of these propositions. He is employed for the most part in asserting that his hypothesis of a future state is a more agreeable one than mine, and in earnest complaints that I should call his view of a future state a selfish or personal hope. As to the first, I will only remark that it is scarcely a question whether his notion of immortality is beautiful or not, but whether it is true. If there is no rational ground for expecting such immortality to be a solid fact, it is to little purpose to show us what a sublime idea it would be if there were anything in it. As to the second, I will only say that I do not call his notion of a future existence a selfish or personal hope. In the last paragraph of my second paper I speak with respect of the opinion of those who look forward to a future of moral development instead of to an idle eternity by

of psalm-singing. My language as to the selfishness of the vulgar ideas of salvation was directed to those who insist that, unless they are to *feel* a continuance of pleasure, they do not care for any continuance of their influence at all. The vulgar are apt to say that what they desire is the sense of personal satisfaction, and, if they cannot have this, they care for nothing else. This, I maintain, is a selfish and debasing idea. It is the common notion of the popular religion, and its tendency to concentrate the mind on a merely personal salvation does exert an evil effect on practical conduct. I once heard a Scotch preacher, dilating on the narrowness of the gate, etc., exclaim, "O dear brethren, who would care to be saved *in a crowd?*"

I do not say this of the life of grander activity in which Mr. Hutton believes, and which Lord Blachford so eloquently describes. This is no doubt a fine ideal, and I will not say other than an elevating hope. But on what does it rest? Why this ideal rather than any other? Each of us may imagine, as I said at the outset, his own Elysian fields, or his own mystic rose. But is this philosophy? Is it even religion? Besides, there is this other objection to it: It is not Christianity, but Neo-Christianity. It is a fantasia with variations on the orthodox creed. There is not a word of the kind in the Bible. Lord Blachford says he believes in it "because he is told." But it so happens that he is not told this, at any rate in the creeds and formularies of orthodox faith. If this view of future life is to rest entirely on revelation, it is a very singular thing that the Bible is silent on the matter. Whatever kind of future ecstasy may be suggested in some texts, certain it is that such a glorified energy as Lord Blachford paints in glowing colors is nowhere described in the Bible. There is a constant practice nowadays, when the popular religion is criticised, that earnest defenders of it come forward exclaiming: "Oh! that is only the vulgar notion of our religion. My idea of the doctrine is so and so," something which the speaker has invented without countenance from official authority. For my part, I hold Christianity to be what is taught in average churches and chapels to the millions of professing Christians. And I say it is a very serious fact when philosophical defenders of religion begin by repudiating that which is taught in average pulpits.

Perhaps a little more attention to my actual words might have rendered unnecessary the complaints in all these papers as to my language about the hopes which men cherish for the fu-

ture. In the first place I freely admit that the hopes of a grander energy in heaven are not open to the charge of vulgar selfishness. I said that they are unintelligible, not that they are unworthy. They are unintelligible to those who are continually alive to the fact I have placed as my first proposition—that *every moral phenomenon is in functional relation with some physical phenomenon*. To those who deny or ignore this truth, there is, doubtless, no incoherence in all the ideals so eloquently described in the papers of Mr. Hutton and Lord Blachford. But, once get this conception as the substratum of your entire mental and moral philosophy, and it is as incoherent to talk to us of your immaterial development as it would be to talk of obtaining redness without any red thing.

I will try to explain more fully why this idea of a glorified activity implies a contradiction in terms to those who are imbued with the sense of correspondence between physical and moral facts. When we conceive any process of thinking, we call up before us a complex train of conditions: objective facts outside of us, or the revived impression of such facts; the molecular effect of these facts upon certain parts of our organism, the association of these with similar facts recalled by memory, an elaborate mechanism to correlate these impressions, an unknown to be made known, and a difficulty to be overcome. All systematic thought implies relations with the external world present or recalled, and it also implies some shortcoming in our powers of perfecting those relations. When we meditate, it is on a basis of facts which we are observing, or have observed and are now recalling, and with a view to get at some result which baffles our direct observation and hinders some practical purpose.

The same holds good of our moral energy. Ecstasy and mere adoration exclude energy of action. Moral development implies difficulties to be overcome, qualities balanced against one another under opposing conditions, this or that appetite tempted, this or that instinct tested by proof. Moral development does not grow like a fungus; it is a continual struggle in surrounding conditions of a specific kind, and an active putting forth of a variety of practical faculties in the midst of real obstacles.

So, too, of the affections: they equally imply conditions. Sympathy does not spurt up like a fountain in the air; it implies beings in need of help, evils to be alleviated, a fellowship of giving and taking, the sense of protecting and

being protected, a pity for suffering, an admiration of power, goodness, and truth. All of these imply an external world to act in, human beings as objects, and human life under human conditions.

Now, all these conditions are eliminated from the orthodox ideal of a future state. There are to be no physical impressions, no material difficulties, no evil, no toil, no struggle, no human beings, and no human objects. The only condition is a complete absence of all conditions, or all conditions of which we have any experience. And we say, we cannot imagine what you mean by your intensified sympathy, your broader thought, your infinitely varied activity, when you begin by postulating the absence of all that makes sympathy, thought, and activity possible, all that makes life really noble.

A mystical and inane ecstasy is an appropriate ideal for this paradise of negations, and this is the orthodox view; but it is not a high view. A glorified existence of greater activity and development may be a high view, but it is a contradiction in terms; exactly, I say, as if you were to talk of a higher civilization without any human beings. But this is simply a metaphysical after-thought to escape from a moral dilemma. Mr. Hutton is surely mistaken in saying that Positivists have forgotten that Christians ever had any meaning in their hopes of a "beatific vision." He must know that Dante and Thomas à Kempis form the religious books of Positivists, and they are, with some other manuals of Catholic theology, among the small number of volumes which Comte recommended for constant use. We can see in the celestial "visions" of a mystical and unscientific age much that was beautiful in its time, though not the highest product even of theology. But in our day these visions of paradise have lost what moral value they had, while the progress of philosophy has made them incompatible with our modern canons of thought.

Mr. Hutton supposes me to object to any continuance of sensation as an evil in itself. My objection was not that consciousness should be prolonged in immortality, but that nothing else but consciousness should be prolonged. All real human life, energy, thought, and active affection, are to be made impossible in your celestial paradise, but you insist on retaining consciousness. To retain the power of feeling, while all means and objects are taken away from thinking, all power of acting, all opportunity of cultivating the faculties of sympathy are stifled: this seems to me something else than a good.

It would seem to me that simply to be conscious, and yet to lie thoughtless, inactive, irresponsive, with every faculty of a man paralyzed within you, as if by that villainous drug which produces torpor while it intensifies sensation—such a consciousness as this must be a very place of torment.

I think some contradictions, which Mr. Hutton supposes he detects in my paper, are not very hard to reconcile. I admitted that death is an evil, it seems; but I spoke of our posthumous activity as a higher kind of influence. We might imagine, of course, a Utopia, with neither suffering, waste, nor loss; and compared with such a world, the world, as we know it, is full of evils, of which death is obviously one. But relatively, in such a world as alone we know, death becomes simply a law of organized Nature, from which we draw some of our guiding motives of conduct. In precisely the same way the necessity of toil is an evil in itself; but, with man and his life as we know them, we draw from it some of our highest moral energies. The grandest qualities of human nature, such as we know it at least, would become forever impossible if Labor and Death were not the law of life.

Mr. Hutton again takes but a pessimist view of life when he insists how much of our activity is evil, and how questionable is the future of the race. I am no pessimist, and I believe in a providential control over all human actions by the great Power of Humanity, which indeed brings good out of evil, and assures, at least for some thousands of centuries, a certain progress toward the higher state. Pessimism, as to the essential dignity of man and the steady development of his race, is one of the surest marks of the enervating influence of this dream of a celestial glory. If I called it as wild a desire as to go roving through space in a comet, it is because I can attach no meaning to a human life to be prolonged without a human frame and a human world; and it seems to me as rational to talk of becoming an angel as to talk of becoming an ellipse.

By "duties" of the world beyond the grave, I meant the duties which are imposed on us in life, by the certainty that our action must continue to have an indefinite effect. The phrase may be inelegant, but I do not think the meaning is obscure.

II. I cannot agree with Lord Balford that I have fallen into any confusion between a substance and an attribute. I am quite aware that the word "soul" has been hitherto used for some centuries as an entity. And I proposed to

retain the term for an attribute. It is a very common process in the history of thought. Electricity, life, heat, were once supposed to be substances. We now very usefully retain these words for a set of observed conditions or qualities.

I agree with Mr. Spenceer that the unity of the social organism is quite as complete as that of the individual organism. I do not confuse the two kinds of unity; but I say that man is in no important sense a unit that society is not also a unit.

With regard to the "percipient" and the "perceptible" I cannot follow Lord Blachford. He speaks a tongue that I do not understand. I have no means of dividing the universe into "percipients" and "perceptibles." I know no reason why a "percipient" should not be a "perceptible," none why I should not be "perceptible," and none why beings about me should not be "perceptible." I think we are all perfectly "perceptible"—indeed, some of us are more "perceptible" than "percipient"—though I cannot say that Lord Blachford is always "perceptible" to me. And how does my being "perceptible," or not being "perceptible," prove that I have an immortal soul? Is a dog "perceptible," is he "percipient?" Has he not some of the qualities of a "percipient," and, if so, has he an immortal soul? Is an ant, a tree, a bacterium, "percipient," and has any of these an immortal soul: for I find Lord Blachford declaring there is an "ineradicable difference between the motions of a material and the sensations of a living being," as if the animal world were "percipient," and the inorganic "perceptible?" But surely in the sensations of a living being the animal world must be included. Where does the vegetable world come in?

I used the word "organism" advisedly, when I said that will, thought, and affection, are functions of a living organism. I decline exactly to localize the organ of any function of mind or will. When I am asked, What are *we*? I reply we are *men*. When I am asked, Are *we* our bodies? I say no, nor are we our minds. Have we no sense of personality, of unity? I am asked. I say certainly; it is an acquired result of our nervous organization, liable to be interrupted by derangements of that nervous organization. What is it that makes us think and feel? The facts of our human nature; I cannot get behind this, and I need no further explanation. We are men, and can do what men can do. I say the tangible collection of organs known as a "man" (not the

consensus or the condition, but the *man*) thinks, wills, and feels, just as much as that visible organism lives and grows. We do not say that this or that ganglion in particular lives and grows; we say the *man* grows. It is as easy to me to imagine that we shall grow fifteen feet high, when we have no body, as that we shall grow in knowledge, goodness, activity, etc., etc., etc., when we have no organs. And the absence of all molecular attributes would be, I should think, particularly awkward in that life of cometary motion in the interstellar spaces with which Lord Blachford threatens us. But, as the poet says:

"Trasumanar significar per verba
Non si porria"—

"If," says he, "practical duties are necessary for the perfection of life," we can take a little interstellar exercise. Why, practical duties are the sum and substance of life; and life which does not centre in practical duties is not life, but a trance.

Lord Blachford, who is somewhat punctilious in terms, asks me what I consider myself to understand "by the incorporation of a consensus of faculties with a glorious future." Well, it so happens that I did not use that phrase. I have never spoken of an immortal soul anywhere, nor do I use the word soul of any but the living man. I said a man might look forward to incorporation with the future of his race, explaining that to mean his "posthumous activity." And I think at any rate the phrase is quite as reasonable as to say that I look forward, as Mr. Hutton does, to a "union with God." What does Mr. Hutton, or Lord Blachford, understand himself to mean by that?

Surely Lord Blachford's epigram about the fiddle and the tune is hardly fortunate. Indeed, that exactly expresses what I find faulty in the view of himself and the theologians. He thinks the tune will go on playing when the fiddle is broken up and burned. I say nothing of the kind. I do not say the man will continue to exist after death. I simply say that his influence will; that other men will do and think what he taught them to do or to think. Just so, a general would be said to win a battle which he planned and directed, even if he had been killed in an early part of it. What is there of fiddle and tune about this? I certainly think that when Mozart and Beethoven have left us great pieces of music, it signifies little to art if the actual fiddle or even the actual composer continue to exist or not. I never said the tune would exist. I said that men would remember it and repeat it. I must thank Lord

Blachford for a happy illustration of my own meaning. But it is *he* who expects the tune to exist without the fiddle. I say, you can't have a tune without a fiddle, nor a fiddle without wood.

III. I have reserved the criticism of Prof. Huxley, because it lies apart from the principal discussion, and turns mainly on some incidental remarks of mine on "biological reasoning about spiritual things."

I note three points at the outset. Prof. Huxley does not himself pretend to any evidence for a theological soul and future life. Again, he does not dispute the account I give of the functional relation of physical and moral facts. He seems surprised that I should understand it, not being a biologist; but he is kind enough to say that my statement may pass. Lastly, he does not deny the reality of man's posthumous activity. Now, these three are the main purposes of my argument; and in these I have Prof. Huxley with me. He is no more of a theologian than I am. Indeed, he is only scandalized that I should see any good in priests at all. He might have said more plainly that, when the man is dead, there is an end of the matter. But this clearly is his opinion, and he intimates as much in his paper. Only he would say no more about it, bury the carcass, and end the tale, leaving all thoughts about the future to those whose faith is more robust and whose hopes are richer; by which I understand him to mean persons weak enough to listen to the priests.

Now, this does not satisfy me. I call it materialism, for it exaggerates the importance of the physical facts, and ignores that of the spiritual facts. And the object of my paper was simply this: that as the physical facts are daily growing quite irresistible, it is of urgent importance to place the spiritual facts on a sound scientific basis at once. Prof. Huxley implies that his business is with the physical facts, and the spiritual facts must take care of themselves. I cannot agree with him. That is precisely the difference between us. The spiritual facts of man's nature are the business of all who undertake to denounce priestcraft, and especially of those who preach "Lay Sermons."

Prof. Huxley complains that I should join in the view-halloo against biological science. Now, I never have supposed that biological science was in the position of the hunted fox. I thought it was the hunter, booted and spurred and riding over us all, with Prof. Huxley leaping the most terrific gates and cracking his whip with intense gusto. As to biological science, it is the last

thing that I should try to run down; and I must protest, with all sincerity, that I wrote without a thought of Prof. Huxley at all. He insists on knowing, in the most peremptory way, of whom I was thinking, as if I were thinking of him. Of whom else could I be thinking, forsooth, when I spoke of biology? Well! I did not bite my thumb at him, but I bit my thumb.

Seriously, I was not writing at Prof. Huxley, or I should have named him. I have a very great admiration for his work in biology; I have learned much from him; I have followed his courses of lectures years and years ago, and have carefully studied his books. If, in questions which belong to sociology, morals, and to general philosophy, he seems to me hardly an authority, why need we dispute? Dog should not bite dog; and he and I have many a wolf that we both would keep from the fold.

But, if I did not mean Prof. Huxley, whom did I mean? Now, my paper, I think clearly enough, alluded to two very different kinds of materialism. There is systematic materialism, and there is the vague materialism. The eminent example of the first is the unlucky remark of Cabanis that the brain secretes thought, as the liver secretes bile; and there is much of the same sort in many foreign theories—in the tone of Moleschott, Büchner, and the like. The most distinct examples of it in this country are found among phrenologists, spiritualists, some mental pathologists, and a few communist visionaries. The far wider, vaguer, and more dangerous school of materialism is found in a multitude of quarters—in all those who insist exclusively on the physical side of moral phenomena—all, in short, who, to use Prof. Huxley's phrase, are employed in "building up a physical theory of moral phenomena." Those who confuse moral and physical phenomena are indeed few. Those who exaggerate the physical side of phenomena are many.

Now, though I did not allude to Prof. Huxley in what I wrote, his criticism convinces me that he is sometimes at least found among these last. His paper is an excellent illustration of the very error which I condemned. The issue between us is this: We both agree that every mental and moral fact is in functional relation with some molecular fact. So far we are entirely on the same side, as against all forms of theological and metaphysical doctrine which conceive the possibility of human feeling without a human body. But, then, says Prof. Huxley, if I can trace the molecular facts which are the antecedents of the mental and moral facts, I have *explained*

these mental and moral facts. That I deny; just as much as I should deny that a chemical analysis of the body could ever lead to an explanation of the physical organism. Then, says the professor, when I have traced out the molecular facts, I have built up a *physical theory of moral phenomena*. That again I deny. I say there is no such thing, or no rational thing, that can be called a physical theory of moral phenomena, any more than there is a moral theory of physical phenomena. What sort of a thing would be a physical theory of history—history *explained* by the influence of climate or the like? The issue between us centres in this: I say that the physical side of moral phenomena bears about the same part in the moral sciences that the facts about climate bear in the sum of human civilization. And that to look to the physical facts as an explanation of the moral, or even as an independent branch of the study of moral facts, is perfectly idle; just as it would be if a mere physical geographer pretended to give us, out of his geography, a climatic philosophy of history. Yet, Prof. Huxley has not been deterred from the astounding paradox of proposing to us a *physiological theory of religion*. He tells us how “the religious feelings may be brought within the range of physiological inquiry.” And he proposes as a problem—“*What diseased viscera may have been responsible for the ‘priest in absolution?’*” I will drop all epithets; but I must say that I call that materialism, and materialism not very nice of its kind. One might as reasonably propose as a problem—What barometrical readings are responsible for the British Constitution? and suggest a congress of meteorologists to do the work of Hallam, Stubbs, and Freeman. No doubt there is *some* connection between the House of Commons and the English climate, and so there is no doubt *some* connection between religious theories and physical organs. But to talk of “bringing religion within the range of physiological inquiry” is simply to stare through the wrong end of the telescope, and to turn philosophy and science upside down. Ah! Prof. Huxley, this is a bad day’s work for scientific progress—

ἢ κεν γηθῆσαι Πρίαμος, Πριάμοι τε παῖδες.

Pope Pius and his people will be glad when they read that fatal sentence of yours. When I complained of the “attempt to dispose of the deepest moral truths of human nature on a bare physical or physiological basis,” I could not have expected to read such an illustration of my meaning by Prof. Huxley.

Perhaps he will permit me to inform him (since that is the style which he affects) that there once was—and, indeed, we may say still is—an institution called the Catholic Church; that it has had a long and strange history, and subtle influences of all kinds; and I venture to think that Prof. Huxley may learn more about the *priest in absolution* by a few weeks’ study of the Catholic system than by inspecting the diseased viscera of the whole human race. When Prof. Huxley’s historical and religious studies “have advanced so far as to enable him to explain” the history of Catholicism, I think he will admit that “priestcraft” cannot well be made a chapter in a physiological manual. It may be cheap pulpit thunder, but this idea of his of inspecting a “diseased viscus” is precisely what I meant by “biological reasoning about spiritual things.” And I stand by it, that it is just as false in science as it is deleterious in morals. It is an attempt (I will not say arrogant, I am inclined to use another epithet) to explain, by physical observations, what can only be explained by the most subtle moral, sociological, and historical observations. It is to think you can find the golden eggs by cutting up the goose, instead of watching the goose to see where she lays the eggs.

I am quite aware that Prof. Huxley has elsewhere formulated his belief that biology is the science which “includes man and all his ways and works.” If history, law, politics, morals, and political economy, are merely branches of biology, we shall want new dictionaries indeed; and biology will embrace about four-fifths of human knowledge. But this is not a question of language; for we here have Prof. Huxley actually bringing religion within the range of *physiological* inquiry, and settling its problems by references to “diseased viscus.” But the differences between us are a long story; and since Prof. Huxley has sought me out, and in somewhat monitorial tone has proposed to set me right, I will take an early occasion to try and set forth what I find paradoxical in his notions of the relations of biology and philosophy.

I note a few special points between us, and I have done. Prof. Huxley is so well satisfied with his idea of a “physical theory of moral phenomena,” that he constantly attributes that sense to my words, though I carefully guarded my language from such a construction. Thus he quotes from me a passage beginning, “Man is one, however compound,” but he breaks off the quotation just as I go on to speak of the direct analysis of mental and moral faculties by mental

and moral science, not by physiological science. I say: "philosophy and science" have accomplished explanations; I do not say biology; and the biological part of the explanation is a small and subordinate part of the whole. I do not say that the correspondence between physical and moral phenomena is an *explanation* of the human organism. Prof. Huxley says that, and I call it materialism. Nor do I say that "spiritual sensibility is a *bodily* function." I say, it is a moral function; and I complain that Prof. Huxley ignores the distinction between moral and physical functions of the human organism.

As to the distinction between anatomy and physiology, if he will look at my words again, he will see that I use these terms with perfect accuracy. Six lines below the passage he quotes, I speak of the human mechanism being only explained by a "complete anatomy *and biology*," showing that anatomy is merely one of the instruments of biology.

He might be surprised to hear that he does not himself give an accurate definition of physiology. But so it is. He says, "Physiology is the science which treats of the functions of the living organism." Not so, for the finest spiritual sensibility is, as Prof. Huxley admits, a function of a living organism; and physiology is not the science which treats of the spiritual sensibilities. They belong to moral science. There are mental, moral, affective functions of the living organism; and they are not within the province of physiology. Physiology is the science which treats of the *bodily* functions of the living organism; as Prof. Huxley says in his admirable "Elementary Lessons," it deals with the facts "concerning the action of the *body*." I complain of the pseudo-science which drops that distinction for a minute. He says, "The explanation of a physiological function is the demonstration of the connection of that function with the molecular state of the organ which exerts the function." That I dispute. It is only a small part of the explanation. The explanation substantially is the demonstration of the laws and all the conditions of the function. The explanation of the circulation of the blood is the demonstration of all its laws, modes, and conditions; and the molecular antecedents of it are but a small part of the explanation. The principal part relates to the molar (and not the molecular) action of the heart and other organs. "The function of motion is explained," he says, "when the movements of the living body are found to have certain molecular changes for their invariable antecedents." Not-

ing of the kind. The function of bodily motion is explained when the laws, modes, and conditions, of that motion are demonstrated; and molecular antecedents are but a part of these conditions. The main part of the explanation, again, deals with molar, not molecular, states of certain organs. "The function of sensation is explained," says Prof. Huxley, "when the molecular changes, which are the invariable antecedents of sensations, are discovered." Not a bit of it. The function of sensation is only explained when the laws and conditions of sensation are demonstrated. And the main part of this demonstration will come from direct observation of the sensitive organism organically, and by no molecular discovery whatever. All this is precisely the materialism which I condemn; the fancying that one science can do the work of another, and that any molecular discovery can dispense with direct study of organisms in their organic, social, mental, and moral aspects. Will Prof. Huxley say that the function of this Symposium is explained, when we have chemically analyzed the solids and liquids which are now effecting molecular change in our respective digestive apparatus? If so, let us ask the butler if he cannot produce us a less heady and more mellow vintage. What irritated *viscus* is responsible for the *materialist in philosophy*? We shall all philosophize aright, if our friend Tyndall can hit for us the exact chemical formula for our drinks.

It does not surprise me, so much as it might, to find Prof. Huxley slipping into really inaccurate definitions in physiology, when I remember that hallucination of his about questions of science all becoming questions of molecular physics. The molecular facts are valuable enough; but we are getting molecular-mad, if we forget that molecular facts have only a special part in physiology, and hardly any part at all in sociology, history, morals, and politics; though I quite agree that there is no single fact in social, moral, or mental philosophy, that has not its correspondence in some molecular fact, if we only could know it. All human things undoubtedly depend on, and are certainly connected with, the general laws of the solar system. And to say that questions of human organisms, much less of human society, tend to become questions of molecular physics, is exactly the kind of confusion it would be, if I said that questions of history tend to become questions of astronomy, and that the more refined calculations of planetary movements in the future will explain to us the causes of the English Rebellion and the French Revolution.

There is an odd instance of this confusion of thought at the close of Prof. Huxley's paper, which still more oddly Lord Blackford, who is so strict in his logic, cites with approval. "Has a stone a future life," says Prof. Huxley, "because the wavelets it may cause in the sea persist through space and time?" Well! has a stone a life at all? because, if it has no present life, I cannot see why it should have a future life. How is any reasoning about the inorganic world to help us here in reasoning about the organic world? Prof. Huxley and Lord Blackford might as well ask if a stone is capable of civilization because I said that man was. I think that man is wholly different from a stone; and from a fiddle; and even from a dog; and that to say that a man cannot exert any influence on other men after his death, because a dog cannot, or because a fiddle, or because a stone cannot, may be to reproduce with rather needless affectation the verbal quibbles and pitfalls which Socrates and the sophists prepared for each other in some wordy symposium of old.

Lastly, Prof. Huxley seems to think that he has disposed of me altogether, so soon as he can point to a sympathy between theologians and myself. I trust there are great affinity and great sympathy between us; and pray let him not think that I am in the least ashamed of that common ground. Positivism has quite as much sympathy with the genuine theologian as it has with the scientific specialist. The former may be working on a wrong intellectual basis, and often it may be by most perverted methods; but, in the best types, he has a high social aim and a great moral cause to maintain among men. The latter is usually right in his intellectual basis as far as it goes; but it does not go very far, and in the great moral cause of the spiritual destinies of men he is often content with utter indifference and simple nihilism. Mere raving at priestcraft, and headles, and outward investments, is indeed a poor solution of the mighty problems of the human soul and of social organization. And the instinct of the mass of mankind will long reject a biology which has nothing for these but a sneer. It will not do for Prof. Huxley to say that he is only a poor biologist and careth for none of these things. His biology, however, "includes man and all his ways and works." Besides, he is a leader in Israel; he has preached an entire volume of "Lay Sermons;" and he has waged many a war with theologians and philosophers on religious and philosophic problems. What, if I may ask him, are his own religion and his own philoso-

phy? He says that he knows no scientific men who "neglect all philosophical and religious synthesis." In that he is fortunate in his circle of acquaintance. But since he is so earnest in asking me questions, let me ask him to tell the world what is his own synthesis of philosophy, what is his own idea of religion? He can laugh at the worship of priests and positivists: whom, or what, does he worship? If he dislikes the word soul, does he think man has anything that can be called a spiritual nature? If he derides my idea of a future life, does he think that there is anything which can be said of a man, when his carcass is laid beneath the sod, beyond a simple final *vale*?

P. S.—And now space fails me to reply to the appeals of so many critics. I cannot enter with Mr. Roden Noel on that great question of the materialization of the spirits of the dead; I know not whether we shall be "made one with the great Elohim, or angels of Nature, or if we shall grovel in dead material bodily life." I know nothing of this high matter: I do not comprehend this language. Nor can I add anything to what I have said on that sense of personality which Lord Selborne and Canon Barry so eloquently press on me. To me that sense of personality is a thing of somewhat slow growth, resulting from our entire nervous organization and our composite mental constitution. It seems to me that we can often trace it building up and trace it again decaying away. We feel ourselves to be *men*, because we have human bodies and human minds. Is that not enough? Has the baby of an hour this sense of personality? Are you sure that a dog or an elephant has not got it? Then has the baby no soul; has the dog a soul? Do you know more of your neighbor, apart from inference, than you know of the dog? Again, I cannot enter upon Mr. Greg's beautiful reflections, save to point out how largely he supports me. He shows, I think with masterly logic, how difficult it is to fit this new notion of a glorified activity on to the old orthodoxy of beatific ecstasy. Canon Barry reminds us how this orthodoxy involved the resurrection of the body, and the same difficulty has driven Mr. Roden Noel to suggest that the material world itself may be the *débris* of the just made perfect. But Dr. Ward, as might be expected, falls back on the beatific ecstasy as conceived by the mystics of the thirteenth century. No word here about moral activity and the social converse, as in the Elysian fields, imagined by philosophers of less orthodox severity.

One word more. If my language has given any believer pain, I regret it sincerely. It may have been somewhat obscure, since it has been so widely arraigned, and I think misconceived. My position is this: The idea of a glorified energy in an ampler life is an idea utterly incompatible with exact thought, one which evaporates in contradictions, in phrases which when pressed have no meaning. The idea of beatific ecstasy is the old and orthodox idea; it does not involve so many contradictions as the former idea, but then it does not satisfy our moral judgment. I say plainly that the hope of such an infinite ecstasy is an inane and unworthy crown of a human life.

And when Dr. Ward assures me that it is merely the prolongation of the saintly life, then I say the saintly life is an inane and unworthy life. The words I used about the "selfish" view of futurity, I applied only to those who say they care for nothing but personal enjoyment, and to those whose only aim is "to save their own souls." Mr. Baldwin Brown has nobly condemned this creed in words far stronger than mine. And here let us close with the reflection that the language of controversy must always be held to apply not to the character of our opponents, but to the logical consequences of their doctrines, if uncorrected and if forced to their extreme.

THE COLORS OF ANIMALS AND PLANTS.¹

By ALFRED RUSSEL WALLACE.

II.—THE COLORS OF PLANTS.

THE coloring of plants is neither so varied nor so complex as that of animals, and its explanation, accordingly, offers fewer difficulties. The colors of foliage are, comparatively, little varied, and can be traced in almost all cases to a special pigment termed chlorophyl, to which is due the general green color of leaves; but the recent investigations of Mr. Sorby and others have shown that chlorophyl is not a simple green pigment, but that it really consists of at least seven distinct substances, varying in color from blue to yellow and orange. These differ in their proportions in the chlorophyl of different plants; they have different chemical reactions; they are differently affected by light; and they give distinct spectra. Mr. Sorby further states that scores of different coloring-matters are found in the leaves and flowers of plants, to some of which appropriate names have been given, as erythrophyl, which is red, and phaiophyl, which is

brown; and many of these differ greatly from each other in their chemical composition. These inquiries are at present in their infancy, but, as the original term chlorophyl seems scarcely applicable under the present aspect of the subject, it would perhaps be better to introduce the analogous word chromophyl as a general term for the coloring-matters of the vegetable kingdom.

Light has a much more decided action on plants than on animals. The green color of leaves is almost wholly dependent on it; and although some flowers will become fully colored in the dark, others are decidedly affected by the absence of light, even when the foliage is fully exposed to it. Looking, therefore, at the numerous colored substances which are developed in the tissues of plants—the sensitiveness of these pigments to light, the changes they undergo during growth and development, and the facility with which new chemical combinations are effected by the physiological processes of plants, as shown by the endless variety in the chemical constitution of vegetable products—we have no difficulty in comprehending the general causes which aid in producing the colors of the vegetable world, or the extreme variability of those colors. We may, therefore, here confine ourselves to an inquiry into the various uses of color in the economy of plants; and this will generally enable us to understand how it has become fixed and specialized

¹ In the first part of this paper I used the term "voluntary sexual selection" to indicate the theory that many of the ornaments of male animals have been produced by the choice of the females, and to distinguish it from that form of sexual selection which explains the acquisition of weapons peculiar to male animals as due to the selective influence of their combats and struggles for the possession of the females. I find that Mr. Darwin thinks the term "voluntary" not strictly applicable, and I therefore propose to alter it to "conscious" or "perceptive," which seem free from any ambiguity, and make not the least difference to my argument.

in the several genera and species of the vegetable kingdom.

In animals, as we have seen, color is greatly influenced by the need of protection from, or of warning to, their numerous enemies, and to the necessity for identification and easy recognition. Plants rarely need to be concealed, and obtain protection either by their spines, their hardness, their hairy covering, or their poisonous secretions. A very few cases of what seem to be true protective coloring do, however, exist, the most remarkable being that of the "stone mesembryanthemum," of the Cape of Good Hope, which in form and color closely resembles the stones among which it grows; and Dr. Burchell, who first discovered it, believes that the juicy little plant thus generally escapes the notice of cattle and wild herbivorous animals. Mr. J. P. Mansel Weale also noticed that many plants growing in the stony Karoo have their tuberous roots above the soil, and these so perfectly resemble the stones among which they grow that, when not in leaf, it is almost impossible to distinguish them (*Nature*, vol. iii., p. 507). A few cases of what seem to be protective mimicry have also been noted, the most curious being that of three very rare British fungi, found by Mr. Worthington Smith, each in company with common species, which they so closely resembled that only a minute examination could detect the difference. One of the common species is stated in botanical works to be "bitter and nauseous," so that it is not improbable that the rare kind may escape being eaten by being mistaken for an uneatable species, though itself palatable. Mr. Mansel Weale also mentions a labiate plant, the *Ajuga ophrydis*, of South Africa, as strikingly resembling an orchid. This may be a means of attracting insects to fertilize the flower in the absence of sufficient nectar or other attraction in the flower itself; and the supposition is rendered more probable by this being the only species of the genus *Ajuga* in South Africa. Many other cases of resemblances between very distinct plants have been noticed—as that of some Euphorbias to Cacti; but these very rarely inhabit the same country or locality, and it has not been proved that there is in any of these cases the amount of inter-relation between the species which is the essential feature of the protective "mimicry" that occurs in the animal world.

The different colors exhibited by the foliage of plants, and the changes it undergoes during growth and decay, appear to be due to the general laws already sketched out, and to have little, if any, relation to the special requirements of each

species. But flowers and fruits exhibit definite and well-pronounced tints, often varying from species to species, and more or less clearly related to the habits and functions of the plant. With the few exceptions already pointed out, these may be generally classed as *attractive* colors. The seeds of plants require to be dispersed, so as to reach places favorable for germination and growth. Some are very minute, and are carried abroad by the wind, or they are violently expelled and scattered by the bursting of the containing capsules. Others are downy or winged, and are carried long distances by the gentlest breeze. But there is a large class of seeds which cannot be dispersed in either of these ways, and are mostly contained in eatable fruits. These fruits are devoured by birds or beasts, and the hard seeds pass through their stomachs undigested, and, owing probably to the gentle heat and moisture to which they have been subjected, in a condition highly favorable for germination. The dry fruits or capsules containing the first two classes of seeds are rarely, if ever, conspicuously colored, whereas the eatable fruits almost invariably acquire a bright color as they ripen, while at the same time they become soft and often full of agreeable juices. Our *red* haws and nips, our *black* elderberries, our *blue* sloes and whortleberries, our *white* mistletoe and snowberry, and our *orange* sea-buckthorn, are examples of the color-sign of edibility; and in every part of the world the same phenomenon is found. The fruits of large forest-trees, such as the pines, oaks, and beeches, are not colored, perhaps because their size and abundance render them sufficiently conspicuous, and also because they provide such a quantity of food to such a number of different animals that there is no danger of their being unnoticed.

The colors of flowers serve to render them visible and recognizable by insects which are attracted by secretions of nectar or pollen. During their visits for the purpose of obtaining these products, insects involuntarily carry the pollen of one flower to the stigma of another, and thus effect cross-fertilization, which, as Mr. Darwin was the first to demonstrate, immensely increases the vigor and fertility of the next generation of plants. This discovery has led to the careful examination of great numbers of flowers, and the result has been that the most wonderful and complex arrangements have been found to exist, all having for their object to secure that flowers shall not be self-fertilized perpetually, but that pollen shall be carried, either constantly or occasionally, from the flowers of one plant to those of

another. Mr. Darwin himself first worked out the details in orchids, primulas, and some other groups; and hardly less curious phenomena have since been found to occur, even among some of the most regularly-formed flowers. The arrangement, length, and position, of all the parts of the flower are now found to have a purpose, and not the least remarkable portion of the phenomenon is the great variety of ways in which the same result is obtained. After the discoveries with regard to orchids, it was to be expected that the irregular, tubular, and spurred flowers, should present various curious adaptations for fertilization by insect-agency. But even among the open, cup-shaped, and quite regular flowers, in which it seemed inevitable that the pollen must fall on the stigma, and produce constant self-fertilization, it has been found that this is often prevented by a physiological variation—the anthers constantly emitting their pollen either a little earlier or a little later than the stigmas of the same flower, or of other flowers on the same plant, were in the best state to receive it; and as individual plants in different stations, soils, and aspects, differ somewhat in the time of flowering, the pollen of one plant would often be conveyed by insects to the stigmas of some other plant in a condition to be fertilized by it. This mode of securing cross-fertilization seems so simple and easy, that we can hardly help wondering why it did not always come into action, and so obviate the necessity for those elaborate, varied, and highly-complex contrivances found in perhaps the majority of colored flowers. The answer to this of course is, that *variation* sometimes occurred most freely in one part of a plant's organization, and sometimes in another, and that the benefit of cross-fertilization was so great that *any* variation that favored it was preserved, and then formed the starting-point of a whole series of further variations, resulting in those marvelous adaptations for insect fertilization, which have given much of their variety, elegance, and beauty, to the floral world. For details of these adaptations we must refer the reader to the works of Darwin, Lubbock, Herman Müller, and others. We have here only to deal with the part played by color, and by those floral structures in which color is most displayed.

The sweet odors of flowers, like their colors, seem often to have been developed as an attraction or guide to insect fertilizers, and the two phenomena are often complementary to each other. Thus, many inconspicuous flowers—like the mignonette and the sweet-violet—can be dis-

tinguished by their odors before they attract the eye, and this may often prevent their being passed unnoticed; while very showy flowers, and especially those with variegated or spotted petals, are seldom sweet. White, or very pale flowers, on the other hand, are often excessively sweet, as exemplified by the jasmine and clematis; and many of these are only scented at night, as is strikingly the case with the night smelling stock, our butterfly orchis (*Habenaria chlorantha*), the greenish-yellow *Daphne pontica*, and many others. These white flowers are mostly fertilized by night-flying moths, and those which reserve their odors for the evening probably escape the visits of diurnal insects which would consume their nectar without effecting fertilization. The absence of odor in showy flowers and its preponderance among those that are white may be shown to be a fact by an examination of the lists in Mr. Mongredien's work on hardy trees and shrubs.¹ He gives a list of about one hundred and sixty species with showy flowers, and another list of sixty species with fragrant flowers; but only twenty of these latter are included among the showy species, and these are almost all white-flowered. Of the sixty species with fragrant flowers, more than forty are white, and a number of others have greenish, yellowish, or dusky and inconspicuous flowers. The relation of white flowers to nocturnal insects is also well shown by those which, like the evening primroses, only open their large white blossoms after sunset. The red Martagon lily has been observed by Mr. Herman Müller to be fertilized by the humming-bird hawk-moth, which flies in the morning and afternoon when the colors of this flower, exposed to the nearly horizontal rays of the sun, glow with brilliancy, and when it also becomes very sweet-scented.

To the same need of conspicuousness the combination of so many individually small flowers into heads and bunches is probably due, producing such broad masses as those of the elder, the guelder-rose, and most of the Umbelliferae, or such elegant bunches at those of the lilac, laburnum, horse-chestnut, and wistaria. In other cases minute flowers are gathered into dense heads, as with *Globularia*, *Jasione*, clover, and all the Compositae; and among the latter the outer flowers are often developed into a ray, as in the sunflowers, the daisies, and the asters, forming a starlike compound flower, which is itself often produced in immense profusion.

¹ "Trees and Shrubs for English Plantations," by Augustus Mongredien. Murray, 1870.

The beauty of Alpine flowers is almost proverbial. It consists either in the increased size of the individual flowers as compared with the whole plant, in increased intensity of color, or in the massing of small flowers into dense cushions of bright color; and it is only in the higher Alps, above the limit of forests and upward toward the perpetual snow-line that these characteristics are fully exhibited. This effort at conspicuousness under adverse circumstances may be traced to the comparative scarcity of winged insects in the higher regions, and to the necessity for attracting them from a distance. Amid the vast slopes of *débris* and the huge masses of rock so prevalent in higher mountain-regions, patches of intense color can alone make themselves visible and serve to attract the wandering butterfly from the valleys. Mr. Herman Müller's careful observations have shown that in the higher Alps bees and most other groups of winged insects are almost wanting, while butterflies are tolerably abundant; and he has discovered that in a number of cases where a lowland flower is adapted to be fertilized by bees, its Alpine ally has had its structure so modified as to be adapted for fertilization only by butterflies.¹ But bees are always (in the temperate zone) far more abundant than butterflies, and this will be another reason why flowers specially adapted to be fertilized by the latter should be rendered unusually conspicuous. We find, accordingly, the yellow primrose of the plains replaced by pink and magenta-colored Alpine species; the straggling wild-pinks of the lowlands by the masses of large flowers in such mountain species as *Dianthus alpinus* and *D. glacialis*; the saxifrages of the high Alps with bunches of flowers a foot long, as in *Saxifraga longifolia* and *S. cotyledon*, or forming spreading masses of flowers, as in *S. oppositifolia*; while the soapworts, silenes, and louseworts, are equally superior to the allied species of the plains.

Again, Dr. Müller has discovered that when there are showy and inconspicuous species in the same genus of plants, there is often a corresponding difference of structure, those with large and showy flowers being quite incapable of self-fertilization, and thus depending for their very existence on the visits of insects; while the others are able to fertilize themselves should insects fail to visit them. We have examples of this difference in *Malva sylvestris*, *Epilobium angustifolium*, *Polygonum bistorta*, and *Geranium pratense*—which have all large or showy flowers and must be fertilized by insects—as compared with *Malva ro-*

tundifolia, *Epilobium parviflorum*, *Polygonum aviculare*, and *Geranium pusillum*, which have small or inconspicuous flowers, and are so constructed that if insects should not visit them they are able to fertilize themselves.¹

As supplementing these curious facts showing the relation of color in flowers to the need of the visits of insects to fertilize them, we have the remarkable, and on any other theory utterly inexplicable circumstance, that in all the numerous cases in which plants are fertilized by the agency of the wind they never have specially colored floral envelopes. Such are our pines, oaks, poplars, willows, beeches, and hazel; our nettles, grasses, sedges, and many others. In some of these the male flowers are, it is true, conspicuous, as in the catkins of the willows and the hazel, but this arises incidentally from the masses of pollen necessary to secure fertilization, as shown by the entire absence of a corolla or of those colored bracts which so often add to the beauty and conspicuousness of true flowers.

The adaptation of flowers to be fertilized by insects—often to such an extent that the very existence of the species depends upon it—has had wide-spread influence on the distribution of plants and the general aspects of vegetation. The seeds of a particular species may be carried to another country, may find there a suitable soil and climate, may grow and produce flowers, but if the insect which alone can fertilize it should not inhabit that country, the plant cannot maintain itself, however frequently it may be introduced or however vigorously it may grow. Thus may probably be explained the poverty in flowering plants and the great preponderance of ferns that distinguishes many oceanic islands, as well as the deficiency of gayly-colored flowers in others. This branch of the subject is discussed at some length in my address to the Biological Section of the British Association,² but I may here just allude to two of the most striking cases. New Zealand is, in proportion to its total number of flowering plants, exceedingly poor in handsome flowers, and it is correspondingly poor in insects, especially in bees and butterflies, the two groups which so greatly aid in fertilization. In both these aspects it contrasts strongly with Southern Australia and Tasmania in the same latitudes, where there are a profusion of gayly-colored flowers and an exceedingly rich insect-fauna. The other case is presented by the Galapagos Islands, which, though situated on the equator off the

¹ *Nature*, vol. ix., p. 164.

² See *Nature*, September 6, 1876.

¹ *Nature*, vol. xi., pp. 32, 110.

west coast of South America, and with a tolerably luxuriant vegetation in the damp mountain-zone, yet produce hardly a single conspicuously-colored flower; and this is correlated with, and no doubt dependent on, an extreme poverty of insect-life, not one bee and only a single butterfly having been found there.

Again, there is reason to believe that some portion of the large size and corresponding showiness of tropical flowers is due to their being fertilized by very large insects and even by birds. Tropical sphinx-moths often have their probosces nine or ten inches long, and we find flowers whose tubes or spurs reach about the same length; while the giant bees, and the numerous flower-sucking birds, aid in the fertilization of flowers whose corollas or stamens are proportionately large.

I have now concluded this sketch of the general phenomena of color in the organic world. I have shown reasons for believing that its presence, in some of its infinitely-varied hues, is more probable than its absence, and that variation of color is an almost necessary concomitant of variation of structure, of development, and of growth. It has also been shown how color has been appropriated and modified both in the animal and vegetable world, for the advantage of the species in a great variety of ways, and that there is no need to call in the aid of any other laws than those of organic development and "natural selection" to explain its countless modifications. From the point of view here taken, it seems at once improbable and unnecessary that the lower animals should have the same delicate appreciation of the infinite variety and beauty—of the delicate contrasts and subtle harmonies of color—which are possessed by the more intellectual races of mankind, since even the lower human races do not possess it. All that seems required in the case of animals is a perception of *distinctness* or *contrast* of colors; and the dislike of so many creatures to scarlet may, perhaps, be due to the rarity of that color in Nature, and to the glaring contrast it offers to the sober greens and browns which form the general clothing of the earth's surface.

The general view of the subject now given must convince us that, so far from color being—as it has sometimes been thought to be—unimportant, it is intimately connected with the very existence of a large proportion of the species of the animal and vegetable worlds. The gay colors of the butterfly and of the Alpine flower which it unconsciously fertilizes while seeking

for its secreted honey, are each beneficial to its possessor, and have been shown to be dependent on the same class of general laws as those which have determined the form, the structure, and the habits of every living thing. The complex laws and unexpected relations which we have seen to be involved in the production of the special colors of flower, bird, and insect, must give them an additional interest for every thoughtful mind; while the knowledge that, in all probability, each style of coloration, and sometimes the smallest details have a meaning and a use, must add a new charm to the study of Nature.

Throughout the preceding discussion we have accepted the subjective phenomena of color—that is, our perception of varied hues, and the mental emotions excited by them—as ultimate facts needing no explanation. Yet they present certain features well worthy of attention, a brief consideration of which will form a fitting sequel to the present essay.

The perception of color seems, to the present writer, the most wonderful and the most mysterious of our sensations. Its extreme diversities and exquisite beauties seem out of proportion to the causes that are supposed to have produced them, or the physical needs to which they minister. If we look at pure tints of red, green, blue, and yellow, they appear so absolutely contrasted and unlike each other that it is almost impossible to believe (what we nevertheless know to be the fact) that the rays of light producing these very distinct sensations differ only in wave-length and rate of vibration; and that there are from one to the other a continuous series and gradation of such vibrating waves. The positive diversity we see in them must, then, depend upon special adaptations in ourselves; and the question arises, For what purpose have our visual organs and mental perceptions become so highly specialized in this respect? When the sense of sight was first developed in the animal kingdom we can hardly doubt that what was perceived was light only, and its more or less complete withdrawal. As the sense became perfected, more delicate gradations of light and shade would be perceived; and there seems no reason why a visual capacity might not have been developed as perfect as our own, or even more so, in respect of light and shade, but entirely insensible to differences of color, except in so far as these implied a difference in the quantity of light. The world would in that case appear somewhat as we see it in good stereoscopic photographs; and we all know how

exquisitely beautiful such pictures are, and how completely they give us all requisite information as to form, surface-texture, solidity, and distance, and even to some extent as to color—for almost all colors are distinguishable in a photograph by some differences of tint, and it is quite conceivable that visual organs might exist which would differentiate what we term color by delicate gradations of some one characteristic neutral tint. Now, such a capacity of vision would be simple as compared with that which we actually possess—which, besides distinguishing infinite gradations of the *quantity* of light, distinguishes also, by a totally distinct set of sensations, gradations of *quality*, as determined by differences of wave-lengths or rate of vibration. At what grade in animal development this new and more complex sense first began to appear we have no means of determining. The fact that the higher vertebrates, and even some insects, distinguish what are to us diversities of color, by no means proves that their *sensations* of color bear any resemblance to ours. An insect's capacity to distinguish red from blue or yellow may be (and probably is) due to perceptions of a totally distinct nature, and quite unaccompanied by any of that sense of enjoyment or even of radical distinctness which pure colors excite in us. Mammalia and birds, whose structure and emotions are so similar to our own, do probably receive somewhat similar impressions of color; but we have no evidence to show that they experience pleasurable emotions from color itself when not associated with the satisfaction of their wants or the gratification of their passions.

The primary necessity which led to the development of the sense of color was probably the need of distinguishing objects much alike in form and size, but differing in important properties—such as ripe and unripe, or eatable and poisonous fruits; flowers with honey or without; the sexes of the same or of closely-allied species. In most cases the strongest contrast would be the most useful, especially as the colors of the objects to be distinguished would form but minute spots or points when compared with the broad masses of tint of sky, earth, or foliage, against which they would be set. Throughout the long epochs in which the sense of sight was being gradually developed in the higher animals, their visual organs would be mainly subjected to two groups of rays—the green from vegetation and the blue from the sky. The immense preponderance of these over all other groups of rays would naturally lead the eye to become specially adapted for their

perception; and it is quite possible that at first these were the only kinds of light-vibrations which could be perceived at all. When the need for differentiation of color arose, rays of greater and of smaller wave-lengths would necessarily be made use of to excite the new sensations required; and we can thus understand why green and blue form the central portion of the visible spectrum, and are the colors which are most agreeable to us in large surfaces; while, at its two extremities, we find yellow, red, and violet colors, which we best appreciate in smaller masses, and when contrasted with the other two or with light neutral tints. We have here probably the foundations of a natural theory of harmonious coloring, derived from the order in which our color-sensations have arisen, and the nature of the emotions with which the several tints have been always associated.¹ The agreeable and soothing influence of green light may be in part due to the green rays hav-

¹ There is reason to believe that our capacity of distinguishing colors has increased even in historical times. The subject has attracted the attention of German philologists, and I have been furnished by a friend with some notes from a work of the late Lazarus Geiger, entitled "Zur Entwicklungsgeschichte der Menschheit" (Stuttgart, 1871). According to this writer it appears that the *color* of grass and foliage is never alluded to as a beauty in the Vedas or the Zenda-vesta, though these productions are continually extolled for other properties. Blue is described by terms denoting sometimes green, sometimes black, showing that it was hardly recognized as a distinct color. The *color* of the sky is never mentioned in the Bible, the Vedas, the Homeric poems, or even in the Koran. The first distinct allusion to it known to Geiger is in an Arabic work of the ninth century. "Hyacinthine locks" are black locks, and Homer calls iron "violet-colored." Yellow was often confounded with green, but, along with red, it was one of the earliest colors to receive a distinct name. Aristotle names three colors in the rainbow—red, yellow, and green. Two centuries earlier Xenophanes had described the rainbow as purple, reddish, and yellow. The Pythagoreans admitted four primary colors—white, black, red, and yellow; the Chinese the same, with the addition of green. If these statements fairly represent the early condition of color-sensation, they well accord with the view here maintained, that green and blue were first alone perceived, and that the other colors were successively separated from them. These latter would be the first to receive names; hence we find purple, reddish, and yellow, first noticed in the rainbow as the tints to be separated from the wide-spread blue and green of the visible world which required no distinctive color-appellation. If the capacity of distinguishing colors has increased in historic times, we may, perhaps, look upon color-blindness as a survival of a condition once almost universal; while the fact that it is still so prevalent is in harmony with the view that our present high perception and appreciation of color is a comparatively recent acquisition, and may be correlated with a general advance in mental activity.

ing little heating power; but this can hardly be the chief cause, for the blue and violet, though they contain less heat, are not generally felt to be so cool and sedative. But when we consider how dependent are all the higher animals on vegetation, and that man himself has been developed in the closest relation to it, we shall find, probably, a sufficient explanation. The green mantle with which the earth is overspread caused this one color to predominate over all others that meet our sight, and to be almost always associated with the satisfaction of human wants. Where the grass is greenest, and vegetation most abundant and varied, there has man always found his most suitable dwelling-place. In such spots hunger and thirst are unknown, and the choicest productions of Nature gratify the appetite and please the eye. In the greatest heats of summer, coolness, shade, and moisture, are found in the green forest-glades; and we can thus understand how our visual apparatus has become especially adapted to receive pleasurable and soothing sensations from this class of rays.

The preceding considerations enable us to comprehend, both why a perception of difference of color has become developed in the higher animals, and also why colors require to be presented or combined in varying proportions in order to be agreeable to us. But they hardly seem to afford a sufficient explanation, either of the wonderful contrasts and total unlikeness of the sensations produced in us by the chief primary colors, or of the exquisite charm and pleasure we derive from color itself, as distinguished from variously-colored objects, in the case of which association of ideas comes into play. It is hardly conceivable that the material *uses* of color to animals and to ourselves required such very distinct and powerfully-contrasted sensations; and it is still less conceivable that a sense of delight in color *per se* should have been necessary for our utilization of it.

The emotions excited by color and by music alike seem to rise above the level of a world developed on purely utilitarian principles.—*Macmillan's Magazine*.

THE ORIGIN OF THE CONSTELLATION-FIGURES.

By RICHARD A. PROCTOR.

ALTHOUGH the strange figures which astronomers still allow to straggle over their star-maps no longer have any real scientific interest, they still possess a certain charm not only for the student of astronomy, but for many who care little or nothing about astronomy as a science. When I was giving a course of twelve lectures in Boston, America, a person of considerable culture said to me: "I wish you would lecture about the constellations; I care little about the sun and moon and the planets, and not much more about comets; but I have always felt great interest in the Bears and Lions, the Chained and Chaired Ladies, King Cepheus and the Rescuer, Perseus, Orion, Ophiucus, Hercules, and the rest of the mythical and fanciful beings with which the old astronomers peopled the heavens. I say with Carlyle, 'Why does not some one teach me the constellations, and make me at home in the starry heavens, which are always overhead, and which I don't half know to this day.'" We may notice, too, that the poets by almost unanimous consent have recognized the poetical aspect of the constellations, while they have found little to

say about subjects which belong especially to astronomy as a science. Milton has indeed made an archangel reason (not unskillfully for Milton's day) about the Ptolemaic and Copernican systems, while Tennyson makes frequent reference to astronomical theories. "There sinks the nebulous star we call the Sun, if that hypothesis of theirs be sound," said Ida; but she said no more, save "let us down and rest," as though the subject was wearisome to her. Again, in "The Palace of Art," the soul of the poet having built herself that "great house so royal rich and wide," thither—

" . . . When all the deep unsounded skies
Shuddered with silent stars, she clomb,
And as with optic glasses her keen eyes
Pierced through the mystic dome,
Regions of lucid matter taking forms,
Brushes of fire, hazy gleams,
Clusters and beds of worlds and beelike swarms,
Of suns, and starry streams:
She saw the snowy poles of moonless Mars,
That marvelous round of milky light
Below Orion, and those double stars
Whereof the one more bright
Is circled by the other."

But the poet's soul so wearied of these astronomical researches that the beautiful lines I have quoted disappeared (more's the pity) from the second and all later editions. Such exceptions, indeed, prove the rule. Poets have been chary in referring to astronomical researches and results, full though these have been of unspeakable poetry; while, from the days of Homer to those of Tennyson, the constellations which garland the heavens have always been favorite subjects of poetic imagery.

It is not my present purpose, however, to discuss the poetic aspect of the constellations. I propose to inquire how these singular figures first found their way to the heavens, and, so far as facts are available for the purpose, to determine the history and antiquity of some of the more celebrated constellations.

Long before astronomy had any existence as a science, men watched the stars with wonder and reverence. Those orbs, seemingly countless—which bespangle the dark robe of night—have a charm and beauty of their own apart from the significance with which the science of astronomy has invested them. The least fanciful mind is led to recognize on the celestial concave the emblems of terrestrial objects, pictured with more or less distinctness among the mysterious star-groupings. We can imagine that, long before the importance of the study of the stars was recognized, men had begun to associate with certain star-groups the names of familiar objects animate or inanimate. The flocks and herds which the earliest observers of the heavens tended would suggest names for certain sets of stars, and thus the Bull, the Ram, the Kids, would appear in the heavens. Other groups would remind those early observers of the animals from whom they had to guard their flocks, or of those animals to whose vigilance they trusted for protection; and thus the Bear, and the Lion, and the Dogs, would find their place among the stars. The figures of men and horses, of birds and fishes, would naturally enough be recognized, nor would either the implements of husbandry or the weapons by which the huntsman secured his prey remain unrepresented among the star-groupings. And lastly, the altar on which the first-fruits of harvest and vintage were presented, or the flesh of lambs and goats consumed, would be figured among the innumerable combinations which a fanciful eye can recognize among the orbs of heaven.

In thus suggesting that the first observers of the heavens were shepherds, huntsmen, and husbandmen, I am not advancing a theory on the

difficult questions connected with the origin of exact astronomy. The first observations of the heavens were of necessity made by men who depended for their subsistence on a familiarity with the progress and vicissitudes of the seasons, and doubtless preceded by many ages the study of astronomy as a science. And yet the observations made by those early shepherds and hunters, unscientific though they must have been in themselves, are full of interest to the student of modern exact astronomy. The assertion may seem strange at first sight, but is nevertheless strictly true, that, if we could but learn with certainty the names assigned to certain star-groups before astronomy had any real existence, we could deduce lessons of extreme importance from the rough observations which suggested those old names. In these days, when observations of such marvelous exactness are daily and nightly made, when instruments capable of revealing the actual constitution of the stars are employed, and thousands of observers are at work, it may seem strange to attach any interest to the question whether half-savage races recognized in such and such a star-group the likeness of a bear, or in another group the semblance of a ship. But though we could learn more, of course, from exacter observations, yet even such rough and imperfect records would have their value. If we could be certain that in long-past ages a star-group really resembled some known object, we should have in the present resemblance of that group to the same object evidence of the general constancy of stellar lustre, or, if no resemblance could be recognized, we should have reason to doubt whether other suns (and, therefore, our own sun) may not be liable to great changes.

The subject of the constellation-figures as first known is interesting in other ways. For instance, it is full of interest to the antiquary (and most of us are to some degree antiquaries) as relating to the most ancient of all human sciences. The same mental quality which causes us to look with interest on the buildings raised in long-past ages, or on the implements and weapons of antiquity, renders the thought impressive that the stars which we see were gazed on perhaps not less wonderingly in the very infancy of the human race. It is, again, a subject full of interest to the chronologist to inquire in what era of the world's history exact astronomy began, when the moon was assigned her twenty-eight zodiacal mansions, the sun his twelve zodiacal signs. It is well known, indeed, that Newton himself did not disdain to study the questions thus suggested;

and the speculations of the ingenious Dupuis found favor with the great mathematician Laplace.

Unfortunately, the evidence is not sufficiently exact to be very trustworthy. In considering, for instance, the chronological inquiries of Newton, one cannot but feel that the reliance placed by him on the statements made by different writers is not justified by the nature of these statements, which are for the most part vague in the extreme. We owe many of them to poets who, knowing little of astronomy, mixed up the phenomena of their own time with those which they found recorded in the writings of astronomers. Some of the statements left by ancient writers are, indeed, ludicrously incongruous; insomuch that Grotius not unjustly said of the account of the constellations given by the poet Aratus, that it could be assigned to no fixed epoch and to no fixed place. However, this could not be the place to discuss details such as are involved in exact inquiries. I have indicated some of these in an appendix to my treatise on "Saturn," and others in the preface to my "Gnomonic Star Atlas;" but, for the most part, they do not admit very readily of familiar description. Let us turn to less technical considerations, which, fortunately, are in this case fully as much to the point as exact inquiries, seeing that there is no real foundation for such inquiries in any of the available evidence.

The first obvious feature of the old constellations is one which somehow has not received the attention it deserves. It is as instructive as any of those which have been made the subject of profound research.

There is a great space in the heavens over which none of the old constellations extend—except the River Eridanus as now pictured, but we do not know where this winding stream of stars was supposed by the old observers to come to an end. This great space surrounds the southern pole of the heavens, and this shows that the first observers of the stars were not acquainted with the constellations which can be seen only from places far south of Chaldea, Persia, Egypt, India, China, and indeed of all the regions to which the invention of astronomy has been assigned. Whatever the first astronomers were, however profound their knowledge of astronomy may have been (as some imagine), they had certainly not traveled far enough toward the south to know the constellations around the southern pole. If they had been as well acquainted with geography as some assert, if even any astronomer had traveled as

far south as the equator, we should certainly have had pictured in the old star-charts some constellations in that region of the heavens wherein modern astronomers have placed the Octant, the Bird-of-Paradise, the Sword-fish, the Flying-fish, the Toucan, the Net, and other uncelestial objects.

In passing I may note that this fact disposes most completely of a theory lately advanced—that the constellations were invented in the southern hemisphere, and that thus is to be explained the ancient tradition that the sun and stars have changed their courses. For though all the northern constellations would have been more or less visible from parts of the southern hemisphere near the equator, it is absurd to suppose that a southern observer would leave untenanted a full fourth of the heavens round the southern or visible pole, while carefully filling up the space around the northern or unseen pole with incomplete constellations whose northern unknown portions would include that pole. Supposing it for a moment to be true, as a modern advocate of the southern theory remarks, that "one of a race migrating from one side to the other of the equator would take his position from the sun, and fancy he was facing the same way when he looked at it at noon, and so would think the motion of the stars to have altered instead of his having turned round," the theory that astronomy was brought us from south of the equator cannot possibly be admitted in presence of that enormous vacant region around the southern pole. I think, however, that, apart from this, a race so profoundly ignorant as to suppose any such thing, to imagine they were looking north when in reality they were looking south, can hardly be regarded as the first founders of the science of astronomy.

The great gap I have spoken of has long been recognized. But one remarkable feature in its position has not, to the best of my remembrance, been considered. The vacant space is eccentric with regard to the southern pole of the heavens. The old constellations, the Altar, and the Centaur, and the ship Argo, extend within twenty degrees of the pole, while the Southern Fish and the great sea-monster Cetus, which are the southernmost constellations on the other side, do not reach within some sixty degrees of the pole.

Of course, in saying that this peculiarity has not been considered, I am not suggesting that it has not been noticed, or that its cause is in any way doubtful or unknown. We know that the earth, besides whirling once a day on its axis, and rushing on its mighty orbit around the sun (spanning some 184,000,000 miles), reels like a gigantic top,

with a motion so slow that 25,868 years are required for a single circuit of the swaying axis around an imaginary line upright to the plane in which the earth travels. And we know that in consequence of this reeling motion the points of the heavens opposite the earth's poles necessarily change. So that the southern pole, now eccentrically placed amid the region where there were no constellations in old times, was once differently situated. But the circumstance which seems to have been overlooked is this, that, by calculating backward to the time when the southern pole was in the centre of that vacant region, we have a much better chance of finding the date (let us rather say the century) when the older constellations were formed than by any other process. We may be sure not to be led very far astray, for we are not guided by one constellation but by several, whereas all the other indications which have been followed depend on the supposed ancient position of single constellations. And then most of the other indications are such as might very well have belonged to periods following long after the invention of the constellations themselves. An astronomer might have ascertained, for instance, that the sun in spring was in some particular part of the Ram or of the Fishes, and later a poet like Aratus might describe that relation (erroneously for his own epoch) as characteristic of one or other constellation; but who is to assure us that the astronomer who noted the relation correctly may not have made his observation many hundreds of years after those constellations were invented? Whereas, there was one period, and only one period, when the most southernmost of the old constellations could have marked the limits of the region of sky visible from some northern region. Thus, too, may we form some idea of the latitude in which the first observers lived. For in high latitudes the southernmost of the old constellations would not have been visible at all, and in latitudes much lower than a certain latitude presently to be noted these constellations would have ridden high above the southern horizon, other star-groups showing below them which were not included among the old constellations.

I have before me, as I write, a picture of the southern heavens, drawn by myself, in which this vacant space—eccentric in position, but circular in shape—is shown. The centre lies close by the Lesser Magellanic cloud, between the stars Kappa Toucani and Eta Hydri of our modern maps, but much nearer to the last named. Near this spot, then, we may be sure, lay the southern

pole of the star-sphere, when the old constellations, or at least the southern ones, were invented; and, if there had been astronomers in the southern hemisphere, Eta Hydri would certainly have been their pole-star.

Now, it is a matter of no difficulty whatever to determine the epoch when the southern pole of the heavens was thus placed.¹ Between 2,100 and 2,200 years before the Christian era, the southern constellations had the position described, the invisible southern pole lying at the centre of the vacant space of the star-sphere—or rather of the space free from constellations. It is noteworthy that, for other reasons, this period, or rather a definite epoch within it, is indicated as that to which must be referred the beginning of exact astronomy. Among others must be mentioned this—that in the year 2170 B. C., *quam proximè*, the Pleiades rose to their highest above the horizon at noon (or technically made their noon culmination) at the spring equinox. We can readily understand that, to minds possessed with full faith in the influence of the stars on the earth, this fact would have great significance. The changes which are brought about at that season of the year, in reality, of course, because of the gradual increase in the effect of the sun's rays as he rises higher and higher above the celestial equator, would be attributed, in part at least, to the remarkable star-cluster coming then close by the sun on the heavens, though unseen. Thus we can readily understand the reference in Job to the "sweet influences of the Pleiades." Again, at that same time, 2170 B. C., when the sun and the Pleiades opened the year (with commencing spring) together, the star Alpha of the Dragon, which was the pole-star of the period, had that precise position with respect to the true pole of the heavens which is indicated by the slope of the long passage extending downward aslant from the northern face of the Great Pyramid; that is to say, when due north below the pole (or at what is technically called its sub-polar meridional passage), the pole-star of the period shone directly down that long passage, and I doubt not could be seen not only when it came to that position during the night, but also when it came there during the daytime.

But some other singular relations are to be

¹ It is, by-the-way, somewhat amusing to find Baron Humboldt referring a question of this sort to the great mathematician Gauss, and describing the problem as though it involved the most profound calculations. Ten minutes should suffice to deal with any problem of the kind.

noted in connection with the particular epoch I have indicated.

It is tolerably clear that, in imagining figures of certain objects in the heavens, the early observers would not be apt to picture these objects in unusual positions. A group of stars may form a figure so closely resembling that of a familiar object, that even a wrong position would not prevent the resemblance from being noticed, as for instance the "Chair," the "Plough," and so forth. But such cases are not numerous; indeed, to say the truth, one must "make believe a good deal" to see resemblance between the star-groups and most of the constellation-figures, even under the most favorable conditions. When there is no very close resemblance, as is the case with all the large constellations, position must have counted for something in determining the association between a star-group and a known object.

Now, the constellations north of the equator assume so many and such various positions that this special consideration does not apply very forcibly to them. But those south of the equator are only seen above the southern horizon, and change little in position during their progress from east to west of the south point. The lower down they are, the less they change in position. And the very lowest—such as those were, for instance, which I have been considering in determining the position of the southern pole—are only fully visible when due south. They must, then, in all probability, have stood upright or in their natural position when so placed, for, if they were not rightly placed then, they only were so when below the horizon, and consequently invisible.

Let us, then, inquire what was the position of the southernmost constellations when fully seen above the southern horizon at midnight.

The Centaur stood then as he does now, upright, only—whereas now in Egypt, Chaldea, India, Persia, and China, only the upper portions of his figure rise above the horizon, he then stood, the noblest save Orion of all the constellations, with his feet (marked by the bright Alpha and Beta still belonging to the constellation, and by the stars of the Southern Cross which have been taken from it) upon the horizon itself. In latitude 20° or so north he may still be seen thus placed when due south.

The Centaur was represented in old times as placing an offering upon the altar, which was pictured, says Manilius, as bearing a fire of incense, represented by stars. This to a student of our

modern charts seems altogether perplexing. The Centaur carries the wolf on the end of his spear; but, instead of placing the wolf (not a very acceptable meat-offering, one would suppose) upon the altar, he is directing this animal toward the base of the altar, whose top is downward, the flames represented there tending naturally downward also. It is quite certain the ancient observers did not imagine anything of this sort. As I have said, Aratus tells us that the celestial Centaur was placing an offering upon the altar, which was therefore upright; and Manilius describes the altar as

"Ferens thuris, stellis imitantibus, ignem,"

so that the fire was where it should be, on the top of an upright altar, where also on the sky itself were stars looking like the smoke from incense-fires. Now, that was precisely the appearance presented by the stars forming the constellation at the time I have indicated, some 2170 years B. C. Setting the altar upright above the southern horizon (that is, inverting the absurd picture at present given of it), we see it just where it should be placed to receive the Centaur's offering, and a most remarkable portion of the Milky-Way is then seen to be directly above the altar in such a way as to form a very good imitation of smoke ascending from it. This part of the Milky-Way is described by Sir J. Herschel, who studied it carefully during his stay at the Cape of Good Hope, as forming a complicated system of interlaced streaks and masses which covers the tail of Scorpio (extending from the altar which lies immediately south of the Scorpion's Tail). The Milky-Way divides, in fact, just above the altar, as the constellation was seen 4,000 years ago above the southern horizon, one branch being that just described, the other (like another stream of smoke) "passing," says Herschel, "over the stars Iota of the Altar, Theta and Iota of the Scorpion, etc., to Gamma of the Archer, where it suddenly collects into a vivid oval mass, so very rich in stars that a very moderate calculation makes their number exceed 100,000." Nothing could accord better with the descriptions of Aratus and Manilius.

But there is another constellation which shows in a more marked way than either the Centaur or the Altar that the date when the constellations were invented must have been near that which I have named. Both Ara and Centaurus look now, in suitable latitudes (about 20° north), as they looked in higher latitudes (about 40° north) 4,000 years ago. For the

reeling motion of our earth has changed the place of the celestial pole in such a way as only to depress these constellations southward without much changing their *position*; they are nearly upright when due south now as they were 4,000 years ago, only lower down. But the great ship Argo has suffered a much more serious displacement. One cannot now see this ship like a ship at any time or from any place on the earth's surface. If we travel south till the whole constellation comes into visibility above the southern horizon at the proper season (January and February for the midnight hours) the keel of the ship is aslant, the stern being high above the waist (the fore-part is wanting). If we travel still farther south, we can indeed reach places where the course of the ship is so widened, and the changes of position so increased, that she appears along part of her journey on an even keel, but then she is high above the horizon. Now, 4,000 years ago she stood on the horizon itself at her southern culmination, with level keel and upright mast.

In passing, I may note that there are those who imagine that this great ship represented the ark, its fore-part formerly being the portion of the Centaur now forming the horse, so that the Centaur was represented as a man (not as a man-horse) offering a gift on the altar. Thus, in this group of constellations men recognized the ark, and Noah going up from the ark toward the altar "which he builded unto the Lord; and took of every clean beast, and of every clean fowl, and offered burnt-offerings on the altar." One heretic has even imagined that the constellation-figures of the ship, the man with an offering, and the altar, painted or sculptured in some ancient astrological temple, came at a later time to be understood as picturing a series of events, interpreted and expanded by a poetical writer into a complete narrative. Without venturing to advocate here so heterodox a notion, I may remark as an odd coincidence that probably such a picture or sculpture would have shown the smoke ascending from the altar which I have already described, and in this smoke there would be shown the bow of Sagittarius. This, interpreted and expanded in the way I have mentioned, might have accounted for the "bow set in the clouds, for a token of a covenant." It is noteworthy that all the remaining constellations forming the southern limit of the old star-domes or charts, were watery ones—the Southern Fish, over which Aquarius is pouring a quite unnecessary stream of water, the great sea-monster,

toward which in turn flow the streams of the River Eridanus. The equator, too, was then occupied along a great part of its length by the great sea-serpent Hydra, which reared its head above the equator, very probably indicated then by a water horizon, for nearly all the signs below it were then watery. At any rate, as the length of Hydra then lay horizontally above the ship, whose masts reached it, we may well believe that this part of the picture of the heavens showed a sea-horizon and a ship, the great sea-serpent lying along the horizon. On the back of Hydra is the raven, which again may be supposed by those who accept the theory mentioned above to have suggested the raven which went forth to and fro from the ark. He is close enough to the rigging of Argo to make an easy journey of it. The dove, however, must not be confounded with the modern constellation Columba, though this is placed (suitably enough) near the ark. We must suppose the idea of the dove was suggested by a bird pictured in the rigging of the celestial ship. The sequence in which the constellations came above the horizon as the year went round corresponded very satisfactorily with the theory, fanciful though this may be. First Aquarius pouring streams of water, the three fishes (Pisces and Piscis Australis), and the great sea-monster Cetus, showing how the waters prevailed over the highest hills, then the ark sailing on the waters, a little later the raven (Corvus), the man descending from the ark and offering a gift on the altar; and last, the bow set amid the clouds.

The theory just described may have little in its favor. But wilder theories of the story of the deluge have been adopted and advocated with considerable confidence. One of the wildest, I fear, is the Astronomer Royal's, that the deluge was simply a great rising of the Nile. Sir G. Airy is so confident respecting this that he says, "I cannot entertain the smallest doubt that the flood of Noah was a flood of the Nile," precisely as he might say, "I cannot entertain the smallest doubt that the earth moves round the sun." On one point we can entertain very little doubt indeed. If it ever rained before the flood, which seems probable, and if the sun ever shone on falling rain, which again seems likely, nothing short of a miracle could have prevented the rainbow from making its appearance before the flood. The wildest theory that can be invented to explain the story of the deluge cannot be wilder than the supposition that the rays of sunlight shining on falling rain-drops could have ever

failed to show the prismatic colors. The theory I have suggested above, without going so far as to advocate it, is free at any rate from objection on this particular score, which cannot be said of the ordinary theory. I am not yet able, however, to say that "I cannot entertain the smallest doubt" about that theory.

We may feel tolerably sure that the period when the old southern constellations were formed must have been between 2,400 and 2,000 years before the present era. This, period, by-the-way, includes the date usually assigned to the deluge, which, however, must really occupy our attention no further. In fact, let us leave the watery constellations below the equator of those remote times, and seek at once the highest heavens above them.

Here, at the northern pole of those days, we find the great Dragon, which in any astrological temple of the time must have formed the highest or crowning constellation, surrounding the very key-stone of the dome. He has fallen away from that proud position since. In fact, even 4,000 years ago he only held to the pole, so to speak, by his tail, and we have to travel farther back 2,000 years or so to find the pole situate in a portion of the length of the Dragon which can be regarded as central. One might almost, if fancifully disposed, recognize the gradual displacement of the Dragon from his old place of honor, in certain traditions of the downfall of the great Dragon whose "tail drew the third part of the stars of heaven."

The central position of the Dragon—for even when the pole-star had drawn near to the Dragon's tail the constellation was still central—will remind the classical reader of Homer's description of the shield of Hercules:

"The sealy horror of a dragon, coiled
Full in the central field, unspeakable,
With eyes oblique retorted, that askant
Shot gleaming fire."

Elton's translation.

I say Homer's description, for I cannot understand how any one, who compares together the description of the shield of Achilles in the "Iliad" and that of the shield of Hercules in the fragmentary form in which we have it, can doubt for a moment that both descriptions came from the same hand. (The theory that Hesiod composed the latter poem can scarcely be entertained by any scholar.) As I long since pointed out in my essay, "A New Theory of Achilles's Shield" ("Light Science," first series), no poet, so inferior as actually to borrow Homer's words

in part of the description of the shield of Hercules, could have written the other parts not found in the shield of Achilles. "I cannot, for my own part, entertain the smallest doubt"—that is to say, I think it altogether probable—that Homer composed the lines supposed to describe the shield of Hercules long before he introduced the description, pruned and strengthened, into that particular part of the "Iliad" where it served his purpose best. And I have as little doubt that the original description, of which we only get fragments in either poem, related to something far more important than a shield. The constellations are not suitable adornments for the shield of a fighting-man, even though he was under the special care of a celestial mother, and had armor made for him by a celestial smith. Yet we learn that Achilles's shield displayed—

"The starry lights that heaven's high convex
crowned,

The Pleiads, Hyads, and the northern beam,
And great Orion's more refulgent beam,
To which, around the cycle of the sky,
The Bear revolving, points his golden eye,
Still shines exalted on th' ethereal plain,"

and so forth. The shield of Hercules displayed at its centre the polar constellation, the Dragon. We read also that—

"There was the knight of fair-haired Danæ born,
Perseus."

Orion is not specially mentioned, but Orion, Lepus, and the Dogs, seem referred to:

" . . . Men of chase
Were taking the fleet hares: two keen-toothed
dogs
Bounded beside."

Homer would find no difficulty in pluralizing the mighty hunter and the hare into huntsmen and hares when utilizing a description originally referring to the constellation. I conceive that the original description related to one of those zodiac temples whose remains are still found in Egypt, though the Egyptian temples of this kind were probably only copies of more ancient Chaldean temples. We know from Assyrian sculptures that representations of the constellations (and especially the zodiacal constellations) were common among the Babylonians; and, as I point out in the essay above referred to, "it seems probable that in a country where Sabianism or star-worship was the prevailing form of religion, yet more imposing proportions would be given to zodiac temples than in Egypt." My theory, then, respecting the two famous "shields" is, that

Homer in his Eastern travels visited imposing temples devoted to astronomical observation and star-worship, and that nearly every line in both descriptions is borrowed from a poem in which he described a temple of this sort, its domed zodiac, and those illustrations of the labors of different seasons and of military or judicial procedures which the astrological proclivities of star-worshippers led them to associate with the different constellations. For the arguments on which this theory is based I have not here space. They are dealt with in the essay from which I have quoted. One point only I need touch upon here, besides those I have mentioned already. It may be objected that the description of a zodiac temple has nothing to connect it with the subject of the "Iliad." This is certainly true; but no one who is familiar with Homer's manner can doubt that he would work in, if he saw the opportunity, a poem on some subject outside that of the "Iliad," so modifying the language that the description would correspond with the subject in hand. There are many passages, though none of such length, in both the "Iliad" and the "Odyssey," which seem thus to have been brought into the poem; and other passages not exactly of this kind yet show that Homer was not insensible to the advantage of occasionally using memory instead of invention.

Any one who considers attentively the aspect of the constellation Draco in the heavens, will perceive that the drawing of the head in the maps is not correct; the head is no longer pictured as it must have been conceived by those who first formed the constellation. The two bright stars, Beta and Gamma, are now placed on a head in profile. Formerly they marked the two eyes. I would not lay stress on the description of the Dragon in the shield of Hercules, "with eyes oblique retorted, that askant shot gleaming fire;" for the reader may not be prepared to accept my opinion that the description related to the constellation Draco. But the description of the constellation itself by Aratus suffices to show that the two bright stars I have named marked the eyes of the imagined monster—in fact, Aratus's account singularly resembles that given in the shield of Hercules. "Swol'n is his neck," says Aratus of the Dragon—

" . . . Eyes charged with sparkling fire
His erected head illumine. As if in ire
To Helice he turns his foaming jaw,
And darts his tongue, barbed with a blazing star."

And the Dragon's head with sparkling eyes can be recognized to this day, so soon as this change

is made in its configuration, whereas no one can recognize the remotest resemblance to a dragon's head in profile. The star barbing the Dragon's tongue would be Xi of the Dragon according to Aratus's account, for so only would the eyes be turned toward Helice the Bear. But, when Aratus wrote, the practice of separating the constellations from each other had been adopted; in fact, he derived his knowledge of them chiefly from Endoxus the astronomer and mathematician, who certainly would not have allowed the constellations to be intermixed. In the beginning there are reasons for believing it was different; and if a group of stars resembled any known object it would be called after that object, even though some of the stars necessary to make up the figure belonged already to some other figure. This being remembered, we can have no difficulty in retorting the Dragon's head more naturally—not to the star Xi of the Dragon, but to the star Iota of Hercules.

The four stars are situated thus, * * the larger ones representing the eyes, and so far as the head is concerned it is a matter of indifference whether the lower or the upper small star be taken to represent the tongue. But, as any one will see who looks at these stars when the Dragon is best placed for (ordinary non-telescopic) observation, the attitude of the animal is far more natural when the star Iota of Hercules marks the tongue, for then the creature is situated like a winged serpent hovering above the horizon and looking downward; whereas, when the star Xi marks the tongue, the hovering Dragon is looking upward and is in an unnaturally constrained position. (I would not, indeed, claim to understand perfectly all the ways of dragons; still it may be assumed that a dragon hovering above the horizon would rather look downward in a natural position than upward in an awkward one.)

The star Iota of Hercules marks the heel of this giant, called the Kneeler (Engonasin) from time immemorial. He must have been an important figure on the old zodiac temples, and not improbably his presence there as one of the largest and highest of the human figures may have caused a zodiac dome to be named after Hercules. The Dome of Hercules would come near enough to the title, "The Shield of Hercules," borne by the fragmentary poem dealt with above. The foot of the kneeling man was represented on the head of the dragon, the dragon having hold of the heel. And here, again, some imagine that

a sculptured representation of these imagined figures in the heavens may have been interpreted and expanded into the narrative of a contest between the man and the old serpent the dragon, Ophiuchus the serpent-bearer being supposed to typify the eventual defeat of the dragon. This fancy might be followed out like that relating to the deluge; but the reader has possibly no desire for further inquiries in that particular direction.

Some interest attaches to the constellation Ophiuchus, to my mind, in the evidence it affords respecting the way in which the constellations were at first intermixed. I have mentioned one instance in which, as I think, the later astronomers separated two constellations which had once been conjoined. Many others can be recognized when we compare the actual star-groups with the constellation-figures as at present depicted. No one can recognize the poop of a ship in the group of stars now assigned to the stern of Argo; but if we include the stars of the Greater Dog, and others close by, a well-shaped poop can be clearly seen. The head of the Lion of our maps is as the head of a dog, so far as stars are concerned; but, if stars from the Crab on one side and from Virgo on the other be included in the figure, and especially Berenice's Hair to form the tuft of the lion's tail, a very fine lion with waving mane can be discerned, with a slight effort of the imagination. So with Boötes the herdsman. He was of old "a fine figure of a man," waving aloft his arms, and, as his name implies, shouting lustily at the retreating bear. Now, and from some time certainly preceding that of Eudoxus, one arm has been lopped off to fashion the northern crown, and the herdsman holds his club as close to his side as a soldier holds his shouldered musket. The constellation of the Great Bear, once I conceive the only bear (though the lesser bear is a very old constellation), has suffered wofully. Originally it must have been a much larger bear, the stars now forming the tail marking part of the outline of the back; but first some folks who were unacquainted with the nature of bears turned the three stars (the horses of the plough) into a long tail, abstracting from the animal all the corresponding portion of his body, and then modern astronomers, finding a great vacant space where formerly the bear's large frame extended, continually formed the stars of this space into a new constellation, the Hunting Dogs. No one can recognize a bear in the constellation as at present shaped; but any one who looks attentively at

the part of the skies occupied by the constellation will recognize (always "making believe a good deal") a monstrous bear, with the proper small head of creatures of the bear family, and with exceedingly well-developed plantigrade feet. Of course, this figure cannot at all times be recognized with equal facility; but before midnight during the last four or five months in the year, the bear occupies positions favoring his recognition, being either upright on his feet, or as if descending a slope, or squatting on his great haunches. As a long-tailed animal the creature is more like one of those wooden toy-monkeys which used to be made for children (and may be now), in which the sliding motion of a ringed rod carried the monkey over the top of a stick. The Little Bear has I think been borrowed from the dragon, which was certainly a winged monster originally.

Now, the astronomers who separated from each other (and in so doing spoiled) the old constellation-figures seem to have despaired of freeing Ophiuchus from his entanglements. The Serpent is twined around his body, the Scorpion is clawing at one leg. The constellation-makers have *per fas et nefas* separated Scorpio from the Serpent-Holder, spoiling both figures. But the Serpent has been too much for them, inasmuch that they have been reduced to the abject necessity of leaving one part of the Serpent on one side of the region they allow to Ophiuchus, and the other part of the Serpent on the other.

A group of constellations whose origin and meaning are little understood remains to be mentioned. Close by the Dragon is King Cepheus; beside him his wife Cassiopeia (the Seated Lady), near whom is Andromeda, the Chained Lady. The Sea Monster Cetus is not far away, though not near enough to threaten her safety, the Ram and Triangle being between the monster's head and her feet, the Fishes intervening between the body of the monster and her fair form. Close at hand is Perseus, the Rescuer, with a sword (looking very much like a reaping-hook in all the old pictures) in his right hand, and bearing in his left the head of Medusa. The general way of accounting for the figures thus associated has been by supposing that, having a certain tradition about Cepheus and his family, men imagined in the heavens the pictorial representation of the events of the tradition. I have long believed that the actual order in this and other cases was the reverse of this—that men imagined certain figures in the heavens, pictured these figures in their astronomical temples or observatories, and made

stories afterward to fit the pictures, probably many generations afterward. Be this as it may, we can at present give no satisfactory account of the group of constellations.

Wilford describes, in his "Asiatic Researches," a conversation with a pundit or astronomer respecting the names of the Indian constellations. "Asking him," he says, "to show me in the heavens the constellation Antarmada, he immediately pointed to Andromeda, though I had not given him any information about it beforehand. He afterward brought me a very rare and curious work in Sanskrit, which contained a chapter devoted to *Upanachatras*, or extra-zodiacal constellations, with drawings of *Cepuja* (Cepheus) and of *Casyapi* (Cassiopeia) seated and holding a lotus-flower in her hand, of Antarmada chained with the Fish beside her, and last of *Parascia* (Perseus), who, according to the explanation of the book, held the head of a monster which he had slain in combat; blood was dripping from it, and for hair it had snakes." Some have inferred, from the circumstance that the Indian charts thus showed the Cassiopeian set of constellations, that the origin of these figures is to be sought in India. But probably both the Indian and the Greek constellation-figures were derived from a much older source.

The zodiacal twelve are in some respects the most important and interesting of all the ancient constellations. If we could determine the origin of these figures, their exact configuration as at first devised, and the precise influences assigned to them in the old astrological systems, we should have obtained important evidence as to the origin of astronomy itself. Not, indeed, that the twelve signs of the zodiac were formed at the beginning or even in the early infancy of astronomy. It seems abundantly clear that the division of the zodiac (which includes the moon's track as well as the sun's) had reference originally to the moon's motions. She circuits the star-sphere in about twenty-seven and a third days, while the lunation or interval from new moon to new moon is, as we all know, about twenty-nine and a half days in length. It would appear that the earliest astronomers, who were of course astrologers also, of all nations—the Indian, Egyptian, Chinese, Persian, and Chaldean astronomers—adopted twenty-eight days (probably as a rough mean between the two periods just named) as their chief lunar period, and divided the moon's track round the ecliptic into twenty-eight portions or mansions. How they managed about the fractions of days outstanding—whether the common lunation

was considered or the moon's motion round the star-sphere—is not known. The very circumstance, however, that they were for a long time content with their twenty-eight lunar mansions shows that they did not seek great precision at first. Doubtless they employed some rough system of "leap-months" by which, as occasion required, the progress of the month was reconciled with the progress of the moon, just as by our leap-years the progress of the year is reconciled with the progress of the sun or seasons.

The use of the twenty-eight-day period naturally suggested the division of time into weeks of seven days each. The ordinary lunar month is divided in a very obvious manner into four equal parts by the lunar aspects. Every one can recognize roughly the time of full moon and the times of half-moon before and after full, while the time of new moon is recognized from these last two epochs. Thus the four quarters of the month, or roughly the four weeks of the month, would be the first time measure thought of, after the day, which is the necessary foundation of all time measures. The nearest approach which can be made to a quarter-month in days is the week of seven days; and although some little awkwardness arose from the fact that four weeks differ appreciably from a lunar month, this would not long prevent the adoption of the week as a measure of time. In fact, just as our years begin on different days of the week without causing any inconvenience, so the ancient months might be made to begin with different week-days. All that would be necessary to make the week measure fairly well the quarters of the month, would be to start each month on the proper or nearest week-day. To inform people about this some ceremony could be appointed for the day of the new moon, and some signal employed to indicate the time when this ceremony was to take place. This—the natural and obvious course—we find, was the means actually adopted, the festival of the new moon and the blowing of trumpets in the new moon being an essential part of the arrangements adopted by nations who adopted the week as a chief measure of time. The seven days were not affected by the new moons so far as the nomenclature of these days, or special duties connected with any one of them, might be concerned. Originally the idea may have been to have festivals and sacrifices at the time of new moon, first quarter, full moon, and third quarter; but this arrangement would naturally (and did, as we know, actually) give way before long to a new-moon festival regulating the month, and seven

daily festivals, each class of festival having its appropriate sacrifices and duties.

This, I say, was the natural cause. Its adoption *may* have been aided by the recognition of the fact that the seven planets of the old system of astronomy might conveniently be taken to rule the days and the hours in the way described in my essay on astrology. That that nomenclature and that system of association between the planets and the hours, days, and weeks of time measurement were eventually adopted, is certain; but whether the convenience and apparent mystical fitness of this arrangement led at all to the use of weekly festivals in conjunction with monthly ones, or whether those weekly festivals were first adopted in the way described above, or whether (which seems altogether more likely) both sets of considerations led to the arrangement, we cannot certainly tell. The arrangement was in every way a natural one, and one may say, considering all the circumstances, that it was almost an inevitable one. There was, however, another possible arrangement, viz., the division of time into ten daily periods, three to each month, with corresponding new-moon festivals. But as the arrival of the moon at the *thirds* of her progress are not at all so well marked as her arrival at the quarters, and, as there is no connection between the number ten and the planets, this arrangement was far less likely to be adopted than the other. Accordingly, we find that only one or two nations adopted it. Six sets of five days would be practically the same arrangement; five sets of six for each month would scarcely be thought of, as with that division the use of simple direct observations of the moon for time measurement, which was the real aim of all such divisions, would not be convenient or indeed even possible for the generality of persons. Few could tell easily when the moon is two-fifths or four-fifths full, whereas every one can tell when she is half full or quite full (the requisite for weekly measurement); and it would be *possible* to guess pretty nearly when she is one-third or two-thirds full, the requisite for the tridecennial division.

My object in the above discussion of the origin of the week (as distinguished from the origin of the Sabbath, which I considered in my paper on astrology), has been to show that the use of the twelve zodiacal signs was in every case preceded by the use of the twenty-eight lunar mansions. It has been supposed that those nations in whose astronomy the twenty-eight mansions still appear adopted one system, while the use of the twelve signs implies that another system had

been adopted. Thus the following passage occurs in Mr. Blake's version of Flammarion's "History of the Heavens:" "The Chinese have twenty-eight constellations, though the word *sion* does not mean a group of stars, but simply a mansion or hotel. In the Coptic and ancient Egyptian the word for constellation has the same meaning. They also had twenty-eight, and the same number is found among the Arabians, Persians, and Indians. Among the Chaldeans or Accadians we find no sign of the number twenty-eight. The ecliptic, or 'yoke of the sky,' with them, as we see in the newly-discovered tablets, was divided into twelve divisions, as now; and the only connection that can be imagined between this and the twenty-eight is the opinion of M. Biot, who thinks that the Chinese had originally only twenty-four mansions, four more being added by Chen-kung, 1100 B. C., and that they corresponded with the twenty-four stars, twelve to the north and twelve to the south, that marked the twelve signs of the zodiac among the Chaldeans. But under this supposition the twenty-eight has no reference to the moon, whereas we have every reason to believe it has." The last observation is undoubtedly correct—the twenty-eight mansions have been mansions of the moon from the beginning. But in this very circumstance, as also in the very tablets referred to in the preceding passage, we find all the evidence needed to show that originally the Chaldeans divided the zodiac into twenty-eight parts. For we find from the tablets that, like the other nations who had twenty-eight zodiacal mansions, the Chaldeans used a seven-day period, derived from the moon's motions, every seventh day being called *sabbatu*, and held as a day of rest. We may safely infer that the Chaldean astronomers, advancing beyond those of other nations, recognized the necessity of dividing the zodiac with reference to the sun's motions instead of the moon's. They therefore discarded the twenty-eight lunar mansions, and adopted instead twelve solar signs; this number twelve, like the number twenty-eight itself, being selected merely as the most convenient approximation to the number of parts into which the zodiac was naturally divided by another period. Thus the twenty-eighth part of the zodiac corresponds roughly with the moon's daily motion, and the twelfth part of the zodiac corresponds roughly with the moon's monthly motion; and both the numbers twenty-eight and twelve admit of being subdivided, whereas twenty-nine (a nearer approach than twenty-eight to the number of days in a lunation) and thirteen (almost as near

an approach as twelve to the number of months in a year) do not.

It seems to me highly probable that the date to which all inquiries into the origin of the constellations and the zodiacal signs seems to point—viz., 2170 B. C.—was the date at which the Chaldean astronomers definitely adopted the new system, the luni-solar instead of the lunar division of the zodiac and of time. One of the objects which the architects of the Great Pyramid (not the king who built it) may have had, was not improbably this—the erection of a building indicating the epoch when the new system was entered upon, and defining in its proportions, its interior passages, and other features, the fundamental elements of the new system. The great difficulty, an overwhelming difficulty it has always seemed to me, in accepting the belief that the year 2170 B. C. defined the beginning of exact astronomy, has been this—that several of the circumstances insisted upon as determining that date imply a considerable knowledge of astronomy. Thus astronomers must have made great progress in their science before they could select, as a date for counting from, the epoch when the slow reeling motion of the earth (the so-called precessional motion) brought the Pleiades centrally south at the time of the vernal equinox. The construction of the Great Pyramid, again, in all its astronomical features, implies considerable proficiency in astronomical observation. Thus the year 2170 B. C. may very well be regarded as defining the introduction of a new system of astronomy, but certainly not the beginning of astronomy itself. Of course, we may cut the knot of this difficulty, as Prof. Smythe and Abbé Moigno do, by saying that astronomy began 2170 B. C., the first astronomers being instructed supernaturally, so that the astronomical Minerva came full-grown into being. But I apprehend that argument against such a belief is as unnecessary as it would certainly be useless.

And now let us consider how this theory accords with the result to which we were led by the position of the great vacant space around the southern pole. So far as the date is concerned, we have already seen that the epoch 2170 B. C. accords excellently with the evidence of the vacant space. But this evidence, as I mentioned at the outset, establishes more than the date; it indicates the latitude of the place where the most ancient of Ptolemy's forty-eight constellations were first definitely adopted by astronomers. If we assume that at this place the southernmost constellations were just fully seen when due south,

we find for the latitude about 38° north. (The student of astronomy who may care to test my results may be reminded here that it is not enough to show that every star of a constellation would when due south be above the horizon of the place: what is wanted is, that the whole constellation when toward the south should be visible at a single view. However, the whole constellation may not have included all the stars now belonging to it.) The station of the astronomers who founded the new system can scarcely have been more than a degree or two north of this latitude. On the other side, we may go a little farther, for by so doing we only raise the constellations somewhat higher above the southern horizon, to which there is less objection than to a change thrusting part of the constellations below the horizon. Still, it may be doubted whether the place where the constellations were first formed was less than 32° or 33° north of the equator. The Great Pyramid, as we know, is about 30° north of the equator; but we also know that its architects traveled southward to find a suitable place for it. One of their objects may well have been to obtain a fuller view of the star-sphere south of their constellations. I think from 35° to 39° north would be about the most probable limits, and from 32° to 41° north the certain limits of the station of the first founders of solar zodiacal astronomy. What their actual station may have been is not so easily established. Some think the region lay between the sources of the Oxus (Amoor) and Indus; others think that the station of these astronomers was not very far from Mount Ararat—a view to which I was led long ago by other considerations, discussed in the first appendix to my treatise on "Saturn and its System."

At the epoch indicated, the first constellation of the zodiac was not, as now, the Fishes, nor, as when a fresh departure was made by Hipparchus, the Ram, but the Bull, a trace of which is found in Virgil's words,

"Candidus auratis aperit cum cornibus annum Taurus."

The Bull then was the spring sign, the Pleiades and ruddy Aldebaran joining their rays with the sun's at the time of the vernal equinox. The midsummer sign was the Lion (the bright Cor Leonis nearly marking the sun's highest place). The autumn sign was the Scorpion, the ruddy Antares and the stars clustering in the head of the Scorpion joining their rays with the sun's at the time of the autumnal equinox. And, lastly,

the winter sign was the Water-Bearer, the bright Fomalhaut conjoining his rays with the sun's at mid-winter. It is noteworthy that all these four constellations really present some resemblance to the objects after which they are named. The Scorpion is in the best drawing; but the Bull's head is well marked, and, as already mentioned, a leaping Lion can be recognized. The streams of stars from the urn of Aquarius and the urn itself are much better defined than the Urn-Bearer.

I have not left myself much space to speak of the finest of all the constellations, the glorious Orion—the giant in his might, as he was called of old. In this noble asterism the figure of a giant ascending a slope can be readily discerned when the constellation is due south. At the time to which I have referred the constellation Orion was considerably below the equator, and instead of standing nearly upright when due south high above the horizon, as now in our northern latitudes, he rose upright above the southeastern horizon. The resemblance to a giant figure must then have been more striking than it is at present (except in high northern latitudes, where Orion, when due south, is just fully above the horizon). The giant Orion has long been identified by nations with Nimrod; and those who recognize the antetypes of the Ark in Argo, of the old dragon in Draco, and of the first and second Adams in the kneeling Hercules defeated by the serpent, and the upright Ophiuchus triumphant over the serpent, may, if they so please, find in the giant Orion, the Two Dogs, the Hare, and the Bull (whom Orion is more directly dealing with) the representations

of Nimrod, “that mighty hunter before the Lord,” his hunting dogs, and the animals he hunted. Pegasus, formerly called the Horse, was regarded in very ancient times as the steed of Nimrod.

In modern astronomy the constellations no longer have the importance which once attached to them. They afford convenient means of naming the stars, though I think many observers would prefer the less attractive but more business-like methods adopted by Piazzzi and others, by which a star rejoices in no more striking title than Piazzzi XIIIh. 273, or Struve 2819. They still serve, however, to teach beginners the stars, and probably many years will pass before even exact astronomy dismisses them altogether to the limbo of discarded symbolisms. It is, indeed, somewhat singular that astronomers find it easier to introduce new absurdities among the constellations than to get rid of these old ones. The new and utterly absurd figures introduced by Bode still remain in many charts despite such inconvenient names as *Honores Frederici*, *Globum Aerostaticum*, and *Machina Pneumatica*; and I have very little doubt that a new constellation, if it only had a specially inconvenient title, would be willingly accepted. But, when Francis Baily tried to simplify the heavens by removing many of Bode's absurd constellations, he was abused by many as violently as though he had proposed the rejection of the Newtonian system. I myself tried a small measure of reform in the first three editions of my “Library Atlas,” but have found it desirable to return to the old nomenclature in the fourth.

—*Belgravia*.

THE TRIAL OF JESUS CHRIST.

By ALEXANDER TAYLOR INNES.

II.—THE ROMAN TRIAL.

THE trial of their Messiah by the Sanhedrim, had it stood alone, would have no doubt been the most interesting judicial transaction in history. The law of Moses, perpetuated though modified by Christianity, has perhaps been more influential than any other code of the world. Yet that law has had one rival, in the mighty jurisprudence of Rome. “The written reason of the Roman law has been silently or studiously

transfused” into all our modern life, and lawyers of every nation look back with filial reverence to the great juriconsults of the great age of the Imperial Republic. But between the two influences there is one important point of contrast. In the Hebrew commonwealth, law was the product of religion. It was received, as Christendom has been content to receive it, as a divine rule. There is no evidence whatever that the Jewish race was remarkable for an innate passion for justice, or for any such “tendency to righteous-

ness" as might have originally led it to religion. Their whole history and literature indicate, on the contrary, that it was the intense sense of the Divine which moulded the nation originally, and which afterward led to a wide-spread though imperfect cultivation of the *ars boni et aequi*. Even that Rabbinic cultivation, as we have seen, was marred by continual exaggerations and artifices which reveal the original inaptitude of the race for high judicial excellence. Accordingly, down to the time with which we are dealing, it remained a small, isolated Asiatic tribe, filled through and through with national and religious prejudices. It is not to such that men look for a model of the administration of equal laws. But there have been races in the world who reflected, as there are races who do reflect, in an eminent degree, that deep sense of righteousness which lies at the root of all law. And of all such races, ancient and modern, the greatest was that which at this time ruled over Palestine and over the world. When the sceptre departed from Judah, it passed into the strong, smiting hands of Rome; and already all the nations had begun to exchange their terror of its warlike might for that admiration of its administrative wisdom which has grown upon the world ever since. And already, too, that admiration was mingled with confidence and trust. Those Eastern races felt, what we two thousand years after can historically trace, that the better part of the unequalled authority of the Roman law was due to the stern, hard virtues of the early race and early republic. Its influence was dimly recognized then, and it is clearly traceable now, as having sprung from the instinct of righteousness which guided prætor and proconsul in every subject land, long before Ulpian or Gaius had written out that instinct into immortal law.

Pontius Pilate was at this time the representative of Rome in Judea; the governor, as he is called in the Gospels. But it will be found instructive to note more carefully what his exact position was. He was the *procurator Cæsaris*; the procurator, deputy, or attorney, of Tiberius in that province. And he was no *procurator fiscalis*,¹ with functions equivalent to those of quaestor. Pilate's was no such subordinate or financial office. He was a *procurator cum potestate*; a governor with civil, criminal, and military jurisdiction; subordinated no doubt in rank to the adjacent Governor of Syria, but directly responsible to his great master at Rome. And what

was the relation of the emperor himself to the inhabitants of Judea and to the world? The answer is important. The emperor was neither more nor less than the representative of Rome. In modern times men associate the imperial title with absolutism and a more than royal power. To Romans, even in the days of Tiberius, the name of a king was intolerable, and absolutism, except under republican forms, distasteful. Accordingly, when Augustus became the undisputed chief of the republic, and determined so to continue, he remained nominally a mere private nobleman or citizen. The saviour of society did not dare to attack the constitution of the state. He effected his object in another way. He gathered into his own hands the whole powers and functions, and accumulated upon his own head the whole honors and privileges, which the state had for centuries distributed among its great magistrates and representatives. He became perpetual *Princeps Senatûs*, or leader of the legislative house. He became perpetual *Pontifex Maximus*, or chief of the national religion. He became perpetual tribune, or guardian of the people, with his person thereby made sacred and inviolable. He became perpetual consul, or supreme magistrate over the whole Roman world, with the control of its revenues, the disposal of its armies, and the execution of its laws. And, lastly, he became perpetual imperator, or military chief, to whom every legionary throughout the world took the *sacramentum*, and whose sword swept the globe from Indus and Gibraltar to the pole. And yet in all he was a simple citizen—a mere magistrate of the republic. Only, in this one man was now visibly accumulated and concentrated all that for centuries had broadened and expanded under the magnificent abstraction of Rome. Tiberius, therefore, the first inheritor of this constitution of Cæsar Augustus, was in the strictest sense the representative of that great city that ruled over the kings of the earth. And the Roman knight who now governed in Judea was his representative in his public capacity. For Augustus, as is well known, had divided the provinces into two classes. To the more peaceful and central, he allowed the Senate to send proconsuls, while even over these he reserved his own consular and military power. But some provinces, like Judea, he retained in his own hands as their proconsul or governor. Strictly and constitutionally, the governor of the Jewish nation, at the time of which we write, was not Pilate at Cæsarea or Vitellius at Antioch, but Tiberius at Rome. He was the Proconsul or

¹ The name is still used in Scotland, having had there originally its old sense of "the deputy of a provincial judge appointed by him to look after money-matters."

Governor of Judea under the still-existing republic, a republic now almost identified with himself. And Pilate, whom the Jews popularly called their governor, was strictly the procurator of the great proconsul, holding civil and military authority by delegation from him in whom was now concentrated the boundless authority of Rome. Such was the tribunal before which the council of the Sanhedrim is now to lead a prisoner.

Pilate sat in his prætorium on the morning of that "preparation-day," to transact business and administer justice as usual. In what spot in Jerusalem his judgment-seat was on this occasion set up, cannot certainly be known. It may have been within the fortress and under the tower of Antonia, the visible symbol of Roman predominance which frowned beside the temple. Much more probably it was "Herod's prætorium," that magnificent palace to the north of the temple which Josephus describes, and which had been recently built by the Idumean kings. Their former palace was also still in existence, and the visit of the Roman procurator and the Tetrarch of Galilee to the same feast, while it raises the question which of them occupied the new and more splendid residence, suggests the inevitable rivalry and possible "enmity" of their relation. If we suppose that Pilate, like Florus, asserted his right to occupy the new palace, we may remember that its white marble semicircle enclosed an open *place* which looked out on the sacred city, and was almost as public as the space between Antonia and the temple. In the open space in front of this or any other prætorium the movable *Bema* or tribunal could at once be set up. But on this morning Pilate was still sitting in the judgment-hall. Outside was the roar of the Eastern city awakening on a passover dawn; within, the clash of Roman steel, the altars of the Roman gods, and perhaps the sculptured frown of the distant demi-god Tiberius. Into that heathen chamber the priests and doctors of the separated nation would not enter during their sacred week; and the Roman, with his Roman smile, willingly removed their difficulty by coming with his soldier-licitors to the gate. But his first words there, as his eyes fell upon the prisoner, who stood with his hands bound before him, were, "What accusation bring ye against this man?" We recognize instantly the spontaneous voice of Roman justice. It was no doubt meant to suggest his own authority and power of review, and in that respect we must presently consider it. But it was before every-

thing else the instinctive utterance of a judge, and it at once recalls that singularly noble dictum of Pilate's successor in the same seat, "It is not the manner of the Romans to deliver any man to die, until that he which is accused have the accusers face to face, and have license to answer for himself concerning the crime laid against him." So ever spoke the worst of the Roman governors—and neither Pilate nor Festus was among the best—out of the mere instinct and tradition of justice which clung to their great office among the treacherous tribes around. The chief priests and scribes on this occasion avoided the demand to know the accusation. "If he were not a malefactor, we would not have delivered him to thee." The insolent evasion of his question was not likely to propitiate Pilate, who instantly puts the matter on its true footing by the calm but somewhat contemptuous reply, "Take ye him, and judge him according to your law." Sullenly came the answer, "It is not lawful for us (it is not permissible—*οὐκ ἔστιν*) to put any man to death." The answer revealed (what the word "malefactor" had perhaps already implied, and what may have been involved in their bringing their prisoner to Pilate at all) that it was a capital charge which they had come to make. But it closed this important opening dialogue. The conversation just narrated is only found in the Gospel of John; and it is remarkable that a narrative apparently very much later than the others should record words which not only have the strongest internal evidence of truth, but to which subsequent investigation has given immensely increased historical value.

For at this point of the story comes in the question of conflict of *jurisdiction*. Why did the Jews go to Pilate at all? We have seen that their council condemned Jesus "to be guilty of death." Had they no right to pass such a sentence? or, having the right to pass it, had they merely no power to execute it? How far did the authority of the governor trench upon, or supersede, the authority of the Sanhedrim? Which of them had the *jus vite aut necis*? What was the relation of the two powers, the Jewish and the Roman, to each other at this time? This broad historical question lies at the root of the views which may be taken of the legal point—views which have sometimes been extremely contrasted. In the controversy between Salvador and Dupin, the former (true in this to the sad claim of some of his nation of old, "His blood be on us") urged that the Sanhedrim had full authority to try even for capital crimes, and that

their sentence of death required only the countersign or indorsement of the Roman governor. His opponent held that the Jewish court had no right to try for grave, or at least capital, crimes at all; that their whole procedure was a usurpation; and that the only real or competent trial was that which we are about to consider. I have no intention of going into the great mass of historical investigation which has been undertaken on this confessedly difficult point. There seems no one consideration which is quite conclusive upon it. Thus it would be rash to ascribe to the assertion of the Talmud, that "forty years before the destruction of the temple the judgment of capital causes was taken away from Israel," the praise of exact chronological accuracy. Yet it is very striking as showing the time about which the doctors of the Jewish law were willing to hold that their power of life and death (no doubt already restricted or suspended under the despotism of Herod) had finally passed away. But on the general subject of the relation of the two powers in that age, there are some considerations which reasoners on either side do not seem to have always kept in view: 1. There was no *concordat* on this subject between the Romans and the Jews. The latter were the conquered nation; their jurisdiction, including the power of life and death, was wrested from them *de facto*, and they were obliged to submit. But *de jure* they never did. To them, at least to the great mass of the nation, the Sanhedrim was still the national authority, especially in accusations relating to religious matters. 2. On the Roman side, the matter was of course precisely otherwise. Their view of the jurisdiction of subject races generally, and of the Jews in particular, was (I suspect) that it was just so much as they chose to leave them. In most cases that formed a very large field. The Roman governor sanctioned, or even himself administered, the old law of the region; but the policy of the ruling power was to concede to local self-government as much as possible. The concession was of course all the larger where there was no disposition on the part of the province to provoke a contest. In Roman law as in Roman campaigns, in questions of jurisdiction as in questions of politics, the maxim of the haughty and wise rulers of the world was *parcere subjectis et debellare superbos*. 3. It is evident that a large latitude was allowed on this subject to the great Roman officers—proconsuls or procurators—who administered *la haute justice*. The republic and the emperor permitted, and indeed demanded, that they should stretch or relax their author-

ity as the particular case or exigency required. In ordinary matters brought before their tribunals, the rule on which they acted is perfectly expressed, a few years after this, by Annaeus Gallio, the humane Proconsul of Achaia and brother of the philosopher Seneca: "If it were a matter of wrong or wicked lewdness, O ye Jews, reason would that I should bear with you; but if it be a question of words and names, and of your law, look ye to it; I will be no judge of such matters." But, while they drove such questions from the judgment-seat, so long as they did not affect the rights of the sovereign power, the least hint that one of these words or names or questions of another law could prejudice the supreme power of Rome was enough to authorize the governor to plunge his axe into the offending part of the body politic with prompt and savage severity.—These general considerations should never be forgotten in reading the scattered and often inconsistent historical notices on the subject. They show that the extreme views, which critics in our own time have maintained, were probably held even then by the opposing powers whose jurisdictions were in poise. But the balance of evidence is very strong that, at this time, all questions of life and death in Judea were by Roman law and practice reserved for the final decision of the Roman governor. In such cases the Jews had, at the most, only the *cognitio causæ*. Nor can there be much doubt that the governor's final power in these cases was not a merely ministerial right of indorsement and *executio*; it was also a power of *cognitio*, or review, in so far at least as he chose to exercise it. Whether this reservation to the governor was such as to deprive the Jewish courts of their rights as tribunals of first instance—whether any previous trial of a capital cause before the Sanhedrim was necessarily a usurpation—is another and a more difficult question. With regard to ordinary civil crimes—robberies or assassinations—the Jewish rulers may have been content not to interfere further than to bring the perpetrators to the Roman tribunal for judgment. The Roman governor, on the other hand, may have been quite willing to send to the cross without much inquiry any ordinary malefactors against whom the authorities of their country, having already inquired into the case, were willing to appear as accusers. But obviously a more serious question arose when the alleged crime was a religious one—a claim, as prophet or Messiah, to change the ecclesiastical institutions. In such a case the San-

hedrim itself no doubt maintained, as the Jews generally did on its behalf, an exclusive right to judge in the first instance; and its tendency would be very strong to deny any *re-cognitio* by the Roman power, and either not to call in that power at all, or to limit it to a mere right of countersign. What view the Roman governor might take, in the very unusual case of such a charge being brought to his tribunal, was another matter.

But in truth, while the dialogue-narrative of the fourth Gospel admirably illustrates the historical relations of the parties at the time, the narrative, in that Gospel and in the others, supersedes the necessity for referring to these more general relations. Whether it was legitimate or not for the Jews to condemn for a capital crime, on this occasion they did so. Whether it was legitimate or not for Pilate to try over again an accused whom they had condemned, on this occasion he did so. There were certainly two trials. And the dialogue already narrated expresses with the most admirable terseness the struggle which we should have expected between the effort of the Jews to get a mere countersign of their sentence and the determination of Pilate to assume his full judicial responsibility, whether of first instance or of review. The reluctance of the Jews on the present occasion was no doubt prompted not so much by their usual ecclesiastical independence as by their dread lest inquiry by Pilate should prevent his carrying out their scheme. But as matters actually turned out, the collision which the procurator's first words provoked had the effect of binding him publicly, before the men of both nations who surrounded his judgment-seat, to deal with this capital case in his judicial capacity. It was henceforth no mere matter of administration; no incident of summary police jurisdiction or military court-martial: it was a deliberate judgment of life and death by the supreme civil ruler who had interposed his jurisdiction between an accused man and the chief authorities of the subject nation.

The *accusation* demanded by Pilate necessarily followed, now that he had insisted on being judge in the cause. We have this given with considerable formality in the Gospel of Luke; and, though it is omitted in the three others, the first question of Pilate to Jesus, which they all record, implies a previous charge. Luke gives it thus: "We found this man perverting the nation, and forbidding to give tribute to Cæsar, saying that he himself is Christ a

king." Had the accusation retained the form in which it was brought before the Sanhedrim—had it been a merely religious or ecclesiastical crime which was now named—a different question would have arisen. Had the chief priests, when they "began to accuse" Jesus, said at once what they passionately exclaimed at a later stage of the cause, "We have a law, and by our law he ought to die, because he made himself the Son of God," it may be doubtful what Pilate would have done. He was authorized as governor to administer their law, or to preside over and control its administration; and while his leaning would be, like that of Gallio, to consider this question a matter of words, he might have been induced to see that these words covered grave consequences to the state. But such questions are superseded by the deliberate change in the form of the accusation—or, rather, the reverting to that accusation which had been originally intended, and for which the ecclesiastical procedure of the night before was a pretext or preliminary. If we accept the sentence of Luke as equivalent to the *nominis delatio* of the Roman law, or to the affidavit of the prosecutor-witness of the Hebrew law already considered—and it has resemblances to both—it throws a flood of light before as well as behind. The charge of "perverting" (*διαστρέφοντα*), including perhaps "revolutionizing" as well as "seducing" the nation, was fairly true, and was distinctly included in the Jewish procedure of the night before. No doubt to Roman ears it was ambiguous, but the ambiguity recalls that very real doubt which had governed his mind who said, "If we let him alone, all men will believe on him, and the Romans will come and take away our place and our nation." The culminating charge, that Jesus called himself "Christ a king," was also true, and had just been acknowledged to be true, though scarcely in the sense in which the accusers expected that the ears of the governor would receive it. But if we are to take Luke's narrative, we must believe that the charge was not left in this doubtful and ineffective form. The managers of the impeachment had no doubt not intended to make a deliberately untrue statement before the heathen judgment-seat. They wished, at as small an expense of falsehood as possible, to throw upon the foreign power the odium of a prophet's death. But the prompt utterances of Pilate seem to have forced them into the villainy they would rather have avoided, and, between the more ambiguous charges of seducing the nation and claiming a royal Messiahship, they add, by way of illustration, "forbidding to give

tribute to Cæsar." It was a sheer falsehood, and some of the accusers must have known it to be the converse of the fact as recently ascertained. But it was a suggestion which, as they must also have known, would give the most deadly significance to the other vaguer and truer heads of the indictment, and would make it impossible for the governor to waive the capital charge.

For there is no mistake as to what the crime here is imputed to. It is *majestas*—the greatest crime known in the Roman law, the greatest crime conceivable by the Roman imagination—an attack upon the sovereignty or supreme majesty of the Roman state.¹ In the early days of the republic the name *perduellio* was applied to treason and rebellion, and the citizen condemned by the people for that crime was interdicted from fire and water, or hanged upon an *arbor infelix*. As the rule of the city spread over the world, treason came to be known as an attack upon its majesty; and various laws were passed to define this crime and the treatment of it, the chief enactment being the *Lex Julia*. According to this law every accusation of treason against a Roman citizen must be made by a written libel. A Jewish provincial had, of course, no such protection. He stood before the procurator of the Cæsar, with no defense against the summary exercise of absolute power but the plea of justice.

We come now to the *defensæ*. All the narratives bear that Pilate put the same question to Jesus, in the same words, "Art thou the King of the Jews?" but that, on his answering in the affirmative, the Roman came to the paradoxical conclusion that there was "no fault in him." The fourth Gospel contains the explanatory conversation which these facts almost necessarily imply. The statement of Jesus is unusually impressive. It is couched, no doubt, in that involved, allusive, and aphoristic style of utterance which we find in this Gospel from end to end. But we must remember that all the biographies represent this very style as occasionally used by Jesus, and as characteristic of him in critical circumstances. It comes out in all the histories when he touches on the esoteric "mysteries of the kingdom" he preached, or where his own claims are brought in question; and it manifestly grew more and more his manner of utterance toward the close

of his career. We hold, therefore, that a statement which, though only recorded in the latest Gospel, must, according to all the others, have been substantially made, and which as reported is at once startlingly original and intensely characteristic, has every internal evidence of being historical. This dialogue took place in the prætorium, where Jesus may have possibly been detained while the question of jurisdiction was settled with his accusers. (It rather appears, however, that he must have been present while the accusation was made; the first two evangelists state that either then or at a later stage his silence extorted the marvel of the governor, who said, "Hearest thou not how many things they witness against thee?") He now, however, brings his prisoner within, and puts the sudden question, "Art thou the King of the Jews?" Jesus's answer, "Sayest thou this of thyself, or did others tell it thee of me?" does not seem to have been a request to know what had been uttered by the Jews in his absence. The words evidently have a deeper reference. They are equivalent to—"In what sense dost thou use the expression? If thou sayest it of thyself, in the sense in which a Roman would naturally use the word, then I am not the King of the Jews. But if others told thee this of me, if thou art using the words of Hebrew prophecy, or of the world's hope, that may need further explanation." Pilate strives to reply as a Roman should: "Am I a Jew? Thine own nation and the chief priests have delivered thee to me; what hast thou done?" It was throwing back, and not unfairly, the burden of explanation upon the accused; and he who had kept silence before the midnight Sanhedrim, and who made no answer even now to their dissimulated accusation, at once frankly responded to the heathen magistrate who desired himself to know the truth of the case: "My kingdom is not of this world: if my kingdom were of this world, then would my servants fight: . . . but now is my kingdom not from hence." In considering words so memorable we must avoid as much as possible the theological and ecclesiastical, and look only from the historical, and in particular the forensic and judicial, point of view. Whatever else these words import, they are in substance, and almost in form, a defense. If they imply a confession of kingship, they express an avoidance of the particular kind of kingship charged. They do not set up a plea in bar of the jurisdiction. They seem to acknowledge that a kingdom of this world would be a legitimate object of attack by the deputy of Cæsar, but

¹ "Crimen adversus populum Romanum vel adversus securitatem ejus."—Ulpian, "Digest," xlviii., 4, 1. The origin of the name is plain. Cicero defines *majestas* as "magnitudo populi Romani," and the full name of the crime is "crimen læsæ aut imminutæ majestatis." It is very adequately expressed by our word treason.

they deny that the kingship of Jesus could be so described. The most important commentary on the words is of course the recent and famous scene of the tribute-money, where Jesus being demanded as a Jewish patriot and prophet, "Is it lawful to give tribute to Cæsar, or no?" answered, "Show me a penny," and, having asked the significant question as to Cæsar's image and superscription engraved upon it, closed the discussion with the words, "Render therefore unto Cæsar the things that are Cæsar's, and unto God the things that are God's." The two incidents, in common with the whole of the history, make it certain that it was no part of his plan of kingdom, as it was no part of the plan of Christianity historically, to attack the Roman power. But this critical utterance to Pilate (like that former one) seems to go further. On the face of it, it indicates that there was no necessary collision between the kingdom which Jesus was prepared to assert as his own and that great "kingdom of this world" which his judge represented. An actual collision there too probably might be. But the words are meaningless unless they are taken as asserting separate spheres within which it was possible for each power to confine itself, and by confining themselves within which it was possible for them to escape collision. Only one of these kingdoms is described, and it is defined generally as "of this world," the definition being illustrated by the suggestion that in every such kingdom the monarch may suitably be defended by the armed force of his subjects. The other is as yet only defined by the negation of these characteristics. Pilate, as the result indicates, was already impressed by the statement, and perhaps convinced by it of the innocence of the accused of all conspiracy against Rome. And yet Jesus still spoke of a kingdom—a kingdom too in this world, though not of it;¹ and his words of renunciation were more royal than all the Roman had ever listened to of greatness. With true judicial tact, the governor lays his finger on the exact point which required to be brought from negative implication into express statement. "Art thou a king then?" he asked the prisoner whose kingdom was not of this world. And as before, to the adjuration of God's High-Priest, so now, to the representative of all the greatness of earth, the answer came back, making a crisis in the world's history, "Thou sayest it: I am a king." He who spoke so to a Roman governor knew that he was offering him-

self to the cross, and that the next few hours might close that fateful life. And the thought was in his mind when he deliberately added, "To this end was I born, and for this cause came I into the world, that I might bear witness unto the truth." Whatever else is included in words so great, this "witness to the truth" certainly embraces the testimony which a moment before had been given by the speaker himself—by him "who before Pontius Pilate witnessed the good confession"—to the existence of a kingdom, true and real, though not of this *cosmos*. But this supreme utterance struck a deeper note than even the assertion of a spiritual and separate kingdom. It proclaimed that which is the basis of all human veracity and virtue, but which in those later ages was becoming strange to Roman ears—the existence of an eternal world of truth outside of man—a universal divine system of things, high above all local or national tradition, and indeed above all human beliefs and desires. Over that objective truth men have no power: their highest privilege is to recognize and to confess it. And those do recognize it who have already a certain kinship and relation to that central truth—who are "of the truth." For the last words of him who now claimed to be both the witness and the king of that greater world were, "He that is of the truth heareth my voice."

Pilate answered, "What is truth?" The blank response, half sarcastic, half despairing, wholly skeptical, will claim notice at a later stage. In the mean time we follow the course of the judge,¹ who, thus waiving the personal question presented to him, goes on to deal with the accusation and the accused. The narratives all bear that Pilate reached and expressed the conclusion that the crime charged had not been proved—that indeed he found in the accused "no fault at all." And the last Gospel distinctly refers the first public utterance of this conviction to the exact point in the conversation and defense at which we have now arrived. It was the only defense which the accused is at any time stated to have offered;

¹ The apocryphal "Acts of Pilate," after giving this conversation with much accuracy, adds a few sentences which, while they rather vulgarize the previous utterances, indicate a special application of the words of Jesus which may have occurred to the mind of the governor as he passed from their higher suggestions to announce his judgment in the cause:

"Pilate saith unto him, What is truth? Jesus said, Truth is from heaven. Pilate said, Therefore truth is not on earth. Jesus said to Pilate, Believe that truth is on earth among those who, when they have the power of judgment, are governed by truth and form right judgment."

¹ "My kingdom is not of this world." The word used is *κόσμος*, not *αἰών*.

and Pilate now went straight out from the prætorium, and announced his verdict, perhaps from the judgment-seat. Yet was this utterance, as it turned out, only the first step in that downward course of weakness the world knows so well: a course which, beginning with indecision and complaisance, passed through all the phases of alternate bluster and subserviency; persuasion, evasion, protest, and compromise; superstitious dread, conscientious reluctance, cautious duplicity, and sheer moral cowardice at last; until this Roman remains photographed forever as the perfect feature of the unjust judge, deciding "against his better knowledge, not deceived." Upon some of the points in the evangelic narrative we need not dwell. The graphic incident of the judge catching at an allusion to Galilee, and, on ascertaining that the man was a Galilean, sending him to Herod, may be just noticed in passing. The word used is ἀπέπεμψεν (*remisit*), which seems the proper technical term for restoring an accused to his proper jurisdiction, as here in sending him from a *forum apprehensionis* to a *forum originis*. Herod's declinature was prudent as well as courteous, when we remember the terms of the accusation. A man, even a provincial, accused of *majestas*, "stood at Cæsar's judgment-seat, where he ought to be judged;" and the Idumean "fox" may have dreaded the lion's paw, while very willing to exchange courtesies with the lion's deputy. The second appearance at the tribunal of the governor shows a distinct accession of weakness on the part of the judge, and of pressure upon him by the accusers. His wife's¹ morning message troubles his conscience, but does not purify his heart. Pilate is now willing to "chastise him and let him go," i. e., to mangle an innocent man with the savage Roman scourge. The Jewish accusers refuse the compromise; and Pilate, characteristically, seems to have left them under the impression that he had finally sent him to the cross, while he still intended to make a postponed appeal to their compassion. But before taking his first step in actual guilt, the judge washes his hands with the memorably vain words, "I am innocent of the blood of this just person: see ye to it." After the scourging, the three evangelists record nothing but the insults of the fierce soldiery to one who was given up to them as a Jewish traitor to their emperor. But the later evangelist inter-

poses a series of incidents which are now as before noted with the finest characterization and the most delicate verisimilitude. He alone records the "Behold the man!" with which the struggling procurator, whose "faith unfaithful" still made him "falsely true," sought to move the multitude. He alone records the response, "We have a law, and by our law he ought to die, because he made himself the Son of God"—an utterance in exact accordance with that narrative of the Hebrew trial which is given by all the Synoptics, but which John has omitted. It is he who notices the unexpected but most natural effect of this claim upon the governor, whom the former utterances of the king "come into the world" had deeply impressed. "Whence art thou?" he almost tremulously demands. But from the first moment of his vacillation Jesus had given him no answer. Pilate, accordingly, at the very time when he is described as inwardly "more afraid," flashes out in that insolent tone which less discriminating secular historians regard as the only one characteristic of him: "Speakest thou not unto me? knowest thou not that I have power to crucify thee, and power to release thee?" Jesus breaks the silence by a final word of answer, which is of high importance for our subject: "Thou couldest have no power at all over me, unless it were given thee from above: therefore he that delivered me unto thee had the greater sin." Some writers who hold that Pilate alone had "jurisdiction" in this case, and that the proceedings of the Sanhedrim were a usurpation, have appealed to this text, as containing in its first clause an acknowledgment of the exclusive right of the Roman tribunal, and in its last a denunciation of the illegality, as well as treachery, of Caiaphas. This is unwarranted, and in the circumstances grotesque. Yet while we notice here first of all the extreme consideration and almost tenderness with which the sufferer judges his judge,¹ we must confess that the words, "Thy power (ἐξουσία) is given thee from above," do relate themselves to the previous acknowledgment of a "kingdom of this world," a *cosmos* in which men are to give to Cæsar the things that are Cæsar's; while they add to that former acknowledgment the explicit idea (afterward enforced by the apostles) that this earthly kingdom with its earthly aims is also from above. The powers that be are ordained of God; Pilate, who knew this not, was abusing a great and legitimate office partly through a heathen's ignorance; and in so far he was less guilty than the

¹ There is a curious historical question whether the wives of governors were at this time permitted to go down to the province with their husbands, which turns out in favor of Claudia Procula.

¹ "Judex judicantium."—*Gosius*.

false accusers who sat in Moses's seat. It was not strange that the words should have prompted one last effort on the judge's part to save himself from his weakness; but it was too late. The Jewish hierarchs had now taken the full measure of the man, and their final argument was one fitted to bear down in him all of conscience that remained. "If thou let this man go, thou art not Cæsar's friend: whosoever maketh himself a king speaketh against Cæsar." Few utterances are more valuable historically than this last general statement. To feel the full force of it we must recall how, as already explained, the Cæsar had gathered up in himself all the public offices of the republic, so that treason against the state and treason against him had become almost the same. The old Roman watchfulness to crush out attempts against Rome was now intensified by being absorbed into the jealous personal suspicion of a despot. It was no anti-climax when the shrewd Jewish politicians, instead of saying, "Whosoever maketh himself a king speaketh against the majesty of the state," preferred to say, "Whosoever maketh himself a king speaketh against Cæsar." Long before this period of the reign of Tiberius the latter had become the deadlier form of the crime. Some of the accusers must have remembered the early days of the dynasty, when Julius and Octavius perpetrated their own successful *lèse-majesté*, and the nation of the Jews, adhering to them in the great convulsion, merited the name which came afterward to be known as a title of honor, of "Cæsar's friends." And all of them must have been aware that while the first emperor had extended the law of treason to punish libels against his own person, Tiberius, still more watchful in his jealousy, used the *leges majestatis* continually against all who failed in respect to the majesty of Cæsar, even if they did not speak against him (*ἀντιλέγειν*) in the sense of favoring counter-claims by themselves or others. The great historian records how, even before the date when Pilate was sent to Judea, when the provinces appeared before Tiberius with complaints against their proconsuls, they took care to throw in along with the usual accusations of rapacity the added charge of treason—"Addito majestatis crimine, quod tum omnium accusationum complementum erat!"¹ To Pilate, as a personal dependent on the favor of the emperor (a favor seemingly originally procured through Sejanus, about this time hurled from power), all this must have been continually and urgently present, the more as he had

already earned the hatred of his province, and dreaded its revenge. His fears were not groundless. Tiberius was still upon the throne when, a few years later, Pilate was superseded, and ambassadors from Palestine, relying on the hereditary attachment of the nation to the imperial house, were sent to Rome to witness against the recalled and degraded governor. The shadow of that distant day paralyzed Pilate on this morning. What if he were to be accused before Cæsar of spoliation and bloodshed, and too well knowing himself to be guilty of those wrongs, should read also in the eyes of his gloomy master that other charge, the complement and the crown of every lesser crime? He who had so long persisted against all other arguments now succumbed at once before the well-chosen words: "If thou let this man go, thou art not Cæsar's friend: whosoever maketh himself a king speaketh against Cæsar." He ascended the tribunal, from which alone a final sentence could be legally pronounced by a Roman judge—in the present case, apparently, a portable seat carried out from the prætorium, and placed in front upon a *lithostrōton* or tessellated pavement. Yet even here he relieved his bitter feelings by the words to the accusers, "Shall I crucify your king?" But on the chief priests making the historical answer, "We have no king but Cæsar," the judge turned to him who had claimed another kingdom, and, in such words as "Hic ad crucem," delivered him to be crucified.

"Was Pilate right in crucifying Christ?" The question has recently been asked in a book of extraordinary ability, which opens with the most powerful attack in our language on what has been known in modern times as the right of "liberty of conscience." If you deny that right, argued John Stuart Mill and others, you must approve of Marcus Aurelius and the other persecutors of Christianity—nay, you must go further, and find "a principle which will justify Pontius Pilate." A keen critic has accepted the challenge; and his argument, while in the first instance it rather departs from the question of principle so raised, ultimately returns to it, and, I think, justifies the selection of so memorable an illustration. The discussion will be found to lead directly to the only legal question which remains for me to take up—the relation of the Roman state and the Roman law to the sentence of the Roman governor:

1. The suggestion, however, which is first made,¹ that Pilate may have "believed in good

¹ Tacitus, "Annales," iii., 29.

¹ "Was Pilate right in crucifying Christ? I reply,

faith that what he did was necessary for the preservation of the peace of Palestine," is purely gratuitous. Whether that would have justified him in condemning a man he believed to be innocent, we may touch upon hereafter. But, in the mean time, there is not the slightest ground for the suggestion itself. The narratives are uniform in asserting his expressed conviction of his prisoner's innocence, his knowledge that Jesus had been delivered "for envy," his scolding incredulity in speaking to the Jews of their king, and his final yielding, as a judge, to those *vane voces populi* against which his own law warned him, only when his personal and private interests were menaced. And the Christian narratives which have handed this down are, strange to say, in no respect hostile to Pilate. Jewish and other writers who expressly treat of the character of this governor give us his portrait as rapacious, cruel, and unjust. The Christian historians give no portrait, and have occasion to refer to him incidentally only where his actions are fitted to excite the keenest exasperation. Yet these few historical side-touches represent the man within the governor with a delicacy, and even tenderness, which make the accusing portrait of Philo and Josephus look like a hard, revengeful daub.¹ Is there, in the Tito or Balstrode of modern delineation, anything more true to Nature, more provocative of sudden sympathy from men who know the pressure of public life, than that morning's mental history of the sixth Procurator of Judea, as given by the friends of the man whom he crucified? The motives for Pilate's vacillation are only too intelligible. But that at any point of it he believed his sentence was called for to preserve the peace of the province is an unhistorical suggestion.

2. Had the history run at all in that direction, there are various situations which might be fig-

Pilate's paramount duty was to preserve the peace in Palestine, to form the best judgment he could as to the means required for that purpose, and to act upon it when it was formed. Therefore, if and in so far as he believed in good faith and on reasonable grounds that what he did was necessary for the preservation of the peace of Palestine, he was right."—"Liberty, Equality, Fraternity," by J. FITZJAMES STEPHEN, Q. C., p. 87.

¹ My view of his true character scarcely varies from that so tersely given by Dr. Ellicott: "A thorough and complete type of the later-Roman man of the world: stern, but not relentless—shrewd and world-worn, prompt and practical, haughtily just, and yet, as the early writers correctly perceived, self-seeking and cowardly; able to perceive what was right, but without moral strength to follow it out."—"Historical Lectures," sixth edition, p. 350. Compare with Philo, in his letter on "Ambassadors."

ured. That a judge, even if he were not a military governor with *merum imperium* delegated from Rome, should slay a man who was overtly and in intent seditious, raises no question. Neither Mr. Mill, nor any other advocate of liberty, questions the duty of government to preserve the peace. That a governor, sitting or not sitting as a judge, should deliver to death a man whom he believed to have no intentions against the peace, because he was in point of fact dangerous to it, might raise a serious question.¹ In particular,

¹ "If this should appear harsh [the assertion that Pilate's duty was simply to maintain the Roman power], I would appeal again to Indian experience. Suppose that some great religious reformer—say, for instance, some one claiming to be the Gurn of the Sikhs, or the Imam in whose advent many Mohammedans devoutly believe—were to make his appearance in the Punjab or the Northwest Provinces. Suppose that there was good reason to believe—and nothing is more probable—that, *whatever might be the preacher's own personal intentions*, his preaching was calculated to disturb the public peace and produce mutiny and rebellion; and suppose, further (though the supposition is one which it is hardly possible to make even in imagination), that a British officer, instead of doing whatever might be necessary, or executing whatever orders he might receive, for the maintenance of British authority, were to consider whether he ought not to become a disciple of the Gurn or Imam: what course would be taken toward him? He would be instantly dismissed with ignominy from the service which he would disgrace; and, if he acted up to his convictions, and preferred his religion to his queen and country, he would be hanged as a rebel and a traitor."—"Liberty, Equality, Fraternity," p. 94.

Of course, the true parallel would rather be: Suppose that the Gurn or Imam were delivered to a British officer by his coreligionists on a charge of erecting a national system against the English raj, and refusing to pay an English tax; that the officer, on personal examination, came to be satisfied that the man was innocent and the charge was false; that, to pacify the other priests, he proposed an intermediate punishment of one in whom he found no fault; that, under great pressure brought against him to act contrary to his view, he vacillated half a day; and that, at last, on being threatened with a complaint to his official superiors, which might endanger his place or promotion, he ordered his prisoner to torture or to death. Suppose all this, and suppose that the story came out fully on his arrival in London, in how many drawing-rooms would he be received?

But take it even that the case were not so bad. Assume that a British officer thought himself compelled to order for execution a native preacher whose "personal intentions" were not in the least hostile or seditious, because his preaching might in point of fact be, or had in point of fact been, dangerous to the English power, and because the example would have a good effect. This is about the best case made for Pilate. If done judiciously, it would be a judicial murder. If done administratively, what ought it to be called? I believe there are few circles which would

it raises the distinction between the judicial and the administrative. What Pilate, as administrator of the province, might do in the way of deporting or even killing an innocent man for the sake of its peace, is one question. What he might do sitting as a judge and inquiring whether there was "fault in this man touching those things whereof ye accuse him," is another matter; and it is the one with which we have to deal. The distinction, kept sacred in all jurisprudences, is beginning to be confused in the minds of English lawyers by the powerful but provincial theory of utility which they are taught, but the spread of which from the professor's chair to the judgment-seat will, I think, be prevented by both the scientific traditions of Europe and the moral sense of mankind. In saying so, I do not forget the story of the English judge who told a prisoner, "I sentence you to die, not at all because you have robbed this house, but in order that other people may not rob other houses in future." That judge, if he existed and pronounced such a sentence, simply committed murder. But it was Caiaphas, not Pilate, who thought it *expedient* that one man should die for the people. And neither the one nor the other grounded the expediency on any immediately apprehended outbreak or on any danger to the peace. There was, indeed, no such immediate danger. How far there might be ultimate danger to the Roman state from the spread of convictions and the acceptance of claims like those of Jesus, was another matter, and it was the really important one. The true question, as the critic of the "Liberty, Equality, and Fraternity" watchword soon discerns, is between the universal supremacy of a government whose functions extended to something much higher than keeping the peace on the one hand, and the claims of a kingdom not of this world on the other.

3. Accordingly, the final defense made for the Roman governor—the only one which can be of any weight in consistency with the history, and the only one also which bears on the great question of liberty of conscience or repression of opinion—is contained in the following passage of very general theory, illustrated in the quotation in my note on the previous page:

hold that mere hesitation by a British officer to do such an act would infer ignominy or disgrace to the service. As to the further step of becoming personally a disciple of a "higher form of morals" than any previously known (the immediate peace of the region being first cared for), there does not seem any other difficulty than what is dealt with in the text, in next column.

"Pilate's duty was to maintain peace and order in Judea, and to maintain the Roman power. It is surely impossible to contend seriously that it was his duty, or that it could be the duty of any one in his position, to recognize in the person brought to his judgment-seat, I do not say God incarnate, but the teacher and preacher of a higher form of morals and a more enduring form of social order than that of which he was himself the representative. To a man in Pilate's position, the morals and the social order which he represents are for all practical purposes absolute standards."—P. 93.

Whether this was the theory of Roman law, we may afterward see. But it is here presented as the universal and true theory, against which it is difficult to contend seriously. It may be so. This at all events is not the place to deal directly with it, further than by recording a fundamental dissent and implacable opposition.¹ But it is exactly the place to point out that this was the theory which the defense of the accused seems directed to meet. The doctrine of the powerful book from which we quote is that "skeptical arguments in favor of moderation about religion are the only conclusive ones." To suggest such arguments to the governor, or at least to leave his mind to the skeptical poise of the average educated Roman of the day, might have seemed the prudent part in a prophet accused of treason. His words take very much the opposite course. The assertion of a kingdom—a higher and ruling "form of morals and social order"—set up in the earth, but in a different plane and cosmos from the secular power of Rome, might of itself have implied the assertion of a duty to recognize that kingdom. But when its assertion was backed by an immediate appeal to the truth, as that which men are born into the world to confess, the defense plainly resolved into a claim that this truth, and not any social order or traditional belief, should be the "final and absolute standard." And the last words addressed to Pilate clinch "the duty of any one in his position to recognize the teacher" of that higher order and extramundane truth; for "every one that is of the truth heareth my voice." Besides, even if we should prefer to disbelieve this conversation, we cannot escape from the fact that this was precise-

¹ It is the same theory, *mutatis mutandis*, with Ultramontaniam, and that not merely because in both the individual conscience is crushed under authority. "It appears to me," says the author, "that the Ultramontane view of the relation between church and state is the true one" (p. 109), because, as is explained, Ultramontanians correctly hold that of the two powers one must be supreme and the other must obey, and that there is no real distinction of a spiritual and a secular province in human life.

ly the attitude taken up historically by Christianity. It did not claim merely to be one higher form of morals or religion among others. It claimed to be the true religion—in the sense of being both universal and obligatory. And the empire, which would have been content to ignore it while it presented itself as simply a higher form of morals or even of social order, could not ignore it when it appeared as the universal and obligatory form. When it claimed to be the truth, Rome first answered, "What is truth?" and when it insisted on the right of truth to be obeyed, Rome answered again with persecution. And Christianity responded by the constant reiteration of the duty of every member of the state, whether an official or not, to recognize this truth, to bear witness to it, and, if need be, to die for it. Hence the immense interest which has always attached to Pilate's answering inquiry. It was the utterance of one who was neither a philosopher nor a statesman, but simply a typical Roman gentleman, in a position where he represented his state. And precisely because it was so, the question, "What is truth?" lays bare the hinge upon which the mighty Roman world was then smoothly revolving into the abyss. The republic, we must never forget, had already ceased to believe in its own morals and social order. The fact is certain, but the pathos of it has too seldom been acknowledged. Again and again in the past we have mused and mourned over Greece, and its search of truth intellectual—its keen and fruitless search, never ending, ever beginning, across wastes of doubt and seas of speculation, lighted by uncertain stars. But to-day let us for once remember that greater race, the greatest this earth has known; called and trained through long centuries to the work of governing a world, and, when at last that mighty inheritance came into its hands, stricken with inward paralysis for want of a motive and a hope. Too well has our own poet drawn the picture:

"In his cool hall, with haggard eyes,
The Roman noble lay;
He drove abroad, in furious guise,
Along the Appian Way;

"He made a feast, drank fierce and fast,
And crowned his hair with flowers;
No easier and no quicker passed
The impracticable hours."

And so there crept upon men that moral languor and satiety of life which underlay the whole time of the empire, hardening often into cruel apathy or reckless despair. But have we always reflected

how certainly this cynical moral mood of the dominant race was the result of the new circumstances into which it was thrown? In early days the Roman believed in himself, in his gods, in his institutions, and, above all, in his state. It was for him *theatrum satis magnum*—his standard, his rule, his righteousness. And so he was righteous, in his stern, relentless way. But now the world had grown wider. And what had sufficed for virtue in former times did not suffice for virtue now. A provincial belief, a national religion, was too narrow for a world: it necessarily collapsed, and left the lords of earth, with strong hands and empty hearts, skeptical as to truth, and so lapsing from righteousness.

That this had become largely the result, even in the reign of Tiberius, is admitted. And it was plainly a position of matters very unfortunate for the application of the general rule suggested. That Pilate or Pliny, or any Roman official, should have to refuse a higher order of morals which his conscience approved, simply because his state believed in a lower, was hard enough. But that such an official should have to refuse that higher morality or religion, after both he and his state had ceased to believe in the lower, was harder still. And that in such circumstances a judge should have to use systematic persecution against the confessedly higher convictions, simply to prevent their making head against a legal standard of faith which he and all men had begun to disbelieve, was the most unfortunate thing of all. There is probably nothing which so excites the loathing of mankind as when the state persecutes for a faith which it is already beginning to lose. And yet, obviously, that is precisely the time when it is most likely to happen, and on the theory with which we are dealing it is what ought to happen. That theory we are not to discuss, but in answering the question by which its author so courageously illustrates it, "Was Pilate right in crucifying Christ?" we must for a moment shred away all circumstances of aggravation. Suppose that Pilate and the Romans of his time still believed in the old religion of the little Tiber city, that Jesus had been a native subject of that city, and that the law of the city demanded persecution of all religious convictions hostile to its old faith. What, in such circumstances, was the "duty of a man in Pilate's position?" I answer that his duty was (having first cared for the immediate peace of his district) to refuse to obey the law, and to resign his position rather than outrage a principle of conscience, which lies deeper than all social superstructures

of either the church or the state. There are laws which are invalid because they strike against the basis of all law. But this brings us to the final question, What was the law of Rome in the matter of the trial of Jesus Christ?

My space warns me to give a general answer to this question, and to avoid references to sources. It is well known that the policy of Rome as a conquering power toward the religions of subject states was one of toleration. But that meant little more than toleration of existing religions in their local seats. Because the worship of Serapis or Isis was tolerated on the Nile, as a monotheistic worship was in Judea, it by no means followed that either of them became a *religio licita* on the banks of the Tiber. Even if such a religion was tolerated on the Tiber, exclusive devotion to it was tolerated only in natives of the country from which it came, and was at no time permitted to Roman citizens. For them all over the world the old religion was imperative; and for the world the religion of the Tiber, though not imperative, was dominant. The concessions made to the provinces for their religions were strictly concessions, not concorlats. Accordingly, the concession was generally limited by the idea, *Cujus regio, ejus religio*. Outside the region or province where the local cult ruled, it was denied the rights of publicity and of proselytism, and was restricted to a passive and a private existence. These general considerations explain some of the variations in the Roman treatment of the Jewish and Christian faiths. The old Jewish religion had the paradoxical quality of being national or local on the one hand, while on the other it claimed to be exclusive truth. The union of the two qualities went far to explain that hostility to the human race which the Romans were fond of ascribing to it. A faith which attacked that of all other men, without inviting them to share in it, invited this misconception. But its very want of aggressiveness saved it from collisions. When Christianity appeared, a different problem had to be dealt with. Here was a faith which not only claimed to be the absolute truth, but which refused to be confined within local limits. It was essentially proselytizing, and therefore essentially public; and it demanded universal individual acceptance—acceptance by the Roman as by the Greek and the Jew. What was the result? "The substance of what the Romans did was to treat Christianity by fits and starts as a crime."¹

That occasional persecution was not founded upon any specialties in the nature of Christianity, or excited by any great dislike to it as a form of worship or belief. It was persecuted generally as a form of atheism, or of opposition to the established and tolerated institutions. And the opposition to it on this ground was set in motion and regulated by some of the greatest and wisest, and even, in a sense, most tolerant emperors. Trajan and the Antonines were wise and large-hearted monarchs. There was little in Christianity to repel, and there was much in it to attract, such men. They were not bigots, and those around them were generally skeptics. They did not believe in absolute or universal truth in matters of religion, and they did believe in the sovereignty and supremacy of the Roman state. The consequence was, that while they protected in Egypt, and Palestine and Italy, all *religiones licite* which would live in peace with each other and claim no universal dominion, they bent the whole force of the state against the one religion which said, "For this cause are men born, that they should bear witness unto the truth," and "Every one that is of the truth heareth His voice." There is no way of explaining the history except by acknowledging that the constitutional law of Rome reserved to the state the right on the one hand to approve the license, or on the other to repress and forbid, the expression of new religious convictions, the public existence of a new faith. And this prerogative was held to form part of the *majestas* or supremacy of the state.

It was so in the days of Tiberius as truly as in the *Terror juridique* of Domitian. Pilate, as his deputy, seems to have been convinced that the claim of Jesus to be "Christ a king" was not a claim to temporal sovereignty. He accepted in some sense his own assurance that it was a kingdom not of this world. Yet this meant, at the least, that his kingdom was a religion, which he was about to found. It meant more. A religion which takes the form of a kingdom, with a king and his non-combatant servants, however little of "of this cosmos" it may be, must be not only religion but a church. A universal religion, starting with individual faith, but adding immediately an obligation to confess that faith and to proselytize, is already (according to the Protestant definition) a church. The defense of Jesus gave at least as much prominence to this as his disciples did during the early ages; and it gave additional seriousness to the charge of reason. A great student of history of our time has perhaps gone too far in holding that the Roman

¹ "Liberty, Equality, Fraternity," p. 90.

laws against unlicensed association or combination were the unhappy root of all the persecutions,¹ too far even in holding that they were the instrument by which all these persecutions were carried on. These laws were the branches rather than the root, but they were in living union with it. There can be no doubt that the laws regulating *collegia*, and repressing all unlicensed associations, had from the beginning a close connection with the *majestas* of the state, and especially with its right to institute and enforce religion.² The two things worked together, and they did so in theory and practice. A claim of Jesus merely to found a universal religion might, no doubt, in practice, have come into collision with the laws of Rome. But his claim to found it as a kingdom, though not of this world—"une association dans l'état en dehors de l'état," as it is happily expressed—seems to me to have been essentially inconsistent with the public principle of that law. Christianity, in short, was incompatible with the Roman public law, and that not merely because its contents were different from those of the old religion of Rome, but because its claim to universal individual acceptance and public confession conflicted with the unlimited and unbalanced sovereignty of the Roman state. And on these very points that law came into conflict with the Author of Christianity. It does not, perhaps, follow that Pilate, as its administrator—supposing him to have apprehended the existence of this religious conflict, as he apprehended the non-existence of any civil conspiracy—was bound

to condemn Jesus. As Trajan explains in his famous letter to the Governor of Bithynia, it was the duty of the higher magistrate to use his own discretion in dealing with those who had transgressed the law on religion. Pilate seems, indeed, to have believed Jesus to be both just and harmless; and, so believing, he sinned in swaying from his first judgment, and betrayed the innocent blood. But when he ultimately sent him to the cross it was as claiming to be a king, and on the original charge of acting *adversus majestatem populi Romani*. And in point of fact, whatever his judge may have thought, the claim of Christ was truly inconsistent with the claim of the state which Pilate represented; and the world must judge between the two.

In considering the most famous of all trials from a merely legal and, indeed, formal point of view, we have come to some conclusions. We have found that it was a double trial, and that both parts of it were conducted with a certain regard to the forms of the two most famous jurisprudences of the world. In both the judges were unjust, and the trial was unfair; yet in both the right issue was substantially raised. And in both that issue was the same. Jesus Christ was truly condemned on a double charge of treason. He died because in the ecclesiastical council he claimed to be the Son of God and the Messiah of Israel, and because before the world-wide tribunal he claimed to be Christ a king.—*Contemporary Review*.

COSMIC EMOTION.

By W. KINGDON CLIFFORD.

BY a *cosmic emotion*—the phrase is Mr. Henry Sidgwick's—I mean an emotion which is felt in regard to the universe or sum of things,

¹ "La seule chose à laquelle l'empire Romain ait déclaré la guerre, en fait de religion, c'est la théocratie. Son principe était celui de l'état laïque; il n'admettait pas qu'une religion eût des conséquences civiles ou politiques à aucun degré; il n'admettait surtout aucune association dans l'état en dehors de l'état. Ce dernier point est essentiel; il est, à vrai dire, la racine de toutes les persécutions. La loi sur les confréries, bien plus que l'intolérance religieuse, fut la cause fatale des violences qui deshonorèrent les règnes des meilleurs souverains."—Renan's "Les Apôtres," p. 251.

² "La prétexte de religion ou d'accomplissement de vœux en commun est prévu et formellement indiqué parmi les circonstances qui donnent à une réunion le caractère de délit; et ce délit n'était autre que celui de lèse-majesté, au moins pour l'individu qui avait provoqué la réunion."—P. 362.

viewed as a cosmos or order. There are two kinds of cosmic emotion—one having reference to the Macrocosm or universe surrounding and containing us, the other relating to the Microcosm or universe of our own souls. When we try to put together the most general conceptions that we can form about the great aggregate of events that are always going on, to strike a sort of balance among the feelings which these events produce in us, and to add to these the feeling of vastness associated with an attempt to represent the whole of existence, then we experience a cosmic emotion of the first kind. It may have the character of awe, veneration, resignation, submission; or it may be an overpowering stimulus to action, like the effect of the surrounding orchestra upon a musician who is thereby caught

up and driven to play his proper part with force and exactness of time and tune. If, on the other hand, we consider the totality of our own actions and of the feelings that go with them or spring out of them, if we frame the highest possible generalization to express the character of those which we call good, and if we contemplate this with the feeling of vastness which belongs to that which concerns all things that all men do, we shall experience a cosmic emotion of the second kind. Such an emotion finds voice in Wordsworth's "Ode to Duty:"

"Stern daughter of the voice of God!

O Duty, if that name thou love,

Who art a light to guide, a rod

To check the erring, and reprove;

Thou who art victory and law

When empty terrors overawe;

From vain temptations dost set free

And calm'st the weary strife of frail humanity!"

A special form of each of these kinds of cosmic emotion has been expressed in a sentence by Immanuel Kant, which has been perfectly translated by Lord Houghton:

"Two things I contemplate with ceaseless awe:

The stars of heaven, and man's sense of law."

For the star-full sky on a clear night is the most direct presentation of the sum of things that we can find, and from the nature of the circumstances is fitted to produce a cosmic emotion of the first kind. And the moral faculty of man was thought of by Kant as possessing universality in a peculiar sense; for the form of all right maxims, according to him, is that they are fit for universal law, applicable to all intelligent beings whatever. This mode of viewing the faculty is clearly well adapted for producing cosmic emotion of the second kind.

The character of the emotion with which men contemplate the world, the temper in which they stand in the presence of the immensities and the eternities, must depend first of all on what they think the world is. The theory of the universe, the view of things, prevalent at any time and place, will rouse appropriate feelings in those who contemplate it; not the same in all, for temperament varies with the individual, and the same facts stir differently different souls, yet so that, on the whole, the character of cosmic emotion depends on the nature of cosmic ideas.

When, therefore, the inevitable progress of knowledge has changed the prevalent cosmic ideas, so that the world as we know it is not the world which our fathers knew, the old cosmic emotions are no longer found to fit. Knowledge

must have been in men's possession for a long time before it has acquired the certainty, the precision, the familiarity, the wide diffusion and comprehension which make it fit to rouse feelings strong enough and general enough for true poetic expression. For the true poetry is that which expresses *our* feelings, and not *my* feelings only—that which appeals to the universal in the heart of each one of us. So it comes about that the world of the poet, the world in its emotional aspect, always lags a little behind the world of science, not merely as it appears to the few who are able to assist at the birth of its conceptions, but even as it is roughly and in broad strokes revealed to the many. We always know a little more than our imaginations have thoroughly pictured. To some minds there is hope and renewing of youth in the sense that the last word is not yet spoken, that greater mysteries yet lie behind the veil. The prophet himself may say with gladness, "He that cometh after me shall be preferred before me." But others see in the clearer and wider vision that approaches them the end of all beauty and joy in the earth; because their old feelings are not suited to the new learning, they think that learning can stir no feelings at all. Even the great poet already quoted, whom no science will put out of date, complained of the prosaic effects of explanation, and said, "We murder to dissect."

I propose to consider and compare an ancient and a modern system of cosmic ideas, and to show how the emotions suited to the latter have already in part received poetic expression.

In the early part of the fifth century of our era, the Neoplatonic philosopher Hierokles was teaching at Alexandria. He was an Alexandrian by birth, and had studied with Proklos, or a little before him, under Plutarch at Athens. He was a man of great eloquence, and of better Greek than most of his contemporaries. He astonished his hearers everywhere, says Suidas, by the calm, the magnificence, the width of his superlative intellect, and by the sweetness of his speech, full of the most beautiful words and things. A man of manly spirit and courage; for being once at Byzantium he came into collision with the ecclesiastical authorities (*ταῖς κρατοῦσι*) and was scourged in court; then, streaming with blood, he caught some of it in his hand and threw it at the magistrate, with this verse of the *Odyssey*: "*Here, Cyclops, drink wine, since you eat human flesh!*" For which contempt of court he was banished, but subsequently made his way back to Alexandria. Here he lectured on various topics, fore-

knowledge, will, and fate, expounding also some of the dialogues of Plato and other philosophical writings.

But the matter of one course of lectures is preserved to us. It is a commentary on a document in hexameter verse belonging to the Pythagorean scriptures, dating apparently from the third century B. C. These lines were called by Jamblichus the "Golden Verses;" but Gregory of Nazianzum did them the honor to say they were rather made of *lead*. They are not elegant as poetry; the form of verse seems to have been adopted as an aid to the memory. More than half of them consist of a sort of versified "duty to God and my neighbor," except that it is not designed by the rich to be obeyed by the poor, that it lays stress on the laws of health, and that it is just such sensible counsel for the good and right conduct of life as an English gentleman might nowadays give to his son. We need not be astonished that the step from the Mediterranean to Great Britain, over two thousand years of time, should make no great difference in the validity of maxims like these. We might go back four thousand years farther, and find the same precepts handed down at Memphis as the wisdom of a hoar antiquity. "There's some things as I've never felt i' the dark about," says Mrs. Winthrop, "and they're mostly what comes i' the day's work."

There are curious indications that the point of view of the commentator is not that of the verses themselves. "Before all things honor the immortal gods, as they are ordained by law," begin the verses, with the frank Erastianism of the Greeks, who held that every man should worship the gods in the manner belonging to his city and country; that matter being settled for themselves by the oracle of the Delphian Apollo. But this did not suit the Neoplatonist of the fifth century, whom the "law" of his country required to worship images of Mary and her son (to be sure, they might be adapted figures of Isis and Horus) and the miraculous toe-nails of some filthy and ignorant monk. The law named in the verses could not be that which had scourged and banished a philosopher; so it is explained to mean the demiurgic law, which assigns to the gods their several orders, the law of the divine nature. We are to honor the immortal gods, says the commentator, in the order which is assigned to them by the law of their being. For Hierokles there is one supreme deity and three orders of angels—the immortal gods, the illustrious heroes, and the terrestrial demons or partially deified souls of men.

The bishops, as we all know, multiplied these numbers by three.

As to the kind of worship, our commentator quotes some old Pythagorean maxims: "*You shall honor the god best, by becoming godlike in your thoughts. Whoso giveth God honor as to one that needeth it, that man in his folly hath made himself greater than God. The wise man only is a priest, is a lover of God, is skilled to pray.*" "For," he says, "that man only knows how to worship who does not confound the relative dignity of worshipful things, who begins by offering himself as the victim, fashions his own soul into a divine image, and furnishes his mind as a temple for the reception of the divine light." "The whole force of worship," he says in another place, "lies in knowledge of the nature of that which is worshipped."

[It is interesting to compare this last maxim with the proposition of Spinoza:¹ "He who clearly and distinctly understands himself and what affects him, loves God, and that the more, the more he understands himself and what affects him." For to understand clearly and distinctly is to contemplate in relation to God, to the cosmic idea. When the mind contemplates itself in relation to God, it necessarily rises from a lower to a higher grade of perfection. Now *joy* is the passage from a lower to a higher grade of perfection, and *love* is joy associated with the idea of an external cause. He, then, that rises to higher perfection in the presence of the idea of God, loves God.]

But it is in the latter portion of the "Golden Verses" that we find a general view of life and of Nature assigned as the ground of the precepts which have gone before. There are in all seventy-one lines; of the last thirty-two I venture to subjoin a translation as nearly literal as is consistent with intelligibility:²

"Let not soft sleep come upon thine eyelids, till thou hast pondered thy deeds of the day:

"Wherein have I sinned? What work have I done? What left undone that I was bound to do?

"Beginning at the first, go through even unto the last; and then let thy heart suite thee for the evil deed, but rejoice in the good work.

"Work at these commandments, and think upon them; these commandments shalt thou love.

¹ "Qui se suosque affectus clare et distincte intelligit, Deum amat, et eo magis, quo se suosque affectus magis intelligit."—*Eth.* v., prop. xv. Cf. *Affectuum definitiones ad fin. part. iii.*

² The text followed is that of Mullach, in the "*Fragmenta Philosophorum Græcorum*," Paris, 1860, from the prolegomena to which my information is derived.

"They shall surely set thee in the way of divine righteousness; yea, by him who gave into our soul the Tetrads, well-spring of Nature everlasting.

"Set to thy work with a will, beseeching the gods for the end thereof.

"And when thou hast mastered these commandments, thou shalt know the being of the gods that die not, and of men that die; thou shalt know of things, wherein they are diverse, and the kinship that binds them in one.

"Know, so far as is permitted thee, that Nature in all things is like unto herself,

"That thou mayst not hope that of which there is no hope, nor be ignorant of that which may be.

"Know thou also that the woes of men are the work of their own hands.

"Miserable are they, because they see not and hear not the good that is very nigh them; and the way of escape from evil, few there be that understand it.

"Like rollers they roll to and fro, having endless trouble; so hath Fate broken the wits¹ of mortal man.

"A baneful strife lurketh inborn in us, and goeth on the way with us to hurt us; this let not a man stir up, but avoid and flee.

"Verily, Father Zeus, thou wouldst free all men from much evil, if thou wouldst teach all men what manner of spirit they are of.

"But do thou be of good cheer; for they are gods' kindred whom holy Nature leadeth onward, and in due order showeth them all things.

"And if thou hast any part with them, and keepest these commandments, thou shalt utterly heal thy soul, and save it from travail.

"Keep from the meats aforesaid, using judgment both in cleansing and in setting free thy soul.

"Give heed to every matter, and set Reason on high, who best holdeth the reins of guidance.

"Then, when thou leavest the body, and comest into the free ether, thou shalt be a god undying, everlasting, neither shall death have any more dominion over thee."

It is worth while to notice the comment of Hierokles on the self-judgment enjoined in the first of these lines:

"The judge herem appointed," he says, "is the most just of all, and the one which is most at home with us; namely, conscience itself, and right reason. And each man is to be judged by himself, before whom our bringing-up has taught us to be more shamefast than before any other. (As a previous verse commands; of all men be most shamefast before thyself: πάντων δὲ μάλιστα αἰσχύνεο σαυτὸν.) For what is there of which one man can so admonish another, as he can himself? For the free will, misusing the liberty of its nature, turns away from the counsels of others, when it does not

wish to be led by them; but a man's own reason must needs obey itself."

Whether the clear statement of this doctrine of the conscience, *dominans ille deus in nobis*, as Cicero calls it, is originally Stoic or Pythagorean, must be left for the learned to decide. Hierokles, however, says expressly that the image of Reason guiding the lower faculties as the charioteer guides his chariot was derived by Plato from the Pythagoreans.

Very remarkable indeed is the view of Nature set forth in the subsequent verses. "Know, so far as is permitted thee, that Nature is in all things uniform" (*φύσιν περὶ παντός ὁμοίην*). This conception of the world as a great cosmos or order is the primary condition of human progress. In the earliest steps of primitive men in the simplest arts of life there is involved a dim recognition and practical use of it to the extent of its application in that stage. Every step forward is an increase in the range of its application. In the industrial arts, in the rules of health, the methods of healing, the preparation of food, in morals and politics, every advance is an application of past experience to new circumstances, in accordance with an observed order of Nature. Philosophy consists in the conscious recognition of this method, and in the systematic use of it for the complete guidance of life. Aberration from it is the death of the rational soul; not, says Hierokles, that it ceases thereby to exist, but that it falls away from harmony with divine Nature and with reason. This fatal falling away brings about endless waste and perversion of strenuous effort; a hoping for things of which there is no hope, an ignorance of what may be; a perpetual striving to clamber up the back stairs of a universe that has no back stairs. The Neoplatonists were not wholly spotless in this regard. They had learned evil things of the Egyptians: magic, astrology, converse with spirits, theurgy, and the endeavor by trances and ecstasies to arrive at feelings and ideas which are alien to the healthy and wakeful mind. And so the uniformity of Nature gives our commentator some little trouble, and requires to be interpreted.

"Know so far as is permitted thee (*ὡς θέμις ἐστί*)," says the verses. "For we ought not to yield to unreasoning prejudice, and accommodate the order and dignity of things to our fancies; but to keep within the bounds of truth, and know all things as it is permitted, namely, as the Demiurgic law has assigned to every one its place."

¹ "My brains are broken"—SIR WALTER RALEIGH.

So the commentator, reading into the verses

more than the writer put there, not without edification. We, then, on our part, may read into them this—that it is not “permitted” to regard the uniformity of Nature as a dogma known with certainty, or exactness, or universality; but only within the range of human conduct, as a practical rule for the guidance of the same, and as the only source of beliefs that will not lead astray. For to affirm any general proposition of this kind to be certainly, or exactly, or universally true, is to make a mistake about the nature and limits of human knowledge. But at present it is a venial mistake, because the doctrine of the nature of human knowledge, *Erkenntniss-Theorie*, Ken-lore, is only now being thoroughly worked out, so that our children will know a great deal more about it than we do, and have what they know much better and more simply expressed. It is almost infinitely more important to keep in view that the uniformity of Nature is practically certain, practically exact, practically universal, and to make this conception the guide of our lives, than to remember that this certainty, exactness, and universality, are only known practically, not in a theoretical or absolute way.

How far away is the doctrine of uniformity from fatalism! It begins directly to remind us that men suffer from *preventable* evils, that the people perisheth for lack of knowledge. “Miserable are they, because they see not and hear not the good that is very nigh them; and the way of escape from evil, few there be that understand it.” The practical lesson is not that of the pessimist, that we should give up the contest, recognize that life is an evil, and get out of it as best we may; but, on the contrary, that, having found anything wrong, we should set to work to mend it: for *the woes of men are the work of their own hands*.

“But be thou of good cheer, for they are of gods’ kindred whom holy Nature leadeth onward, and in due order showeth them all things.”

The expression (*ἐπὶ προφύροισι . . . δέκνυσιν ἑκάστα*) belongs to the right of initiation into the mysteries. Nature is represented as the hierophant, the guiding priest by whom the faithful were initiated into the divine secrets one by one. The history of mankind is conceived as such a mystic progress under the guidance of divine Nature. It has been sometimes said that the ancient world was entirely devoid of the conception of progress. But like most sweeping antitheses between *ancient* and *modern*, *East* and *West*, and the like, when we come to look a little closely into this assertion it becomes difficult to believe

that any definite meaning can ever have been assigned to it. Certainly in the matter of physical science there is no case of firmer faith in progress than that of Hipparchus, who having made the great step of determining the solar and lunar motions, and having failed to extend the same methods to the planets, stored up observations in the sure and certain hope that a more fortunate successor would accomplish that work; which indeed was done by Ptolemy. And it is very important to notice that the exact sciences were regarded as the standard to which the others should endeavor to attain, as appears by the commentary on a subsequent passage in these very verses. On the phrase “using judgment both in *cleansing* and in *setting free* thy soul,” Hierokles explains that the *cleansing* or *lustration* of the rational soul means the mathematical sciences, and that the upward-leading liberation (*ἀναγωγὸς λύσις*), the freedom that is progress, is *scientific inquiry*, or a *scientific view of things* (*διαλεκτικὴ τῶν ὄντων ἐπιστήμη*), the clear and exact vision of one who has attained the highest grade of initiation. Accordingly, the medical sciences never lost the tradition of progress by continuous observation, impressed on them by Hippocrates; and in the Alexandrian Museum were training that galaxy of famous physicians and naturalists which kept the school illustrious until the claims of culture were restored by the Arab conquest. Nor is it possible to deny the conception and practice of political progress to the great jurists of Rome, any more than that of ethical progress to the Stoic moralists. To the best minds, with whatever subject occupied, there was present this conception of divine Nature patiently educating the human race, ready to bring out of her store-house good things without number in the proper time.

Nor was this hope of continued progress altogether a vain one, if we will only look in the right place for the fulfillment of it. Greek polity and culture had been planted in the East by Alexander’s conquests from the Nile to the Indus, there to suck up and gather together the wisdom of centuries and of continents. When the light and the right were driven out of Europe by the Church, they found in the far East a home with the Ommyyade and Abbasside caliphs, whose reign gave peace and breathing-time to the old and young civilization that was ready to grow. Across the north of Africa came again the progressive culture of Greece and Rome, enriched with precious jewels of old-world lore; it took firm ground in Spain, and the light and the right were flashed back into Europe from the blades of Saracen swords. From

Bagdad to Cordova, in the great days of the caliphate, the best minds had faith in human progress to be made by observation of the order of Nature. Here, again, the true culture was overridden and destroyed by the development of the Mohammedan religion; but not until the sacred torch had been safely handed on to the new nations of convalescent Europe.

If the singer of the "Golden Verses" could have contemplated on these lines the history of the two thousand years that were to succeed him, he would have seen an uninterrupted succession of naturalists and physicians, philosophers and statesmen, all steadily reaching forward to the good things that were before, never losing hold of what had already been attained. And we, looking back, may see that through overwhelming difficulties, and dangers, and diseases, holy Nature has indeed been leading onward the kindred of the gods, slowly but surely unfolding to them the roll of the heavenly mysteries.

Of course, if we restrict our view to Europe itself, we meet with a far more complex and difficult problem—a problem of pathology as opposed to one of healthy growth. We have to explain the apparent anomaly of two epochs of comparative sanity and civilization separated by the disease and delirium of the Catholic episode.

Just as the traveler, who has been worn to the bone by years of weary striving among men of another skin, suddenly gazes with doubting eyes upon the white face of a brother, so, if we travel backward in thought over the darker ages of the history of Europe, we at length reach back with such bounding of heart to men who had like hopes with ourselves; and shake hands across that vast with the singers of the "Golden Verses," our own true spiritual ancestors.

Well may Greece sing to the earth her mother, in the "Litanies of Nations:"

"I am she that made thee lovely with my beauty

From north to south:

Mine, the fairest lips, took first the fire of duty

From thine own mouth.

Mine, the fairest eyes, sought first thy laws and knew them

Truths undefiled;

Mine, the fairest hands, took freedom first into them,
A weanling child."¹

Let us now put together the view of Nature and of life which is presented to us by the "Golden Verses," with a view to considering its fitness for cosmic emotion. We are taught therein to look upon Nature as a divine order or cosmos,

acting uniformly in all of its diverse parts; which order, by means of its uniformity, is continually educating us and teaching us to act rightly. The ideal character, that which is best fitted to receive the teaching of Nature, is one which has conscience for its motive power and reason for its guide. The main point to be observed is that the two kinds of cosmic emotion run together and become one. The macrocosm is viewed only in relation to human action: Nature is presented to the emotions as the guide and teacher of humanity. And the microcosm is viewed only as tending to complete correspondence with the external: human conduct is subject for reverence only in so far as it is consonant to the demiurgic law, in harmony with the teaching of divine Nature. This union of the two sides of cosmic emotion belongs to the essence of the philosophic life, as the corresponding intellectual conception is of the essence of the scientific view of things.

There were other parts of the Pythagorean conception of Nature and man which we cannot at present so easily accept. And even so much as is here suggested we cannot hold as the Pythagoreans held it, because there are the thoughts and the deeds of two thousand years between. These ideas fall in very well with the furniture of our minds; but a great deal of the furniture is new since their time, and changes their place and importance. Of the detailed machinery of the Pythagorean creed these verses say nothing. Of the sacred fire, the hearth of the universe, with sun and planets and the earth's double antichthon revolving round it, the whole inclosed in a crystal globe with nothing outside—of the "Great Age" of the world, after which everything occurs over again in exactly the same order—of the mystic numbers, and so forth, we find no mention in these verses, and they do not lose much by it, though on that account Zeller calls them "colorless." But a remembrance of these doctrines will help us to appreciate the change that has come over our view of the world.

First, then, the cosmos that we have to do with is no longer a definite whole including absolutely all existence. The old cosmos had a boundary in space, a finite extent in time; for the great age might be regarded as a circle, on which you return to the same point after going once round. Beyond the crystal sphere of the fixed stars was nothing; outside that circle of time no history. But now the real universe extends at least far beyond the cosmos, the order that we actually know of. The sum total of our experience and of the inferences that can fairly

¹ Swinburne, "Songs before Sunrise."

be drawn from it is only, after all, a part of something larger. So sings one whom great poets revere as a poet, but to whom writers of excellent prose, and even of leading articles, refuse the name:

"I open my scuttle at night and see the far-sprinkled systems—

"And all I see, multiplied as high as I can cipher, edge but the rim of the farther systems.

"Wider and wider they spread, expanding, always expanding,

"Outward and outward, and forever outward.

"There is no stoppage, and never can be stoppage;

"If I, you, and the worlds, and all beneath or upon their surfaces, were this moment reduced back to a pallid float, it would not avail in the long-run;

"We should surely bring up again where we now stand,

"And as surely go as much farther—and then farther and farther.

"A few quadrillions of eras, a few octillions of cubic leagues, do not hazard the span, or make it impatient;

"They are but parts—anything is but a part.

"See ever so far, there is limitless space outside of that;

"Count ever so much, there is limitless time around that."¹

Whatever conception, then, we can form of the external cosmos must be regarded as only provisional and not final, as waiting revision when we shall have pushed the bounds of our knowledge farther away in time and space. It must always, therefore, have a character of incompleteness about it, a want, a stretching out for something better to come, the expectation of a further lesson from the universal teacher, Experience. And this not only by way of extension of space and time, but by increase of our knowledge even about this part that we know of. Our conception of the universe is for us, and not for our children, any more than it was for our fathers.

But, again, this incompleteness does not belong to our conception of the external cosmos alone, but to that of the internal cosmos also. Human nature is fluent, it is constantly, though slowly, changing, and the universe of human action is changing also. Whatever general conception we may form of good actions and bad ones, we must regard it as quite valid only for ourselves; the next generation will have a slightly modified form of it, but not the same thing. The Kantian universality is no longer possible. No maxim can be valid at all times and places for all rational beings; a maxim valid for us can only be valid for such portions of the human race as are practically identical with ourselves.

¹ Whitman, "Leaves of Grass."

Here, then, we have two limitations to keep in mind when we form our cosmic conceptions. On both sides they are provisional: instead of picturing to ourselves a universe, we represent only a changing part; instead of contemplating an eternal order, an absolute right, we find only a changing property of a shifting organism.

Are we, then, to be disappointed? I think not; for, if we consider these limitations a little more closely, we shall perceive an advantage in each of them.

First, of the external cosmos. Our conception is limited to a part of things. But to what part? Why, precisely to the part that concerns us. The universe we have to consider is the whole of that knowledge which can rightly influence human action. For, wherever there is a question of guiding human action, there is a possibility of profiting by experience on the assumption that Nature is uniform; that is, there is room for the application of science. All practical questions, therefore, are within the domain of science. And we may show conversely that all questions in the domain of science, all questions, that is, which have a real intelligible meaning, and which may be answered either now or at some future time by inferences founded on the uniformity of Nature, are *practical* questions in a very real and important sense. For the interrogation of Nature, without and within him, is a most momentous part of the work of man on this earth, seeing how all his progress has depended upon conscious or unconscious labor at this task. And, although the end of all knowledge is action, and it is only for the sake of action that knowledge is sought by the human race, yet, in order that it may be gained in sufficient breadth and depth, it is necessary that the individual should seek knowledge *for its own sake*. The seeking of knowledge for its own sake is a practical pursuit of incalculable value to humanity. The pretensions of those who would presume to clothe genius in a strait-waistcoat, who would forbid it to attempt this task because Descartes failed in it, and that one because Comte knew nothing about it, would be fatally mischievous if they could be seriously considered by those whom they might affect. No good work in science has ever been done under such conditions; and no good worker can fail to see the utter futility and short-sightedness of those who advocate them. For there is no field of inquiry, however apparently insignificant, that does not teach the worker in it to distrust his own powers of prevision as to what he is

likely to find; to expect the unexpected; to be suspicious of his own accuracy if everything comes out quite as it "ought to;" but not to hazard the shadow of a guess about the degree of "utility" that may result from his investigations. Man's creative energy may be checked and hindered, or perverted from the truth; but it is not to be regulated by a pedantic schoolmaster who thought he could whip the centuries with his birch-broom.

The cosmos, then, which science now presents to our minds, is only a part of something larger which includes it. But at the same time it is the whole of what concerns us, and no more than what concerns us. Wherever human knowledge establishes itself, that point becomes thenceforward a centre of practical human interest. It, and whatever valid inference can connect with it, is the business of all mankind.

So also, if we consider the limitation imposed on our idea of the internal cosmos by the changing character of human nature, we shall find that we have gained more than we have lost by it. It is true that we can no longer think of conscience and reason as testifying to us of things eternal and immutable. If human nature is no longer there, a definite thing from age to age, persisting unaltered through the vicissitudes of cities and peoples. Very nearly constant it is, practically constant for so many centuries; but not constant through that range of time which it practically concerns us to know about and to ponder. But, on the other side, what a flood of light is let in by this very fact, not only on human nature, but on the whole world! It is impossible to exaggerate the effect of the doctrine of evolution on our conception of man and of Nature. Suppose all moving things to be suddenly stopped at some instant, and that we could be brought fresh, without any previous knowledge, to look at this petrified scene. The spectacle would be intensely absurd. Crowds of people would be senselessly standing on one leg in the street, looking at one another's backs; others would be wasting their time by sitting in a train in a place difficult to get at, nearly all with their mouths open and their bodies in some contorted, unrestful posture. Clocks would stand with their pendulums on one side. Every thing would be disorderly, conflicting, in its wrong place. But once remember that the world is in motion, is going somewhere, and everything will be accounted for and found just as it should be. Just so great a change of view, just so complete an explanation, is given to us

when we recognize that the nature of man and beast and of all the world is changing, is going somewhere. The silly maladaptations in organic Nature are seen to be steps toward the improvement or discarding of imperfect organs. The *baneful strife which lurketh inborn in us, and goeth on the way with us to hurt us*, is found to be the relic of a time of savage or even lower condition.

It is probable that the doctrine of evolution fills a somewhat larger space in our attention than belongs to its ultimate influence. In the next century, perhaps, men will not think so much about it; they will be paying a new attention to some new thing. But it will have seized upon their minds, and will dominate all their thoughts to an extent that we cannot as yet conceive. When the sun is rising we pay special attention to him and admire his glories; but when he is well risen we forget him, because we are busy walking about in his light.

Meanwhile, the doctrine of evolution may be made to compensate us for the loss of the immutable and eternal verities by supplying us with a general conception of a *good* action, in a wider sense than the ethical one.

If I have evolved myself out of something like an amphioxus, it is clear to me that I have become *better* by the change—I have risen in the organic scale; I have become more organic. Of all the changes that I have undergone, the greater part must have been changes in the organic direction; some in the opposite direction, some perhaps neutral. But if I could only find out which, I should say that those changes which have tended in the direction of greater organization were good, and those which tended in the opposite direction bad. Here there is no room for proof; the words "good" and "bad" belong to the practical reason, and if they are defined it is by pure choice. I choose that definition of them which must, on the whole, cause those people who act upon it to be selected for survival. The good action, then, is a mode of action which distinguishes organic from inorganic things, and which makes an organic thing more organic, or raises it in the scale. I shall try presently to determine more precisely what is the nature of this action; we must now merely remember that my actions are to be regarded as good or bad according as they tend to improve me as an organism—to make me move farther away from those intermediate forms through which my race has passed, or to make me retrace these upward steps and go down again.

Here we have our general principle for the internal cosmos, the world of our own actions.

What, now, is our principle for the external cosmos? We consider here again not a statical thing, but a vast series of events. We want to contemplate, not the nature of the external universe as it now is, but the history of its changes; not a perpetual cycle of similar events, with nothing new under the sun, but a drama whose beginning is different from its middle, and the middle from the end. For practical purposes, which are what concern us, the solar system is a quite sufficient cosmos. We have certainly a history of it furnished to us by the nebular hypothesis; and the truth of this hypothesis is a matter of practical interest, because the failure of the inferences on which it is founded would modify our actions very considerably. Still the great use of it is to show that the life upon the earth must have been evolved from inorganic matter; for the evolution of life is that part of the history of the cosmos which directly concerns us. Now here we have the enormous series of events which bridges over the gulf between the smallest of colloid matter and the human organism; this is our external cosmos. Must we leave it as a series of events? or can we find a general principle by which the series shall be represented as a single event constantly going on? Clearly we can, for the single event is a mode of action which distinguishes organic from inorganic things, and makes organic things more organic. We may regard this mode of action as the generating principle which has produced all the life upon the earth.

We arrive thus at a common principle, which at once distinguishes good actions from bad in the internal world, and which has created the external world so far as it is living. This principle is, then, a fit object for cosmic emotion if we can only get rid of the vagueness of its definition. And it has this great advantage, that it does not need to be personified for poetical purposes. For we may regard the result of this mode of action, extended over a great length of time, as in some way an embodiment of the action itself. In this way the human race embodies in itself all the ages of organic action that have gone to its evolution. The nature of organic action, then, is to personify itself, and it has personified itself most in the human race.

But before we go further two things must be remarked: First, the very great influence of life in modifying the surface of the earth, so great as in many cases to be comparable to the effects of

far ruder changes. Thus, we have rocks composed entirely of organic remains, and climate changed by the presence or absence of forests. Secondly, although we have restricted our cosmos to the earth in space, and to the history of life upon it in time, there is no necessity to maintain the restriction. For we must suppose that organic action will always take place when the elements which are capable of it are present under the requisite physical conditions of temperature, light, and environment. It is, therefore, in the last degree improbable that it is confined to our own planet.

In this principle, therefore, we must recognize the mother of life, and especially of human life, powerful enough to subdue the elements, and yet always working gently against them; bidding her time in the whole expanse of heaven, to make the highest cosmos out of inorganic chaos; the actor, not of all the actions of living things, but only of the good actions; for a bad action is one by which the organism tends to become less organic, and acts for the time as if inorganic.

To this mother of life, personifying herself in the good works of humanity, it seems to me that we may fitly address a splendid hymn of Mr. Swinburne's, whose meaning if I mar or mistake by such application, let the innocency of my intent plead for pardon with one into whose work it is impossible to read more or more fruitful meaning than he meant in the writing of it:

- "Mother of man's time-traveling generations,
Breath of his nostrils, heart-blood of his heart,
God above all gods worshiped of all nations,
Light above light, law beyond law, thou art.
- "Thy face is as a sword smiting in sunder
Shadows, and chains, and dreams, and iron things;
The sea is dumb before thy face, the thunder
Silent, the skies are narrower than thy wings.
- "All old gray histories hiding thy clear features,
O secret spirit and sovereign, all men's tales,
Creeds woven of men thy children and thy creatures,
They have woven for vestures of thee and for veils.
- "Thine hands, without election or exemption,
Feed all men fainting from false peace or strife,
O thou, the resurrection and redemption,
The godhead and the manhood and the life."¹

Still our conception is very vague. We have only said, "*Good action* has created the life of the world, and in so doing has personified itself in humanity; so we call it the mother of life and of man." And we have defined good action to be that which makes an organism more organic.

¹ "Songs before Sunrise."

We want, therefore, to know something more definite about the kind of action which makes an organism more organic.

This we can find, and of a nature suitable for cosmic emotion, by paying attention to the difference between molar and molecular movement. We know that the particles, even of bodies which appear to be at rest, are really in a state of very rapid agitation, called molecular motion, and that heat and nerve-discharge are cases of such motion. But molar motion is the movement in one piece of masses large enough to be seen.

Now, the peculiarity of living matter is, that it is capable of combining together molecular motions, which are invisible, into molar motions, which can be seen. It, therefore, appears to have the property of moving spontaneously, without help from anything else. So it can for a little while; but it is then obliged to take molecular motion from the surrounding things if it is to go on moving. So that there is no real spontaneity in the case. But still its changes of shape, due to aggregation of molecular motion, may fairly be called *action from within*, because the energy of the motion is supplied by the substance itself, and not by any external thing. If we suppose the same thing to be true for a complex organism that is true for a small speck of living matter—that those changes in it which are directly initiated by the living part of the organism are the ones which distinguish it from inorganic things, and tend to make it more organic—then we shall have here the nearer definition of organic action. It is probable that the definition, as I have stated it, is rather too precise—that the nature of the action, in fact, varies with circumstances in the complex organism, but it is always nearly as stated.

Let us consider what this means from the internal point of view. When I act from within, or in an organic manner, what seems to me to happen? I must appear to be perfectly free, for, if I did not, I must be made to act by something outside of me. "We think ourselves free," says Spinoza, "being conscious of our actions, and not of the causes which determine them." But we have seen reason to believe that, although there is no physical spontaneity, yet the energy for such an action is taken out of myself—i. e., out of the living matter in my body. As, therefore, the immediate origin of my action is in myself, I really am free in the only useful sense of the word. "Freedom is such a property of the will," says Kant, "as enables living agents to

originate events independently of foreign determining causes."

The character of an organic action, then, is freedom—that is to say, *action from within*. The action which has its immediate antecedents within the organism has a tendency, in so far as it alters the organism, to make it more organic, or to raise it in the scale. The action which is determined by foreign causes is one in regard to which the organism acts as if inorganic, and, in so far as the action tends to alter it, it tends also to lower it in the scale.

It is important to remember that only a part of the body of a complex organism is actually living matter. This living matter carries about a quantity of formed or dead stuff; as Epictetus says, *ψυχάριον εἰ βάσταζον νεκρόν*—"a little soul for a little bears up this corpse which is man."¹ Only actions originating in the living part of the organism are to be regarded as actions from within; the dead part is, for our purposes, a portion of the external world. And so, from the internal point of view, there are rudiments and survivals in the mind which are to be excluded from that *me*, whose free action tends to progress; that *baneful strife which lurketh inborn in us* is the foe of freedom—*this let not a man stir up, but avoid and flee*.

The way in which freedom, or action from within, has effected the evolution of organisms, is clearly brought out by the theory of natural selection. For the improvement of a breed depends upon the selection of *sports*—that is to say, of modifications due to the overflowing energy of the organism, which happen to be useful to it in its special circumstances. Modifications may take place by direct pressure of external circumstances; the whole organism, or any organ, may lose in size or strength from failure of the proper food, but such modifications are in the downward, not in the upward, direction. *Indirectly* external circumstances may, of course, produce upward changes; thus the drying up of axolotl ponds caused the survival of individuals which had "sporting" in the direction of lungs. But the *immediate* cause of change in the direction of higher organization is always the internal and quasi-spontaneous action of the organism.

¹ Swinburne, "Poems and Ballads." I am aware of the difficulties which beset Dr. Beale's theory of germinal matter, as they are stated by Mr. G. H. Lewes; but, however hard it may be to decide what *is* living matter, and what is formed stuff, the distinction appears to me to be a real one, to the extent, at least, of the use here made of it.

"Freedom we call it, for holier
 Name of the soul's there is none;
 Surelier it labors, if slower,
 Than the metres of star or of sun;
 Slower than life into breath,
 Surelier than time into death,
 It moves till its labor be done." ¹

The highest of organisms is the social organism. To Mr. Herbert Spencer, who has done so much for the whole doctrine of evolution, and for all that is connected with it, we owe the first clear and rational statement of the analogy between the individual and the social organism, which, indeed, is more than an analogy, being in many respects a true identity of process, and structure, and function. Our main business is with one property which the social organism has in common with the individual—namely, this, that it aggregates molecular motions into molar ones. The molecules of a social organism are the individual men, women, and children, of which it is composed. By means of it, actions which, as individual, are insignificant, are massed together into the important movements of a society. Co-operation, or *band-work*, is the life of it. Thus it is able to "originate events independently of foreign determining causes," or to act with freedom.

Freedom in a society, then, is a very different thing from anarchy. It is the organic action of the society as such; the union of its elements in a common work. As Mr. Spencer points out, society does not resemble those organisms which are so highly centralized that the unity of the whole is the important thing, and every part must die if separated from the rest, but rather those which will bear separation and reunion, because, although there is a certain union and organization of the parts in regard to one another, yet the far more important fact is the life of the parts separately. The true health of society depends upon the communes, the villages and townships, infinitely more than on the form and pageantry of an imperial government. If in them there is band-work, union for a common effort, converse in the working out of a common thought, then the Republic is, and needs not to be made with hands, though Caesar have his guns in every citadel. None the less it will be part of the business of the Republic, as she grows in strength, to remove him. So long as two or three are gathered together, freedom is there in the midst of them, and it is not until society is utterly divided into its elements that she departs:

"Courage yet! my brother or my sister!
 Keep on! Liberty is to be subserved, whatever occurs;

¹ Swinburne, "Songs before Sunrise."

That is nothing, that is quelled by one or two failures, or
 any number of failures,
 Or by the indifference or ingratitude of the people, or by
 any unfaithfulness,
 Or the show of the tushes of power, soldiers, cannon, penal
 statutes.

Revolt! and still revolt! revolt!

What we believe in waits latent forever through all the
 continents, and all the islands and archipelagos of the
 sea;

What we believe in invites no one, promises nothing, sits
 in calmness and light, is positive and composed, knows
 no discouragement,

Waiting patiently, waiting its time.

When liberty goes out of a place, it is not the first to go,
 nor the second or third to go,

It waits for all the rest to go—it is the last.

When there are no more memories of heroes and martyrs,
 And when all life, and all the souls of men and women, are
 discharged from any part of the earth,

Then only shall liberty, or the idea of liberty, be discharged
 from that part of the earth,

And the infidel come into full possession." ¹

So far our cosmic conception is external. Starting with organic action, as that which has effected the evolution of life, and all the works of life, we have found it to have the character of freedom, or action from within, and in the case of the social organism we have seen that freedom is the organic action of society as such, which is what we call the Republic. The Republic is the visible embodiment and personification of freedom in its highest external type.

But the Republic is itself still further personified, in a way that leads us back with new light to the conception of the internal cosmos. The practice of band-work, or comradeship, the organic action of society, has so moulded the nature of man as to create in it two specially human faculties—the conscience and the intellect. Conscience is an instinctive desire for those things which conduce to the welfare of society; intellect is an apparatus for connecting sensation and action, by means of a symbolic representation of the external world, framed in common, and for common purposes, by the social intercourse of men. Conscience and reason form an inner core in the human mind, having an origin and a nature distinct from the merely animal passions and perceptions; they constitute the soul or spirit of man, the universal part in every one of us. In these are bound up, embalmed and embodied, all the struggles and searchings of spirit of the countless generations which have made us what we are. Action which arises out of that inner core, which is prompted by conscience and guided by reason, is *free* in the highest sense of all; this at least is

¹ Whitman, "Leaves of Grass," p. 363.

good in the ethical sense. And yet, when we act with this most perfect freedom, it may be said that it is not we that act, but Man that worketh in us. He whose life is habitually governed by reason and conscience is the free and wise man of the philosophers of all ages. The highest freedom, then, is identical with the Spirit of Man—

“The earth-god Freedom, the lonely
Face lightening, the footprint unshod,
Not as one man crucified only
Nor scourged with but one life's rod;
The soul that is substance of nations,
Reincarnate with fresh generations;
The great god Man, which is God.”¹

The social organism itself is but a part of the universal cosmos, and like all else is subject to the uniformity of Nature. The production and distribution of wealth, the growth and effect of

administrative machinery, the education of the race, these are cases of general laws which constitute the science of sociology. The discovery of exact laws has only one purpose—the guidance of conduct by means of them. The laws of political economy are as rigid as those of gravitation; wealth distributes itself as surely as water finds its level. But the use we have to make of the laws of gravitation is not to sit down and cry “Kismet!” to the flowing stream, but to construct irrigation-works. And the use which the Republic must make of the laws of sociology is to rationally organize society for the training of the best citizens. Much patient practice of comradeship is necessary before society will be qualified to organize itself in accordance with reason. But those who can read the signs of the times read in them that the kingdom of Man is at hand.—*The Nineteenth Century*.

METEORITES AND THE ORIGIN OF LIFE.

By WALTER FLIGHT, D. Sc., F. G. S.

THE question which has so often been raised, How did life originate on our earth? has again been brought before the consideration of the scientific world by Prof. Allen Thomson, in the presidential address delivered at the Plymouth meeting of the British Association during the present autumn. One explanation to which he refers is that which formed a prominent feature in the address of a former occupant of the presidential chair, Sir William Thomson, who six years ago suggested as a possible solution of this great question that the germs of life might have been borne to our globe by the meteorites which are scattered through space, and which from time to time fall upon the surface of our planet. If, he maintained, we trace back the physical history of our earth, we are brought to a red-hot, melted globe on which no life could exist. The earth was first fit for life, and there was no living thing upon it. Can any probable solution, consistent with the ordinary course of Nature, be found to explain the problem of its first appearance? When a lava-stream flows down the side of Vesuvius or Etna it quickly cools and becomes solid, and after a few weeks or years it teems with vegetable and animal life, which life originated by

the transport of seed and ova and by the migration of individual living creatures. When a volcanic island emerges from the sea, and after a few years is clothed with vegetation, we do not hesitate to assume that seed has been wafted to it through the air, or floated to it on rafts. It is not possible—and if possible, is it not probable—that the beginning of vegetable life on the earth may be similarly explained? Every year thousands, probably millions, of fragments of solid matter fall upon the earth. Whence came they? What is the previous history of any one of them? Was it created in the beginning of time an amorphous mass? The idea is so unacceptable that, tacitly or explicitly, all men discard it. It is often assumed that all, and it is certain that some, meteorites are fragments severed from larger masses and launched free into space. It is as sure that collisions must occur between great masses moving through space as it is that ships, steered without intelligence directed to prevent collisions, could not cross and recross the Atlantic for thousands of years with immunity from such catastrophes. When two great masses come into collision in space it is certain that a large part of each of them is melted; but it appears equally certain that in

¹ Swinburne, “Songs before Sunrise.”

many cases a large quantity of *débris* must be shot forth in all directions, much of which may have been exposed to no greater violence than individual pieces of rock experience in a land-slip or in blasting by gunpowder. Should the time when this earth comes into collision with another body, comparable in dimensions to itself, be when it is still clothed, as at present, with vegetation, many great and small fragments carrying seed and living plants and animals would undoubtedly be scattered through space. Hence and because we all confidently believe that there are at present, and have been from time immemorial, many worlds of life besides our own, we must regard it as probable in the highest degree that there are countless seed-bearing meteoric stones moving about through space. If at the present instant no life existed upon this earth, one such stone falling upon it might lead to its becoming covered with vegetation. "I am fully conscious," he concludes, "of the many scientific objections which may be urged against this hypothesis, but I believe them to be all answerable. . . . The hypothesis that life originated on this earth through moss-grown fragments from the ruins of another world may seem wild and visionary; all I maintain is that it is not unscientific."¹

Sir William Thomson's views, thus plainly set forth, did not fail to attract adverse criticism. Before we proceed to consider the comments which his hypothesis called forth, we may call the reader's attention for a short time to speculations in the same direction which have appeared in the writings of scientific men in France and Germany.

First, we must refer to a remarkable passage in the great work of Count A. de Bylandt Palstercamp, on the "Theory of Volcanoes."² He wrote in 1835, at a time when Laplace's theory that meteorites were hurled at us from lunar volcanoes was still generally received, and this will account to some extent for the source of the cosmical masses of which he treats. What is mainly worthy of notice is their character, of carriers of the faculty of organization, which he attributes to them. In the chapter intitled "Principe d'après lequel le premier Développement de notre Globe peut s'être effectué," he writes: "It may be matter of curiosity, but it is in no wise necessary, that we should know on what principle or from

what organized body the great mass of our globe has been derived; it is sufficient for us that we exist in a manner where everything is perfectly organized, at least in so far as the aim of our existence is concerned. Many scientific men have exercised their imagination on this problem without being able to come to any definite decision. Some maintain that the nucleus of our globe was a fragment of a body which in its cosmical path had dashed itself into fragments against the sun, which the very close proximity of some comet to that star gives grounds for believing. Others suppose us to be a vast *aérolite* thrown off from the sun himself¹ with a force proportional to its mass, to a zone where the motion is determined in accordance with the laws of reciprocal attraction, and that this fragment carried in itself the germ of all that organization which we see around us, and of which we form a part. (*Que cet éclat portait en lui le germe de toute cette organisation que nous observons ici et dont nous faisons partie.*) They suppose the satellites to be small parts or fragments detached from the chief mass by the violence of the rotation at the time it is hurled forth, or by the excessively high original temperature, increased by the fall, which produced a very violent dilatation of the matter, and severed some portions from it. These *aérolites*, it is said, by way of comparison, contain within them the principle common to the body whence they have been derived, just as a grain of seed carried by the wind is able to produce at a remote distance a tree like its prototype, with such modifications only as are due to soil or climate."

In the spring of 1871 Prof. Helmholtz delivered at Heidelberg and at Cologne a discourse on the origin of the solar system, which he printed in the third collection of his interesting "Populäre wissenschaftliche Vorträge," published last year.² He directed attention on that occasion to the facts that meteorites sometimes contain compounds of carbon and hydrogen, and that the light emitted by the head of a comet gives a spectrum which bears the closest resemblance to that of the electric light when the arc is surrounded by a gaseous hydrocarbon. Carbon is the characteristic element of the organic compounds of which all things living are built up. "Who can say," he asks, "whether these bodies which wan-

¹ "Address of Sir William Thomson, Knt., LL.D., F.R.S., President." London: Taylor & Francis, 1871, p. 27.

² "Théorie des Volcans. Par le Comte A. de Bylandt Palstercamp." Paris: Levrault, 1838, tome i., p. 95.

¹ He alludes here in a note to the theory held by Laplace and others.

² "Populäre wissenschaftliche Vorträge. Von H. Helmholtz." Braunschweig: Vieweg und Sohn, 1870. Drittes Heft, p. 135.

der about through space may not also strew germs of life where a new heavenly body has become fitted to offer a habitat to organized creatures?" The hypothesis, in the form set forth in 1871 by Prof. Helmholtz and Sir William Thomson, was vigorously handled by Zöllner, of Leipsic, whose work, "Ueber die Natur der Cometen," appeared in the following year. In the *Vorrede* of his book he passes his countryman by unmentioned, but declares Sir William Thomson's proposition to be unscientific, and that in a twofold sense. In the first place he maintains it is unscientific in a formal or logical sense, in that it changes the original *simple* question, Why has our earth become covered with organisms? into a second, Why had that heavenly body the fragment of which fell upon our planet become covered with vegetation, and not our earth itself? "If, however," he adds, "bearing in mind an earlier dictum,¹ we regard inorganic and organic matter as two substances from all eternity diverse, just as in accordance with our present views we consider two chemical elements to be diverse, such an hypothesis as that now advanced must be at variance with the destructibility of organisms by heat which experience has taught us."

"Again," contends Zöllner, "the hypothesis in its *material* bearing is unscientific. When a meteorite plunges with planetary velocity into our atmosphere, the loss of *vis viva* arising from friction is converted into heat, which raises the temperature of the stone to a point where incandescence and combustion take place. This, at all events, is the theory at present generally held to explain the phenomena of star-showers and fireballs. A meteorite, then, laden with organisms, even if it could withstand the sundering of the parent mass unscathed, and should take no part in the general rise of temperature resulting from this disruption, must of necessity traverse the earth's atmosphere before it could deliver at the earth's surface organisms to stock our planet with living forms."²

Helmholtz did not long delay in replying to Zöllner's criticism on this question. An opportunity occurred during the publication, in the following year, 1873, of the second part of the German translation of Thomson and Tait's "Handbook of Theoretical Physics." The preface contains Helmholtz's answer.³ He points to the fact,

¹ "Dead matter cannot become living matter unless it be subject to the influence of matter already living."

² "Ueber die Natur der Cometen. Von J. C. F. Zöllner." Leipzig: Engelmann, 1872, p. 24.

³ "Handbuch der theoretischen Physik. Von W.

confirmed by numerous observers, that the larger meteoric stones, during their transit through our atmosphere, become heated only on the outer surface, the interior remaining cold—often very cold. Germs which may happen to lie in the crevices of such stones would be protected from scorching while traveling through the air. Those, moreover, which lie on or near the surface of the *aërolite* would, as soon as it entered the upper and most attenuated strata of our atmosphere, be blown off by the swift and violent current of air long ere the stone can rend those denser layers of our gaseous envelope where compression is sufficiently great to cause a perceptible rise of temperature. As regards that other point of debate, referred to by Thomson only, the collision of two cosmical masses, Helmholtz shows that the first result of contact would be violent mechanical movement, and that it is only when they begin to be worn down and destroyed by friction that heat would be developed. It is not known whether this may not continue for hours or days, or even weeks. Such portions as at the first moment of contact are hurled away with planetary velocity may consequently be driven from the scene of action before any rise of temperature may have taken place. "It is not impossible," he adds, "that a meteorite or a swarm of meteorites, in traversing the upper layers of the atmosphere of a heavenly body, may either scatter from them or carry with them a quantity of air containing unscorched germs. These are possibilities which are not yet to be taken as probabilities; they are questions which, from the fact of their existence and range, are to be kept in sight, so that, should a case arise, they may receive an answer either by actual observations or by some conclusive deduction." It should be mentioned here that these views of Helmholtz's are also to be met with in a supplement to his lecture on the origin of the solar system.

In tracing the gradual development of this important controversy, we now arrive at the present year, and proceed to discuss the allusion made to it by Prof. Allen Thomson in his address at Plymouth. The difficulty regarding the origin of life is, he considers, not abolished, but only removed to a more remote period, by the supposition of the transport of germs from another planet, or their introduction by means of meteorites or meteoric dust; for, besides the ob-

Thomson und P. G. Tait." Uebersetzung von H. Helmholtz und G. Wertheim. Braunschweig: Vieweg und Sohn, 1-74. Erster Band. Zweiter Theil. 11.

jection arising from the circumstance that these bodies must have been subjected to a very high temperature, we should still have everything to learn as to the way in which the germs arose in the far-distant regions of space from which they have been conveyed. At one of the sectional meetings, a few days later, Sir William Thomson made these observations the text of a further communication on the now well-worn subject. He desired to limit the discussion to the bare, dry question, Was life possible on a meteorite? The hypothesis which was to explain the bringing of life to our earth did not pretend to explain the origin of life, and he would not attempt to offer an explanation of the origin of life. The three questions which presented themselves were these: Was life possible on a meteorite moving in space? Was life possible on a meteorite while falling to the earth's surface? and, Could any germs live after the meteorite had become imbedded in the earth? A meteorite may be exposed to great heat before it reaches the earth; whether or not life on that meteorite would be destroyed by that heat was dependent on the duration of exposure. If a meteorite traversed space with the same side always exposed to the sun, that side would be strongly heated, the other would be cold; if it spun round at a uniform rate all its surface would be of one uniform temperature; and if it rotated once per hour it would have a high temperature on one side and be as cold as ice on the other. The whole or part of the surface of a meteorite might afford a climate suitable to some living forms, destructive to others. When the moss-covered stone enters the atmosphere the germs upon its surface would be torn off long before the stone became heated, and in a few years they may settle down on the earth, take root and grow. But were the germs of the exterior destroyed by heat, there might still be vegetable life in the interior. The time occupied by a stone in its passage through the air would not be more than twenty or thirty seconds at the outside, so that the crust might be fused, while the interior might have a moderate temperature, and anything alive in it would fall to the earth alive. Sir William Thomson concluded by remarking that after the collision of cosmical masses fragments must be shot off, some of which must certainly carry away living things not destroyed by the shock of the collision, and he did not hesitate to maintain, as a not improbable supposition, that at some time or other we should have growing on this earth a plant of meteoric origin. At this particular stage of the

debate (so we are informed by *The Western Morning News*) some one attending the meeting of the section introduced the Colorado beetle, and this was held to be irresistibly funny; then some one else got up and said he was an Irishman, which was judged to be even funnier still. At length another speaker arose to breathe the hope that when Papa Colorado Beetle dropped down on a meteorite he would leave Mamma Colorado Beetle behind, which was felt to be far and away the funniest thing of all. Some of the Associates, however—men who had not yet learned to know the length and depth of scientific "wit"—began to feel uneasy; and although a gallant effort appears at this juncture to have been made to win back their confidence by assuring them that meteorites really do not contain organic matter of any kind, the section was not to be comforted till the telephone was set a-going. But to return.

Nothing bearing the semblance of a plant or even of its seed has as yet been met with in a meteorite; nor have any of the masses which have fallen on our planet shown anything approaching the structure which distinguishes sedimentary rocks from those of a purely plutonic character. The occurrence, however, in them, or with them, of organic compounds, of compounds of carbon and hydrogen, which it is hard to suppose could owe their existence to any other agency than that of life itself, and which represent the final stage previous to their final destruction, has now been so frequently noticed that I have put together in chronological order what information in this direction from a "world ayont" the meteorites have brought to us.

1806. *March 15th*, 5 P. M.—Two stones, weighing together six kilogrammes, fell at Alais, département du Gard, France. They have the appearance of an earthy variety of coal; the color of the crust is a dull brownish-black, so is that of the interior. The structure is very soft and friable. When heated it emits a faint bituminous odor. It was examined at the time of its fall by Thénard and a commission appointed by the Institute of France. The French observers found it to contain 2.5 per cent. of carbon; while Berzelius, in 1834, estimated the amount of carbon present to be 3.05 per cent. In 1862 Roscoe submitted this meteorite to a very thorough investigation. He found the carbon present to amount to 3.36 per cent. Ether dissolved 1.94 per cent. of the stone; the solution on evaporation left crystals which have an aromatic odor, and a fusing-point of 114 C., and which sublime on the application of heat,

leaving a slight carbonaceous residue. The crystals really appear to be of two kinds: *acicular* crystals, which are sparingly soluble in absolute alcohol, but are readily taken up by ether, carbon disulphide, turpentine, and cold nitric acid, and dissolve in cold sulphuric acid, striking a brown color; and *rhombic* crystals, which dissolve in ether and carbon disulphide, but are unaffected by cold nitric acid, sulphuric acid, or turpentine. An analysis of 0.0078 gramme of the crystals soluble in alcohol gave the following numbers:

Sulphurous acid . . 0.010	Sulphur . . . 0.005
Carbonic acid . . . 0.008	Carbon . . . 0.0022
Water 0.003	Hydrogen . . 0.0003

The atomic ratio of carbon to hydrogen, then, is nearly 1:1, or that of the reddish-brown and colorless mineral resin *könleinite*, which occurs in crystalline plates and grains in the lignite of Uznach, in Switzerland. Kraus makes the fusing-point of *könleinite* 114°C.; it is slightly soluble in alcohol, but much more soluble in ether. Dr. Lawrence Smith, who has recently examined the Alais meteorite, arrives at the same results as Roscoe; and, also, that the carbonaceous ingredient of this meteorite resembles, in all its physical characters, those of a substance which he obtained from the graphite of the Sevier County meteoric iron, to which I shall presently refer.

1838. *October 13th*, 9 A.M.—At the hour mentioned a great number of large stones fell over a considerable area at Kold-Bokkeveld, seventy miles from Cape Town. Those which fell near Tulbagh are estimated to have weighed many hundred-weights. It is said that they were soft when they fell, but became hard after a time. This material has a dull, black color, and is very porous and friable. Harris, who analyzed it in 1859, determined the presence of 1.67 per cent. of carbon, and somewhat more than 0.25 per cent. of an organic substance soluble in alcohol. This compound is described as possessing a yellow color, and a soft, resinous, or waxy, aspect. It readily fused with a slight rise of temperature, and when heated in a tube it was decomposed, emitting a strong bituminous odor, and leaving a carbonaceous residue. Some four years ago I was considering what should be done with a trace of this substance, so small in amount that it could not be removed from the vessel containing it. I was unwilling to throw away even so small a quantity of so precious a substance, so I drew off the neck of the flask and placed it in a dark cupboard of a room, the temperature of which, during the greater part of the year, is

unusually high. In the interval this organic compound has sublimed, and is deposited on the higher parts of the vessel in colorless and well-defined crystalline plates.

1840.—During this year a large mass of meteoric iron was discovered in Sevier County, Tennessee, inclosing a large nodule of graphite. "It is," writes Dr. Lawrence Smith, "the largest mass of graphite which has come under my observation, and is perhaps the largest known." Its dimensions are 60^{mm} by 20^{mm} and 35^{mm}, and it weighs ninety-two grammes. Two grammes of this nodule were reduced to powder and treated with ether, and the liquid on evaporation left a residue weighing fifteen milligrammes, and possessing an aromatic, somewhat alliaceous, odor. It consisted of long, colorless acicular crystals, others which were shorter, as well as some rhomboidal crystals and rounded particles. This extracted substance melted at about 120°C. When heated in a tube closed at one end it melts and then volatilizes, condensing in yellow drops, and leaving a carbonaceous residue. Dr. Lawrence Smith believes that the three elements, carbon, hydrogen, and sulphur, which they contain, may be in combination, and he has named the meteoric sulphohydrocarbon "*celestialite*."

1857. *April 15th*, 10.11 P.M.—A brilliant detonating meteor was observed at this hour over Kaba, southwest of Debreczin, Hungary, and a meteorite weighing four kilogrammes was found on the following morning imbedded in the hard surface of a road close by. The crust is black, and the mass of the stone dark gray; throughout the structure black portions of the size of peas lie scattered, giving the stone a porphyritic character. Wöhler treated the stone with alcohol, which removed a white, apparently crystalline, substance possessing a peculiar aromatic odor. With ether it broke up into oily drops, and appeared to be decomposed into an insoluble fluid body and a soluble solid portion. The solid substance was obtained in a distinctly crystalline condition on driving off the ether. It volatilizes in air, fuses in a close tube, and is decomposed when greater heat is applied, a fatty odor being observed, and a black residue left. The hydrocarbon is believed by Wöhler to be allied to ozocerite or scheererite. When the powdered stone is heated in oxygen it turns of a cinnamon-brown color. This meteorite contains 0.58 per cent. of carbon.

1861.—The huge mass of meteoric iron discovered at Cranbourne, near Melbourne, Australia, in 1861, incloses more or less rounded masses of

carbon. They are pronounced by Berthelot, who has submitted some of the material to the most powerful oxidizing reagents, to resemble the form of carbon which separates from cast-iron on cooling rather than native graphite.

1864. *May 14th*, 8 P.M.—On this occasion more than twenty stones fell at Montauban, Tarn-et-Garonne, France, some of them being as large as a human head, and most of them smaller than a fist. The appearance which this meteorite exhibits closely resembles that of a dull-colored earthy lignite. The masses are black and very friable, and fall to powder when placed in water; this is due to the removal of the soluble salts which cement the ingredients together. A shower of rain would have destroyed them. One hundred parts of this stone contain 5.92 parts of carbon itself, partly as a constituent of one organic compound, which Cloëz found to possess the following composition:

Carbon	63.45
Hydrogen	5.98
Oxygen	30.57
	<hr/> 100.00

Berthelot endeavored to reconstruct the body of which this is a decomposed product by means of hydriodic acid, and obtained a considerable quantity of the hydrocarbon $C_{2n}H_{2n+2}$ analogous to rock-oil. The reduction takes place less readily in this case than in that of coal. Dr. Lawrence Smith finds the combustible portion of the material to amount to about 4.5 per cent.

1867.—This Indian meteorite, which fell at Goalpara about the year 1867 (the exact date is not known), was examined by Tschermak, who found it to contain 0.85 per cent. of a hydrocarbon. The quantity, though small, materially affects the general appearance of the stone; it can be recognized under the microscope as a smoky-brown, lustreless ingredient accompanying the fragments of nickel-iron. Of the 0.85 per cent. 0.72 is carbon and 0.13 hydrogen. Tschermak suggests that the luminous phenomena so often attending the fall of an aërolite and the "tail" left by many meteors and shooting-stars may be due to the combustion of compounds of which carbon forms an important constituent.

1868. *July 11th*.—The curious meteorite of dull gray hue and loose structure which fell on this day at Ornans, Doubs, France, partly owes its dark color to the presence of a hydrocarbon.

1869. *January 1st*, 12.20 P.M.—A most remarkable fall of stones took place on New-Year's-day, 1869, at Hessele, near Upsala; it is the first aërolitic shower recorded to have taken place in

Sweden. The meteorites have so loose a structure that they break in pieces when thrown with the hand against the floor or frozen ground. The most interesting feature of the Hessele fall is the association, with the stones referred to, of matter mainly composed of carbon. The peasants of Hessele noticed that some of the meteorites which fell on the snow near Arnö soon crumbled to a blackish-brown powder resembling coffee-grounds. Similar powder was found on the ice at Häfslaviken in masses as large as the hand, which floated on water like foam, and could not be held between the fingers. A small amount secured for examination was found under the microscope to be composed of small spherules; it contained particles extractible by the magnet, and when ignited left a reddish-brown ash. Heated in a closed tube it gave a small brown distillate. A quantity dried at 110° C. possessed the following composition:

Carbon	51.6
Hydrogen	3.8
Oxygen (calculated)	15.7
Silicic acid	16.7
Iron protoxide	8.4
Magnesia	1.5
Lime	0.8
Soda and lithia	1.5
	<hr/> 100.0

The combustible ingredient appears to have the composition $nC_9H_4O_2$. It was noticed on this occasion that the stones found in the same district with the carbonaceous substance were, as a rule, quite round and covered on all sides with a black, dull, and often almost sponge-like crust. The iron particles on the surface of the smaller stones were usually quite bright and unoxidized, as though the stone had been heated in a reducing atmosphere. Nordenskjöld, who examined them, expresses the belief that this carbon compound frequently, perhaps invariably, occurs in association with the meteorites, and he attributes its preservation in this case to the fall of the stones on snow-covered ground.

1870.—During this year the Swedish Arctic Expedition discovered in the basalt of Ovifak, near Godhavn, island of Disko, Greenland, some enormous metallic masses which are generally regarded as blocks of meteoric iron. Like meteoric iron, they contain nickel and cobalt, but, unlike that iron, they are but slightly attacked by hydrochloric acid. The metal, moreover, when heated, evolves more than one hundred times its volume of a gas which burns with a pale-blue flame and is carbonic oxide mixed with a little carbonic acid; after this treatment the substance

dissolves in acid, leaving a carbonaceous residue. The composition of this remarkable "iron," if we may call it by that name, has been found by Wöhler to be as follows :

Iron	80.64
Nickel	1.19
Cobalt	0.49
Phosphorus	0.15
Sulphur	2.82
Carbon	3.67
Oxygen	11.09
	100.05

It appears to be a mixture of about forty per cent. of magnetite with metallic iron, its carbide, sulphide, and phosphide, and its alloys of nickel and cobalt, as well as some pure carbon in isolated particles.

From all this we see, though there is not a particle of evidence to prove the persistence of living germs on meteorites during their passage through our atmosphere, it is quite clear that the cosmical bodies, whatever they may have been, from which our meteorites were derived, may very probably have borne on their surface some forms of organized beings.

One objection which appears to have been raised to Sir William Thomson's theory was to the effect that germs could not exist without air ;

another that the low temperature to which they would be exposed before entering our atmosphere would suffice to destroy life. Micheli, in his valuable "Coup d'œil sur les principales Publications de Physiologie végétale," refers to the researches of Uloth,¹ who found that twenty-four species of plants which had been placed in a cave in the centre of a glacier germinated after the lapse of six weeks. *Lepidium ruderales* and *sativum*, *Sinapis alba*, and *Brassica Napus*, had germinated ; and at the close of four months other crucifers and some grasses and leguminous plants had germinated also. Haberlandt found that of a number of seeds which had been exposed for four months to a temperature of 0° to 10°, the following species flourished : rye, hemp, vetch, pea, mustard, camelina, two species of clover, and lucerne. The influence of the withdrawal of air from seeds on their power of germination has also been studied by Haberlandt. He found that seeds after they had been placed *in vacuo* germinated as usual. A slight retardation was noticed in the case of the seeds of the oat, the beet-root, and a bean, which appear to require the air contained in their tissues. In three experiments fifty-eight, thirty-two, and forty per cent. of the seeds germinated.

—*Popular Science Review*.

THE LIVINGSTONIA MISSION.

NARRATIVES OF DRs. J. THORNTON MACKLIN AND JAMES STEWART.

THE following interesting letters from Dr. J. Thornton Macklin and Dr. Stewart, of the Livingstonia Mission, have been forwarded to us from the Cape by Sir Bartle Frere :

"The site on which Blantyre Mission Station rests is an admirable one in every way, and reflects great credit on Mr. Henderson, who, it must be remembered, went out with the Free-Church party, under Mr. Young, of the Royal Navy, in 1875, for the purpose of looking round the country and finding out a suitable place where to establish our mission. In the course of his travels Mr. Henderson came to the conclusion that the most suitable locality would be somewhere in the Shire Highlands, among the Ageneas, and, if possible, in the vicinity of Magomero, the scene of the University Mission la-

bors. Accordingly, when our party had arrived out in 1876, and had reached Ramakukan's village, which it may be said is practically the head of the Shire navigation, though seven miles below Matili, to which place boats can reach, here Mr. Henderson left us, and went up the hill to fix definitely on a site for the settlement. I should have gone with him, but was ill with fever at the time. The carefulness and discrimination shown in the selection—the result of a long experience in Australia—clearly points out that Mr. Henderson was well worthy of the trust reposed in him, and well fitted to perform the difficult task laid upon him. A short time ago there was a village here, but it was deserted some time before we came, as the head-man had

¹ *Flora*, 1875, No. 17.

been killed, it is said, by Ramakukau. He was buried in his hut, which was knocked down, and the place was left. When Mr. Henderson came he found several standing, and these he had repaired and put in order for us to dwell in until such time as we got more suitable houses built.

"Now as to the advantage of the site, and first as to its healthiness. The altitude is good, as we are upon the third plateau of the Shire Hill, which is about 3,000 feet high. Thus we are high above the malarious level, not, I mean, to assert that altitude necessarily procures immunity from malaria, for even in the hills, if one chooses to settle down in a hollow or low-lying, marshy place, he will probably find more than enough of the miasmatic poison developed than is conducive to health. The temperature is very suitable, being equable, rarely in the shade rising above 80°, and rarely falling below 70°. Drainage is good, and is secured by the settlement standing on a rising ground or knoll, from which the ground slopes away in every direction, so that during the rainy season no water accumulates in our immediate vicinity.

"The water-supply is good, both as regards quality and quantity, and it is but a short distance off. Again, almost every day a fine breeze prevails, which is cool and bracing, yet mild. I think, therefore, all things being considered, I can congratulate both ourselves and the friends of the mission at home on the healthiness of Blantyre. Concerning the matter of cultivation, things are satisfactory. The soil is good, and already we have got a large garden, producing not only plants indigenous to the soil, but also home-plants and others we got from the Cape. Now a few words as to the conveniences of the situation. We are but two days' march from Ramakukau's, thus we can have speedy access to the coast, Kongoni, or Quillimane. Again, we are within the same number of days' journey from Pimbe, on the Upper Shire, the place to which the *Ilala*, the steamer of the Free-Church party, comes down, so we are also within speedy communication with Lake Nyassa. Lake Shirwa is only three days off at the most, and from there the natives bring us very good fish. We are also only one day's journey from the Ruu; but as it flows through a bad and uninhabited country, it cannot be said to be much of an advantage in the mean time.

"*General Aspect of the Country.*—Hills and dales, all well wooded and covered with vegetation of different kinds—in some places very rank and dense indeed. I have been caught and held

fast in the thicket more than once. In most parts wild-flowers abound of many and varied hues, which, in the midst of the fresh green verdure that prevails, relieves it, and is very pleasing to the eye, and in some cases our sense of smell is much gratified. Our water-courses and streams are rich with vegetation of every kind and variety. Many different kinds of ferns abound; but I do not think any have yet been found that are not also to be found at home. Very fine and large trees are plentiful on the banks of the streams, too, and some good planks might be got out of them; but generally the trees which prevail over the country are low and stunted: they are principally acacias. Sometimes one emerges from the wood into fine glades covered with long, waving green grass; these, in some cases, much resemble the parks in the confines of a gentleman's grounds at home. They are very picturesque. The mountains are high and steep, with many deep ravines. They are clad with verdure to the very top, from the midst of which the brown rocks may be seen lifting up their ancient, weather-beaten heads, lending enchantment to the view. Here and there are large fields of corn and pumpkins flourishing, helping to relieve the wild appearance of the country. The gardens are often far away from the villages in the season, the people leaving their homes, and living in temporary habitations for the purpose of cultivating them.

"The people are quiet and peaceable and well disposed. They are fond of fun and music. They are impressive, expressing great surprise and pleasure at the sight of pictures, our guns, pistols, watches, and other, to them, wonderful things. They are quick and intelligent, and pick up with a wonderful degree of alacrity what you want or mean. Their features are not at all unpleasant to look upon, and there is great variety; the expression is generally happy and comparatively intelligent. Their stature is very good, and so, too, their physique; in height, on an average, of about 5 feet 6 inches to 5 feet 8 inches. The following measurements I have taken, of which I give the average: the head, in circumference, 21½ inches; chest, 34½ inches; arm in length, 22½ inches; hand, 6½ inches. The measurement of the pelvis by a foot I have not yet ascertained, but they are well proportioned. They are lithe, supple, and active in their movements. They are a bow-and-arrow people, and distinguished from those tribes whose chief weapon is the spear, though now many of them have flint-lock muskets, which, curiously enough, are all branded Forty-second Regiment, and have a crown

on them. There is one thing they are very fond of doing, and that is, gathering themselves together to one place, talking and drinking *pombe*, i. e., native beer—of course, men only; the women do not take part in these proceedings. Smoking is a common habit among them; even women and very little boys smoke, and if they would confine themselves to tobacco it would not matter much; but they have a very pernicious habit of smoking hemp and bangue, which produces a kind of intoxication—an hysterical fit I should be inclined to call it; but the effect it produces, be it what it may, seems to be very pleasant, for they practise the habit most pertinaciously, though it produces a severe fit of coughing, which is most painful to hear, if not to experience. The women, like the men, are well formed, and of a good height. They seem quite contented and happy, though undoubtedly they do the most work; still, they are not in any way ill-used by the men. The features of most of the elderly women are disfigured by tattoo-marks, and the hideous lip-ring, or *pilele*; I say the elder women, for I am happy to say that the younger women are not adopting the foolish fashion of wearing the *pilele*, though most undergo the tattooing operation.

Industries.—These are chiefly iron manufactured into various stages, in which they have reached a considerable degree of perfection. *Basket-making.*—In this I would say they have reached perfection, but then I am not a competent judge. *Cloth-Manufacture.*—In this trade their attainments are of no mean order, both as regards cloth manufactured from the bark of trees or that from cotton. Of these I will give you more details in a future letter, when I will also speak of their habits, houses, food, and other matters that may prove of interest."

The following letter is from the leader of the expedition, Dr. Stewart, to Mr. Dunn:

"LIVINGSTONIA, LAKE NYASSA,

"February 27, 1877.

"Since I wrote you in December, I am glad to be able to say that things here have been going on well, nothing of any consequence of an untoward kind having occurred, while there is much to be thankful for. There have been a few cases of fever, mostly slight, and lasting only a day or two. With this exception, and that of a chronic case which improves but slowly, the health of the party is fairly good; we cannot expect, in latitude 14° in Central Africa, the robust vigor and energy we enjoy in latitude 30° or 50°.

"During the last few weeks, or since the beginning of this year, Livingstonia seems to have taken a start, and begun to grow in one of the directions we specially wish it to grow—as an antislavery centre. There were very few people actually settled here in 1876: up to October, at least, not a dozen. Since then, some five or six parties, the smallest numbering from one or two up to twenty-two, have come seeking the protection of the English. The story of these twenty-two is this: A man arrived here in the middle of the night, in the fragments of a large canoe, in which I feel certain no white man would venture one hundred yards from the shore, yet it appears that he had been part of the two days and nights in this crazy affair. He had slept on the sand all night, and made his appearance in the station about six in the morning. He was in a woful condition, but told his story with directness, and said he and twenty-one others were about to be sold by Inpemba, a notorious slaver on the western shore of the lake; that they saw the *dhow* which had come, and having got information from a friend, they fled in the night, in a large canoe, and made for an island to the north; that their canoe had got broken on the rocks as they landed, and he had come in the patched-up fragments to ask the assistance and protection of the English; that there were twenty-one men, women, and children, on the island. There was not much time for delay or consideration—they had nothing to eat, and no means of getting away. We accordingly got up steam in the *Ilala*, and, taking the fugitive for our guide, made for the island, which we reached about one o'clock. We approached it cautiously, partly on account of the rocks, and partly because I was not sure whether he might not be leading us into some trap, though I have never uttered that opinion till now; but a little doubt in such circumstances, and with new men, is wholesome. The natives saw us, though we did not first see them, as the trees come down to the water's edge. He shouted, and they replied. We sent off the boat, and shortly had all of them on board. There they certainly were—twenty-two men, women, and children. They had only a few hoes, the bows and arrows usually carried by the natives, a little maize in a calabash, and a few wild roots gathered on the island. We got up the anchor and steamed off, arriving at the station at sunset; and the Fugitive-Slave Circular never crossed my mind till I sat down to write this. On the contrary, as we made rapid way homeward over the glassy lake, on a very fine afternoon, I thought the

Ilaia was just about her proper work. It is true she is not a fighting-ship, intended to burn and sink dhows, and frighten Arabs out of their skins and color, but she is peacefully circumventing those senseless chiefs who weaken themselves by selling their people; and in many ways the steamer has been a great element in our progress and in the security of the position we have attained. Both would have been different and very much less without the steamer. Of course the slaving chiefs cannot look with friendly eyes on these doings, and two efforts have been made to get back the refugees. We have seen no occasion, except in one instance, to give them up, and the applicants have generally departed crestfallen. We tell them—if any man accused of a serious crime comes, and they show that he is guilty, we shall not receive him; but any one running away to escape being sold, will be protected. Out of these cases some complications may yet arise of an unlooked-for kind. In the mean time we cannot do otherwise than as we are doing, even though the increasing numbers lead us into a difficulty about food till their crops are ready, and some were rather late in sowing. We have to feed about one hundred daily, and even though the ration is little over one and a half pound of maize, we are sometimes in a strait; a ton of maize or Caffre corn does not last much more than a fortnight or three weeks. But this giving out of food is not gratuitous; all work at roads, fields, or house-building, or whatever is on hand. We have not an idler about the place, not one. The rule is simple: He who will not work for his daily maize stays not here.

“The school goes on steadily; and the daily meeting with the people, now generally held in the evening, is kept up regularly, and apparently with interest. The meeting is frequently closed by one of Moody and Sankey’s hymns; and when it is well sung in parts, it produces a very marked effect, even though they understand but generally what the hymn is about from a few words of previous explanation. I have great faith in the daily religious service. Some time soon it will bear fruit.

“The first task of ivory was brought into the settlement a fortnight ago, and bought by Mr. Cotterill for £14. I shall not mention the weight of it, but simply say I would not recommend any one to come here to purchase ivory at present, with the view of making a profitable business of it. Mr. Cotterill apparently bought it simply to commence operations and to encourage the others.

“Our first visitor from the outside world also arrived at Livingstonia the other day. He comes straight from the Punjab, where he has been working as an engineer for eight years on the Sirhind Canal, and having a furlough of two years, and having also been in Europe lately, and wishing to spend a part of his furlough in some useful way, comes here and asks if he can help us, and place himself as a volunteer on the Livingstonia force for a year; and all this from pure interest in the enterprise and in the success of missionary work. If he was not a relative of my own, and also a James Stewart, I should be disposed to say this example is worth following by Christian men who have occasional periods of leisure. He is a vigorous young fellow who does not care for spending two years in lounging about Continental picture-galleries or in the pleasant work of the old country, but who believes he can be of use elsewhere, and forthwith, after one or two letters on the subject, starts off, and we have him here among us. The idea is a new one: and it suggests that many young men of different professions and occupations might aid the mission cause temporarily and yet permanently benefit it by a similar course of action. His coming has already benefited us, and cleared up our misty news on various pieces of work going on or to be attempted. The first important work, however, that he will undertake will be a survey of a road over the Murchison Cataracts. We shall probably offer this survey, when completed, to one of the branches of this great International Society inaugurated by the King of the Belgians; it will form an *experimentum crucis* as to whether actual work is intended by that Society. If they do not aid in the making of the road, we shall just have to make it in an inferior style ourselves.

“We also got here last week our first importation of cattle, consisting of seven cows, three calves, and a bull. They were brought 450 miles, partly by land and partly in the steamer, and the business was well managed by Dr. Laws. I fear, however, we have *tsetse* in this district, and, if so, it is a heavy blow to us. A short time will make the matter plain—a few months at most. No worse blow to our peaceful progress and prosperity could occur than this.

“Since writing the above an accident to a portion of the machinery of the steamer has caused delay in sending this off. The mischief is now quite repaired.

“March is one of the most unhealthy months here (April farther down), and both Dr. Laws

and myself have had pretty severe attacks, and some of the others have also suffered. The last man to succumb, Shadrach Ngunana, from Lovedale, who has never yet had the slightest touch of fever, has suffered slightly. Average health

among the others. A greater variety and better food would prevent that anæmia that seems to be the worst part of the fever.

“JAMES STEWART.”

—*Geographical Magazine.*

BRIEF NOTES.

The Volcanoes of Iceland.—Prof. Johnstrup, sent to Iceland by the Danish Government for the purpose of exploring the scene of the recent volcanic disturbances in that island, has made his official report, a summary of which we find in *Nature*. He first examined the volcanoes of the Dyngju Mountains. These mountains are not of volcanic origin. The Askja Valley, which the Dyngju Mountains encircle, was evidently much deeper in former times than at present: repeated flows of lava have gradually filled it up. Along the outer edge of the Dyngju Mountains are numerous craters, which have contributed most of the lava covering the plain of Odadah-rann. In the neighborhood of the newly-found craters the earth is covered, to the distance of over a mile, with the bright-yellow pumice-stone ejected during the eruption of March 29, 1875. In places where the pumice-stone is several feet in depth, it covers a layer of snow twenty-five feet deep, and this snow has ever since been protected from the effects of solar heat by the feeble conducting power of its covering. Not a trace of a lava-stream is to be found. At present the craters are to be regarded as gigantic steam-escape tubes, the activity of which will continue for an uncertain period with gradually-decreasing intensity. The volcanoes in Myvatns Örafi presented entirely different characteristics. In the centre of this barren plain, thirty-five miles long, thirteen wide, a volcano suddenly appeared on February 18, 1875, and four others appeared subsequently. They emitted a mass of lava estimated at 10,000,000,000 cubic feet. This lava was basaltic and viscous when emitted, and crystals of chloride of ammonium were found in the vicinity of the craters.

Epidemics of Trichinosis.—Between the years 1860 and 1875 there appeared in the kingdom of Saxony 39 epidemics of trichinosis, with 1,267 cases of this disease and 19 deaths. From a brief digest of the statistics of trichinosis published in the *Medical and Surgical Reporter* it appears that

only a small proportion of the cases arose from eating raw pork, while one-half were produced by eating smoked sausages, which, however, caused only two deaths. Among 340 persons who partook of well-cooked sausages eight died. The epidemic appeared in 15 places once, in seven places more than once, and in Dresden seven times. In most instances the number of persons attacked was small, the highest numbers being 209, 140, and 199, and only one death resulted from the total of 548 cases occurring in these epidemics. In several of the “epidemics” (?) the number of cases was as low as from one to seven. The mean ($32\frac{1}{2}$) of the 39 epidemics was scarcely exceeded in one-fourth of the places, while in three-quarters of the other places the mean was not reached. In many instances the number of cases was so small as to show that a trichinized animal may be entirely consumed without inducing the disease at all. It is calculated that 100 trichinized pigs will give rise to only four cases of the disease in man.

Mushroom-Culture in Japan.—The Japanese mode of raising mushrooms, as described by Mr. Robertson, British consul, is as follows: About the beginning of autumn the trunk, about five or six inches in diameter, of the *shu* or some other tree of the oak kind, is selected and cut into lengths of four or five feet; each piece is then split lengthwise into four, and on the outer bark slight incisions are either made at once with a hatchet, or the cut logs are left till the following spring, and then deep wounds, seven or eight inches long, are incised in them. In the former case the logs are placed in a wood or grove, where they can get the full benefit of the air and heat; in about three years they will be tolerably rotten in parts. After the more rotten parts are removed, they are placed against a rack in a slanting position, and about the middle of the ensuing spring the mushrooms will come forth in abundance. They are then gathered. The logs are, however, still kept, and submitted to the following process: Every morning they are put in water

where they remain till afternoon, when they are taken out, laid lengthwise on the ground, and beaten with a mallet. They are then ranged on end, slanting as before, and in two or three days mushrooms again make their appearance. In Yen-shin the custom is to beat the log so heavily that the wood swells, and this induces mushrooms of more than ordinary size. If the logs are beaten gently, a great number of small mushrooms grow up in succession.

The Period of Incubation in Hydrophobia.—

An apparently well-proved case of hydrophobia, occurring five years after the lesion which occasioned it, is reported for the *Lancet* by Dr. Hulme. The history of the case is as follows: A muscular agricultural laborer, fifty-one years of age, was very slightly bitten in the finger by a mad dog in 1872. He had the wound thoroughly cauterized, and, as his health seemed in no way affected, soon forgot all about it. But on Monday, June 25th, in the present year, he complained of a general *malaise* and pain in the arm to which the bitten finger belonged. The next day this pain had so increased that he gave up work, and, becoming alarmed, sent for a surgeon. By ten o'clock on the Wednesday the man began to be plainly hydrophobic. When the physician saw him, three hours later, he was sitting up in bed very quietly, but troubled with a terrible misgiving, because he felt frightened at the water in the room. This terror manifested itself when the doctor presented the medicine in a fluid state. The glass was nervously seized, and the act of swallowing was attended with convulsive shuddering. The pain soon extended from the arm to the neck, and thence to the diaphragm. Respiration became difficult; saliva was ejected by jerky discharges, and the jaws moved as though the patient were hawking and spitting. The snap and the bark soon followed, and he threw himself on and off the bed with loud, hoarse screams. In his few moments of consciousness he begged his friends not to approach him, lest he should bite them. The incessant paroxysms soon began to tell upon his frame, and the feeling of suffocation grew more severe each moment. Nervous exhaustion came on, but the patient never reached coma, for eleven hours after his seizure he died of suffocation.

Nicotine-Poisoning.—There occurred recently, in England, a case of fatal poisoning by nicotine,

which is worthy of record, inasmuch as it may serve as a warning. A child, three years of age, was permitted by his father to use an old wooden pipe for blowing soap-bubbles. The child was then quite well, but an hour later became sick, vomited very much, and afterward became very drowsy and pale. The next day he was worse; castor-oil was administered, and he was put to bed. After a bad night, he was very much worse on the following morning, and in the evening medical advice was sought. But to no avail, for the child grew steadily worse, and died after a few hours. The physician said that the deceased was suffering from narcotic poison when he first saw him; that he was easily aroused, and could answer questions. Two drops of nicotine suffice to kill an adult man, and one drop would kill a large dog; while a very small quantity would be enough to kill a child.

THE subject of forming an inland sea in Algeria is still warmly discussed in France. At one of the late meetings of the Paris Academy of Sciences, M. Augot said that the dominant winds of Algeria are not those which have hitherto been regarded as such, namely, southeast, south, and southwest, and are not such as would produce the good effects expected from this artificial sea. The favorable winds are to the others in the proportion of one to nine. The vapor which they would carry would be borne almost entirely toward the Sahara, without benefit to Algeria. M. Augot further estimates, from observation, that the average layer of water raised by evaporation from the proposed inland sea in twenty-four hours, would be more than six millimetres; this would require the canal of communication to bring daily at least 78,000,000 cubic metres of water to keep the lake-level constant.

A MERCANTILE firm in Aberdeen, interested in the herring-fisheries of Scotland, keep a number of carrier-pigeons, one of which is sent out with each boat in the afternoon, and liberated the following morning, to carry intelligence to headquarters of the quantity of herrings taken, position of the boat, direction of the wind, prospects of the return-journey, etc. If a boat's crew need assistance, a tug can be at once dispatched to their aid. Another advantage of this system is, that the men ashore know exactly what quantity of herrings are to be landed, and so can make preparations for expediting the delivery and curing of the fish.

SCIENCE AND MAN.¹

By JOHN TYNDALL, F. R. S., LL. D.

A MAGNET attracts iron, but, when we analyze the effect, we learn that the metal is not only attracted but repelled, the final approach to the magnet being due to the difference of two unequal and opposing forces. Social progress is, for the most part, typified by this duplex or polar action. As a general rule, every advance is balanced by a partial retreat, every amelioration is associated more or less with deterioration. No great mechanical improvement, for example, is introduced for the benefit of society at large that does not bear hardly upon individuals. Science, like other things, is subject to the operation of this polar law, what is good for it under one aspect being bad for it under another.

Science demands above all things personal concentration. Its home is the study of the mathematician, the quiet laboratory of the experimenter, and the cabinet of the meditative observer of Nature. Different atmospheres are required by the man of science, as such, and the man of action. The atmosphere, for example, which vivifies and stimulates your excellent representative, Mr. Chamberlain, would be death to me. There are organisms which flourish in oxygen—he is one of them. There are also organisms which demand for their duller lives a less vitalizing air—I am one of these. Thus the facilities of social and international intercourse, the railway, the telegraph, and the post-office, which are such undoubted boons to the man of action, react to some extent injuriously on the man of science. Their tendency is to break up that concentrativeness which, as I have said, is an absolute necessity to the scientific investigator.

The men who have most profoundly influenced the world from the scientific side have habitually sought isolation. Faraday, at a certain period of his career, formally renounced dining out. Darwin lives apart from the bustle of the world in his quiet home in Kent. Mayer and Joule dealt in unobtrusive retirement with the weightiest scientific questions. None of these men, to my knowledge, ever became Presidents of the Midland Institute or of the British Association. They could not fail to know that both positions are posts of honor, but they would also

know that such positions cannot be filled without grave disturbance of that sequestered peace which, to them, is a first condition of intellectual life.

There is, however, one motive-power in the world which no man, be he a scientific student or otherwise, can afford to treat with indifference, and that is the cultivation of right relations with his fellow-men—the performance of his duty, not as an isolated individual, but as a member of society. Such duty often requires the sacrifice of private ease to the public wishes, if not to the public good. From this point of view, the invitation conveyed to me more than once by your excellent senior vice-president was not to be declined. It was an invitation written with the earnestness said to be characteristic of a radical, and certainly with the courtesy characteristic of a gentleman. It quickened within me the desire to meet, in a cordial and brotherly spirit, the wish of an institution of which not only Birmingham, but England, may well be proud, and of whose friendliness to myself I had agreeable evidence in the letters of Mr. Thackray Bunce.

To look at his picture as a whole a painter requires distance, and to judge of the total scientific achievement of any age the standpoint of a succeeding age is desirable. We may, however, transport ourselves in idea into the future, and thus obtain a grasp, more or less complete, of the science of our time. We sometimes hear it decried and contrasted to its disadvantage with the science of other times. I do not think that this will be the verdict of posterity. I think, on the contrary, that posterity will acknowledge that, in the history of science, no higher samples of intellectual conquest are recorded than those which this age has made its own. One of the most salient of these I propose, with your permission, to make the subject of our consideration during the coming hour.

It is now generally admitted that the man of today is the child and product of incalculable antecedent time. His physical and intellectual textures have been woven for him during his passage through phases of history and forms of existence which lead the mind back to an abysmal past. One of the qualities which he has derived from that past is the yearning to let in the light of

¹ Presidential address, delivered before the Birmingham and Midland Institute, October 1, 1877; with additions.

principles on the otherwise bewildering flux of phenomena. He has been described by the German Lichtenberg as "das rastlose Ursachenthier"—the restless, cause-seeking animal, in whom facts excite a kind of hunger to know the sources from which they spring. Never, I venture to say, in the history of the world, has this longing been more liberally responded to, both among men of science and the general public, than during the last thirty or forty years. I say "the general public," because it is a feature of our time that the man of science no longer limits his labors to the society of his colleagues and his peers, but shares, as far as it is possible to share, with the world at large the fruits of inquiry.

The celebrated Robert Boyle regarded the universe as a machine; Mr. Carlyle prefers regarding it as a tree. He loves the image of the umbrageous Igdasil better than that of the Strasburg clock. A machine may be defined as an organism with life and direction outside; a tree may be defined as an organism with life and direction within. In the light of these definitions, I close with the conception of Carlyle. The order and energy of the universe I hold to be inherent, and not imposed from without—the expression of fixed law and not of arbitrary will, exercised by what Carlyle would call an almighty clock-maker. But the two conceptions are not so much opposed to each other, after all. In one fundamental particular they, at all events, agree. They equally imply the interdependence and harmonious interaction of parts, and the subordination of the individual powers of the universal organism to the working of the whole.

Never were the harmony and interdependence just referred to so clearly recognized as now. Our insight regarding them is not that vague and general insight to which our fathers had attained, and which, in early times, was more frequently affirmed by the synthetic poet than by the scientific man. The interdependence of our day has become quantitative—expressible by numbers—leading, it must be added, directly into that inexorable reign of law which so many gentle people regard with dread. In the domain now under review, men of science had first to work their way from darkness into twilight, and from twilight into day. There is no solution of continuity in science. It is not given to any man, however endowed, to rise spontaneously into intellectual splendor without the parentage of antecedent thought. Great discoveries grow. Here, as in other cases, we have first the seed, then the ear, then the full corn in the ear,

the last member of the series implying the first. Thus, as regards the discovery of gravitation, with which the name of Newton is identified, notions more or less clear concerning it had entered many minds before Newton's transcendent mathematical genius raised it to the level of a demonstration. The whole of his deductions, moreover, rested upon the inductions of Kepler. Newton shot beyond his predecessors, but his thoughts were rooted in their thoughts, and a just distribution of merit would assign to them a fair portion of the honor of discovery.

Scientific theories sometimes float like rumors in the air before they receive definite expression. The doom of a doctrine is often practically sealed, and the truth of one is often practically accepted, long prior to the theoretic demonstration of either the error or the truth. Perpetual motion, for example, was discarded before it was proved to be in opposition to natural law; and, as regards the connection and interaction of natural forces, prenatal intimations of modern discoveries and results are strewn through scientific literature.

Confining ourselves to recent times, Dr. Ingleby has pointed out to me some singularly sagacious remarks bearing upon this question, which were published by an anonymous writer in 1820. Roger's penetration was conspicuous in 1829. Mohr had grasped, in 1837, some deep-lying truth. The writings of Faraday furnish frequent illustrations of his profound belief in the unity of Nature. "I have long," he writes, in 1845, "held an opinion almost amounting to conviction, in common, I believe, with other lovers of natural knowledge, that the various forms under which the forces of matter are made manifest have one common origin; or, in other words, are so directly related and mutually dependent, that they are convertible, as it were, one into another, and possess equivalence of power in their action." His own researches on magneto-electricity, on electro-chemistry, and on the "magnetization of light," led him directly to this belief. At an early date Mr. Justice Grove made his mark upon this question. Colding, though starting from a metaphysical basis, grasped eventually the relation between heat and mechanical work, and sought to determine it experimentally. And here let me say that to him who has only the truth at heart, and who in his dealings with scientific history keeps his soul unwarped by envy, hatred, or malice, personal or national, every fresh accession to historic knowledge must be welcome. For every new-comer of proved merit,

more especially if that merit should have been previously overlooked, he makes ready room in his recognition or his reverence. But no retrospect of scientific literature has as yet brought to light a claim which can sensibly affect the positions accorded to two great *Path-headers*, as the Germans call them, whose names in relation to this subject are linked in indissoluble association. These names are Julius Robert Mayer and James Prescott Joule.

In his essay on "Circles," Mr. Emerson, if I remember rightly, pictured intellectual progress as rhythmic. At a given moment knowledge is surrounded by a barrier which marks its limit. It gradually gathers clearness and strength, until, by-and-by, some thinker of exceptional power bursts the barrier and wins a wider circle, within which thought once more intrenches itself. But the internal force again accumulates, the new barrier is in its turn broken, and the mind finds itself surrounded by a still wider horizon. Thus, according to Emerson, knowledge spreads by intermittent victories instead of progressing at a uniform rate.

When Dr. Joule first proved that a weight of one pound, falling through a height of 772 feet, generated an amount of heat competent to warm a pound of water one degree Fahrenheit, and that in lifting the weight so much heat exactly disappeared, he broke an Emersonian "circle," releasing by the act an amount of scientific energy which rapidly overran a vast domain. Helmholtz, Clausius, Thomson, Rankine, Regnault, Woods, Farre, and other illustrious names, are associated with the conquests since achieved and embodied in the great doctrine known as the "Conservation of Energy." This doctrine recognizes in the material universe a constant sum of power made up of items among which the most protean fluctuations are incessantly going on. It is as if the body of Nature were alive, the thrill and interchange of its energies resembling those of an organism. The parts of the "stupendous whole" shift and change, augment and diminish, appear and disappear, while the total of which they are the parts remains quantitatively immutable—immutable, because when change occurs it is always polar—plus accompanies minus, gain accompanies loss, no item varying in the slightest degree without an absolutely equal change of some other item in the opposite direction.

The sun warms the tropical ocean, converting a portion of its liquid into vapor, which rises in the air and is recondensed on mountain-heights, returning in rivers to the ocean from which it came. Up to the point where condensation begins an

amount of heat exactly equivalent to the molecular work of vaporization and the mechanical work of lifting the vapor to the mountain-tops has disappeared from the universe. What is the gain corresponding to this loss? It will seem when mentioned to be expressed in a foreign currency. The loss is a loss of heat; the gain is a gain of distance, both as regards masses and molecules. Water which was formerly at the sea-level has been lifted to a position from which it can fall; molecules which had been locked together as a liquid are now separate as vapor which can recondense. After condensation gravity comes into effectual play, pulling the showers down upon the hills, and the rivers thus created through their gorges to the sea. Every rain-drop which smites the mountain produces its definite amount of heat; every river in its course develops heat by the clash of its cataracts and the friction of its bed. In the act of condensation, moreover, the molecular work of vaporization is accurately reversed. Compare, then, the primitive loss of solar warmth with the heat generated by the condensation of the vapor, and by the subsequent fall of the water from cloud to sea. They are mathematically equal to each other. No particle of vapor was formed and lifted without being paid for in the currency of solar heat; no particle returns as water to the sea without the exact quantitative restitution of that heat. There is nothing gratuitous in physical Nature, no expenditure without equivalent gain, no gain without equivalent expenditure. With inexorable constancy the one accompanies the other, leaving no nook or crevice between them for spontaneity to mingle with the pure and necessary play of natural force. Has this uniformity of Nature ever been broken? The reply is, "Not to the knowledge of Science."

What has been here stated regarding heat and gravity applies to the whole of inorganic Nature. Let us take an illustration from chemistry. The metal zinc may be burned in oxygen, a perfectly definite amount of heat being produced by the combustion of a given weight of the metal. But zinc may also be burned in a liquid which contains a supply of oxygen—in water, for example. It does not in this case produce flame or fire, but it does produce heat which is capable of accurate measurement. But the heat of zinc burned in water falls short of that produced in pure oxygen, the reason being that to obtain its oxygen from the water the zinc must first dislodge the hydrogen. It is in the performance of this molecular work that the missing

heat is absorbed. Mix the liberated hydrogen with the oxygen and cause them to recombine, the heat developed is mathematically equal to the missing heat. Thus in pulling the oxygen and hydrogen asunder an amount of heat is consumed which is accurately restored by their reunion.

This leads up to a few remarks upon the voltaic battery. It is not my design to dwell upon the technic features of this wonderful instrument, but simply by means of it to show what varying shapes a given amount of energy can assume while maintaining unvarying quantitative stability. When that form of power which we call an electric current passes through Grove's battery, zinc is consumed in acidulated water, and in the battery we are able so to arrange matters that when no current passes no zinc shall be consumed. Now the current, whatever it may be, possesses the power of generating heat outside the battery. We can fuse with it iridium, the most refractory of metals, or we can produce with it the dazzling electric light, and that at any terrestrial distance from the battery itself.

We will now, however, content ourselves with causing the current to raise a given length of platinum wire, first to a blood-heat, then to redness, and finally to a white heat. The heat under these circumstances generated in the battery by the combustion of a fixed quantity of zinc is no longer constant, but it varies inversely as the heat generated outside. If the outside heat be *nil*, the inside heat is a maximum; if the external wire be raised to a blood-heat, the internal heat falls slightly short of the maximum. If the wire be rendered red-hot, the quantity of missing heat within the battery is greater, and, if the external wire be rendered white-hot, the defect is greater still. Add together the internal and external heat produced by the combustion of a given weight of zinc, and you have an absolutely constant total. The heat generated without is so much lost within, the heat generated within is so much lost without, the polar changes already adverted to coming here conspicuously into play. Thus, in a variety of ways, we can distribute the items of a never-varying sum, but even the subtle agency of the electric current places no creative power in our hands.

Instead of generating external heat we may cause the current to effect chemical decomposition at a distance from the battery. Let it, for example, decompose water into oxygen and hydrogen. The heat generated in the battery under these circumstances by the combustion of a given weight

of zinc falls short of what is produced when there is no decomposition. How far short? The question admits of a perfectly exact answer. When the oxygen and hydrogen recombine, the heat absorbed in the decomposition is accurately restored, and it is exactly equal in amount to that missing in the battery. We may, if we like, bottle up the gases, carry in this form the heat of the battery to the polar regions, and liberate it there. The battery, in fact, is a hearth on which fuel is consumed, but the heat of the combustion, instead of being confined in the usual manner to the hearth itself, may be first liberated at the other side of the world.

And here we are able to solve an enigma which long perplexed scientific men, and which could not be solved until the bearing of the mechanical theory of heat upon the phenomena of the voltaic battery was understood. The puzzle was, that a single cell could not decompose water. The reason is now plain enough. The solution of an equivalent of zinc in a single cell develops not much more than half the amount of heat required to decompose an equivalent of water, and the single cell cannot cede an amount of force which it does not possess. But by forming a battery of two cells, instead of one, we develop an amount of heat slightly in excess of that needed for the decomposition of the water. The two-celled battery is therefore rich enough to pay for that decomposition, and to maintain the excess referred to within its own cells.

Similar reflections apply to the thermo-electric pile, an instrument usually composed of small bars of bismuth and antimony soldered alternately together. The electric current is here evoked by warming the soldered junctions of one face of the pile. Like the Voltaic current, the thermo-electric current can heat wires, produce decomposition, magnetize iron, and deflect a magnetic needle at any distance from its origin. You will be disposed, and rightly disposed, to refer those distant manifestations of power to the heat communicated to the face of the pile, but the case is worthy of closer examination. In 1826 Thomas Seebeck discovered thermo-electricity, and six years subsequently Peltier made an observation which comes with singular felicity to our aid in determining the material used up in the formation of the thermo-electric current. He found that when a weak extraneous current was sent from antimony to bismuth, the junction of the two metals was always heated, but that when the direction was from bismuth to antimony, the junction was chilled. Now, the current in the

thermo-pile itself is always from bismuth to antimony, across the heated junction—a direction in which it cannot possibly establish itself without consuming the heat imparted to the junction. This heat is the nutriment of the current. Thus the heat generated by the thermo-current in a distant wire is simply that originally imparted to the pile, which has been first transmuted into electricity, and then retransmuted into its first form at a distance from its origin. As water in a state of vapor passes from a boiler to a distant condenser, and there assumes its primitive form without gain or loss, so the heat communicated to the thermo-pile distills into the subtler electric current, which is, as it were, recondensed into heat in the distant platinum wire.

In my youth I thought an electro-magnetic engine which was shown to me a veritable perpetual motion—a machine, that is to say, which performed work without the expenditure of power. Let us consider the action of such a machine. Suppose it to be employed to pump water from a lower to a higher level. On examining the battery which works the engine we find that the zinc consumed does not yield its full amount of heat. The quantity of heat thus missing within is the exact thermal equivalent of the mechanical work performed without. Let the water fall again to a lower level, it is warmed by the fall. Add the heat thus produced to that generated by the friction, mechanical and magnetic, of the engine, we thus obtain the precise amount of heat missing in the battery. All the effects obtained from the machine are thus strictly paid for; this “payment for results” being, I would repeat, the inexorable method of Nature.

No engine, however subtly devised, can evade this law of equivalence, or perform on its own account the smallest modicum of work. The machine distributes, but it cannot create. Is the animal body, then, to be classed among machines? When I lift a weight, or throw a stone, or climb a mountain, or wrestle with my comrade, am I not conscious of actually creating and expending force? Let us look to the antecedents of this force. We derive the muscle and fat of our bodies from what we eat. Animal heat you know to be due to the slow combustion of this fuel. My arm is now inactive, and the ordinary slow combustion of my blood and tissue is going on. For every grain of fuel thus burned a perfectly definite amount of heat has been produced. I now contract my biceps muscle without causing it to perform external work. The

combustion is quickened and the heat is increased, this additional heat being liberated in the muscle itself. I lay hold of a fifty-six-pound weight, and by the contraction of my biceps lift it through the vertical space of a foot. The blood and tissue consumed during this contraction have not developed in the muscle their due amount of heat. A quantity of heat is at this moment missing in my muscle which would raise the temperature of an ounce of water somewhat more than one degree Fahrenheit. I liberate the weight, it falls to the earth, and by its collision generates the precise amount of heat missing in the muscle. My muscular heat is thus transferred from its local hearth to external space. The fuel is consumed in my body, but the heat of combustion is produced outside my body. The case is substantially the same as that of the voltaic battery when it performs external work or produces external heat. All this points to the conclusion that the force we employ in muscular exertion is the force of burning fuel and not of creative will. In the light of these facts the body is seen to be as incapable of generating energy without expenditure as the solids and liquids of the voltaic battery. The body, in other words, falls into the category of machines.

We can do with the body all that we have already done with the battery—heat platinum wires, decompose water, magnetize iron, and deflect a magnetic needle. The combustion of muscle may be made to produce all these effects, as the combustion of zinc may be caused to produce them. By turning the handle of a magneto-electric machine, a coil of wire may be caused to rotate between the poles of a magnet. As long as the two ends of the coil are unconnected we have simply to overcome the ordinary inertia and friction of the machine in turning the handle. But the moment the two ends of the coil are united by a thin platinum wire a sudden addition of labor is thrown upon the turning arm. When the necessary labor is expended, its equivalent immediately appears. The platinum wire glows. You can readily maintain it at a white heat or even fuse it. This is a very remarkable result. From the muscles of the arm, with a temperature of 100°, we extract the temperature of molten platinum, which is many thousand degrees. The miracle here is the reverse of that of the burning bush mentioned in Exodus. There the bush burned but was not consumed: here the body is consumed but does not burn. The similarity of the action with that of the voltaic battery when it heats an external wire is too obvious to need

pointing out. When the machine is used to decompose water, the heat of the muscle, like that of the battery, is consumed in molecular work, being fully restored when the gases recombine. As before, also, the transmuted heat of the muscles may be bottled up, carried to the polar regions, and there restored to its pristine form.

The matter of the human body is the same as that of the world around us, and here we find the forces of the human body identical with those of inorganic Nature. Just as little as the voltaic battery is the animal body a creator of force. It is an apparatus exquisite and effectual beyond all others in transforming and distributing the energy with which it is supplied, but it possesses no creative power. Compared with the notions previously entertained regarding the play of "vital force," this is a great result. The problem of vital dynamics has been described by a competent authority as "the grandest of all." I subscribe to this opinion, and honor correspondingly the man who first successfully grappled with the problem. He was no pope in the sense of being infallible, but he was a man of genius whose work will be held in honor as long as science endures. I have already named him in connection with our illustrious countryman Dr. Joule. Other eminent men took up this subject subsequently and independently; but all that has been done hitherto enhances, instead of diminishing, the merits of Dr. Mayer.

Consider the vigor of his reasoning: "Beyond the power of generating internal heat, the animal organism can generate heat external to itself. A blacksmith by hammering can warm a nail, and a savage by friction can heat wood to its point of ignition. Unless, then, we abandon the physiological axiom that the animal body cannot create heat out of nothing, we are driven to the conclusion that *it is the total heat, within and without, that ought to be regarded as the real calorific effect of the oxidation within the body.*" Mayer, however, not only states the principle, but illustrates numerically the transfer of muscular heat to external space. A bowler who imparts a velocity of thirty feet to an eight-pound ball consumes in the act one-tenth of a grain of carbon. The heat of the muscle is here distributed over the track of the ball, being developed there by mechanical friction. A man weighing one hundred and fifty pounds consumes in lifting his own body to a height of eight feet the heat of a grain of carbon. Jumping from this height the heat is restored. The consumption of two ounces four drachms twenty grains of carbon

would place the same man on the summit of a mountain 10,000 feet high. In descending the mountain an amount of heat equal to that produced by the combustion of the foregoing amount of carbon is restored. The muscles of a laborer whose weight is one hundred and fifty pounds weigh sixty-four pounds. When dried they are reduced to fifteen pounds. Were the oxidation corresponding to a day-laborer's ordinary work exerted on the muscles alone, they would be wholly consumed in eighty days. Were the oxidation necessary to sustain the heart's action concentrated on the heart itself, it would be consumed in eight days. And if we confine our attention to the two ventricles, their action would consume the associated muscular tissue in three days and a half. With a fullness and precision of which this is but a sample did Mayer, between 1842 and 1845, deal with the great question of vital dynamics.

In direct opposition, moreover, to the foremost scientific authorities of that day, with Liebig at their head, this solitary Heilbronn worker was led by his calculations to maintain that the muscles, in the main, played the part of machinery, converting the fat, which had been previously considered a mere heat-producer, into the motive power of the organism. Mayer's prevision has been justified by events, for the scientific world is now upon his side.

We place, then, food in our stomachs as so much combustible matter. It is first dissolved by purely chemical processes, and the nutritive fluid is poured into the blood. Here it comes into contact with atmospheric oxygen admitted by the lungs. It unites with the oxygen as wood or coal might unite with it in a furnace. The matter-products of the union, if I may use the term, are the same in both cases—viz., carbonic acid and water. The force-products are also the same—heat within the body, or heat and work outside the body. Thus far every action of the organism belongs to the domain either of physics or of chemistry. But you saw me contract the muscle of my arm. What enabled me to do so? Was it or was it not the direct action of my will? The answer is, the action of the will is mediate, not direct. Over and above the muscles the human organism is provided with long, whitish filaments of medullary matter, which issue from the spinal column, being connected by it on the one side with the brain, and on the other side losing themselves in the muscles. Those filaments or cords are the nerves, which you know are divided into two kinds, sensor and motor, or, if you like

the terms better, afferent and efferent nerves. The former carry impressions from the external world to the brain; the latter convey the behests of the brain to the muscles. Here, as elsewhere, we find ourselves aided by the sagacity of Mayer, who was the first clearly to formulate the part played by the nerves in the organism. Mayer saw that neither nerves nor brain, nor both together, possessed the energy necessary to animal motion; but he also saw that the nerve could lift a latch and open a door by which floods of energy are let loose. "As an engineer," he says with admirable lucidity, "by the motion of his finger in opening a valve or loosening a detent can liberate an amount of mechanical energy almost infinite compared with its exciting cause, so the nerves, acting on the muscles, can unlock an amount of power out of all proportion to the work done by the nerves themselves." The nerves, according to Mayer, pull the trigger, but the gunpowder which they ignite is stored in the muscles. This is the view now universally entertained.

The quickness of thought has passed into a proverb, and the notion that any measurable time elapsed between the infliction of a wound and the feeling of the injury would have been rejected as preposterous thirty years ago. Nervous impressions, notwithstanding the results of Haller, were thought to be transmitted, if not instantaneously, at all events with the rapidity of electricity. Hence, when Helmholtz, in 1851, affirmed, as the result of experiment, nervous transmission to be a comparatively sluggish process, very few believed him. His experiments may now be made in the lecture-room. Sound in air moves at the rate of 1,100 feet a second; sound in water moves at the rate of 5,000 feet a second; light in ether moves at the rate of 186,000 miles a second, and electricity in free wires moves probably at the same rate. But the nerves transmit their messages at the rate of only 70 feet a second, a progress which in these quick times might well be regarded as intolerably slow.

Your townsman, Mr. Gore, has produced by electrolysis a kind of antimony which exhibits an action strikingly analogous to that of nervous propagation. A rod of this antimony is in such a molecular condition that, when you scratch or heat one end of the rod, the disturbance propagates itself before your eyes to the other end, the onward march of the disturbance being announced by the development of heat and fumes along the line of propagation. In some such way the molecules of the nerves are successively overthrown;

and if Mr. Gore could only devise some means of winding up his exhausted antimony, as the nutritive blood winds up exhausted nerves, the comparison would be complete. The subject may be summed up, as Du Bois-Reymond has summed it up, by reference to the case of a whale struck by a harpoon in the tail. If the animal were seventy feet long, a second would elapse before the disturbance could reach the brain. But the impression after its arrival has to diffuse itself and throw the brain into the molecular condition necessary to consciousness. Then, and not till then, the command to the tail to defend itself is shot through the motor nerves. Another second must elapse before the command can reach the tail, so that more than two seconds transpire between the infliction of the wound and the muscular response of the part wounded. The interval required for the kindling of consciousness would probably more than suffice for the destruction of the brain by lightning or even by a rifle-bullet. Before the organ can arrange itself, it may, therefore, be destroyed, and in such a case we may safely conclude that death is painless.

The experiences of common life supply us with copious instances of the liberation of vast stores of muscular power by an infinitesimal "priming" of the muscles by the nerves. We all know the effect produced on a "nervous" organization by a slight sound which causes affright. An aerial wave the energy of which would not reach a minute fraction of that necessary to raise the thousandth of a grain through the thousandth of an inch, can throw the whole human frame into a powerful mechanical spasm, followed by violent respiration and palpitation. The eye, of course, may be appealed to as well as the ear. Of this the lamented Lange gives the following vivid illustration:

A merchant sits complacently in his easy-chair, not knowing whether smoking, sleeping, newspaper-reading, or the digestion of food, occupies the largest portion of his personality. A servant enters the room with a telegram bearing the words, "Antwerp, etc. . . . Jonas & Co. have failed." "Tell James to harness the horses!" The servant flies. Up starts the merchant wide awake, makes a dozen paces through the room, descends to the counting-house, dictates letters and forwards dispatches. He jumps into his carriage, the horses snort, and their driver is immediately at the bank, on the Bourse, and among his commercial friends. Before an hour has elapsed he is again at home, where he throws himself once more into his easy-chair with a deep-drawn sigh,

"Thank God I am protected against the worst, and now for further reflection!"

This complex mass of action, emotional, intellectual, and mechanical, is evoked by the impact upon the retina of the infinitesimal waves of light coming from a few pencil-marks on a bit of paper. We have, as Lange says, terror, hope, sensation, calculation, possible ruin, and victory, compressed into a moment. What caused the merchant to spring out of his chair? The contraction of his muscles. What made his muscles contract? An impulse of the nerves, which lifted the proper latch, and liberated the muscular power. Whence this impulse? From the centre of the nervous system. But how did it originate there? This is the critical question, to which some will reply that it had its origin in the human soul.

The aim and effort of science is to explain the unknown in terms of the known. Explanation, therefore, is conditioned by knowledge. You have probably heard the story of the German peasant who, in early railway days, was taken to see the performance of a locomotive. He had never known carriages to be moved except by animal power. Every explanation outside of this conception lay beyond his experience, and could not be invoked. After long reflection, therefore, and seeing no possible escape from the conclusion, he exclaimed confidently to his companion, "Es müssen doch Pferde darin sein" ("There must be horses inside"). Amusing as this locomotive theory may seem, it illustrates a deep-lying truth.

With reference to our present question, some may be disposed to press upon me such considerations as these: Your motor nerves are so many speaking-tubes, through which messages are sent from the man to the world; and your sensor nerves are so many conduits through which the whispers of the world are sent back to the man. But you have not told us where *is* the man. Who or what is it that sends and receives those messages through the bodily organism? Do not the phenomena point to the existence of a self within the self, which acts through the body as through a skillfully-constructed instrument? You picture the muscles as hearkening to the commands sent through the motor nerves, and you picture the sensor nerves as the vehicles of incoming intelligence; are you not bound to supplement this mechanism by the assumption of an entity which uses it? In other words, are you not forced by your own exposition into the hypothesis of a free human soul?

Is this reasoning congruous with the knowledge of our time? If so, it cannot be called unscientific. On the same ground the anthropomorphic notion of a creative architect, endowed with manlike powers of indefinite magnitude, is to be regarded with consideration. It marks a phase of theoretic activity, which the human race could not escape, and our present objection to such a notion rests on its incongruity with our knowledge. "When God," says the great Jesuit teacher, Perrone, "orders a given planet to stand still, he does not detract from any law passed by himself, but orders that planet to move round and round the sun for such and such a time, then to stand still, and then to move again, as his pleasure may be." You notice that a modicum of science has entered even the mind of Perrone. At an earlier period he would not have said, "When God orders a planet to move round the sun," but "When God orders the sun to move round a planet." And why, unless the commands of the Almighty are hampered by considerations of mass, should he not give this latter order? Why, moreover, has he suspended his orders, and abandoned sun and planets to the law of gravitation during those particular ages when the human intellect was most specially prepared to appreciate the wonder? The case, to say the least, is suspicious. In Joshua's time such an hypothesis was allowable, and the error of Perrone is simply a sin against the law of relativity. He, and such as he, transport into the nineteenth century the puerilities of a by-gone age. No wonder that our Catholic youth from time to time rebel against such teaching.

But to return to the hypothesis of a human soul, offered as an explanation or simplification of a series of obscure phenomena. Adequate reflection shows that, instead of introducing light into our minds, it increases our darkness. You do not in this case explain the unknown in terms of the known, which, as stated above, is the method of science, but you explain the unknown in terms of the more unknown. Try to mentally visualize this soul as an entity distinct from the body, and the difficulty immediately appears. From the side of science all that we are warranted in stating is that the terror, hope, sensation, and calculation of Lange's merchant are psychical phenomena produced by, or associated with, the molecular processes set up by the waves of light in a previously-prepared brain.

When facts present themselves let us dare to face them, but let us equally dare to confess ignorance where it prevails. What is the causal connec-

tion, if any, between the objective and subjective, between molecular motions and states of consciousness? My answer is: I do not see the connection, nor have I as yet met anybody who does. It is no explanation to say that the objective and subjective effects are two sides of one and the same phenomenon. Why should the phenomenon have two sides? This is the very core of the difficulty. There are plenty of molecular motions which do not exhibit this two-sidedness. Does water think or feel when it runs into frost-ferns upon a window-pane? If not, why should the molecular motion of the brain be yoked to this mysterious companion, consciousness? We can present to our minds a coherent picture of the physical processes—the stirring of the brain, the thrilling of the nerves, the discharging of the muscles, and all the subsequent mechanical motions of the organism. But we can present no picture of the process whereby consciousness emerges, either as a necessary link or as an accidental by-product of this series of actions. Yet it certainly does emerge—the prick of a pin suffices to prove that molecular motion can produce consciousness. The reverse process of the production of motion by consciousness is equally unrepresentable to the mind. We are here, in fact, upon the boundary-line of the intellect, where the ordinary canons of science fail to extricate us from our difficulties. If we are true to these canons, we must deny to subjective phenomena all influence on physical processes. Observation proves that they interact, but in passing from the one to the other we meet a blank which mechanical deduction is unable to fill. Frankly stated, we have here to deal with facts almost as difficult to be seized mentally as the idea of a soul. And if you are content to make your “soul” a poetic rendering of a phenomenon which refuses the yoke of ordinary physical laws, I, for one, would not object to this exercise of ideality. Amid all our speculative uncertainty, however, there is one practical point as clear as the day—namely, that the brightness and the usefulness of life, as well as its darkness and disaster, depend to a great extent upon our own use or abuse of this miraculous organ.

[In an article betraying signs of haste and its consequent confusion, a well-known and accomplished essayist pulls me sharply up in the *Speculator* for the phraseology here employed. In a single breath he brands my “poetic rendering” as a “falsehood” and a “fib.” I should be loath to apply to any utterance of my respected critic terms so uncivil as these. They are, in my opinion, unmerited, for poetry or ideality and untruth

are assuredly very different things. The one may vivify while the other kills. When St. John extends the notion of a soul to “souls washed in the blood of Christ” does he “fib?” Indeed, Christ himself, according to my critic’s canon, ought not to have escaped censure. Nor did he escape it. “How can this man give us his flesh to eat?” expressed the skeptical flouting of unpoetic natures. Such are still among us. Cardinal Manning would doubtless tell my critic that he, even he, “fibs” away the plain words of his Saviour when he reduces “the body of the Lord” in the sacrament to a mere figure of speech.

Though misuse may render it grotesque or insincere, the idealization of ancient conceptions, when done consciously and above board, has, in my opinion, an important future. We are not radically different from our historic ancestors, and any feeling which affected them profoundly requires only appropriate clothing to affect us. The world will not lightly relinquish its heritage of poetic feeling, and metaphysic will be welcomed when it abandons its pretensions to scientific discovery, and consents to be ranked as a kind of poetry. “A good symbol,” says Emerson, “is a missionary to persuade thousands. The Vedas, the Edda, the Koran, are each remembered by its happiest figure. There is no more welcome gift to men than a new symbol. They assimilate themselves to it, deal with it in all ways, and it will last a hundred years. Then comes a new genius and brings another.” Our ideas of God and the soul are obviously subject to this symbolic mutation. They are not now what they were a century ago. They will not be a century hence what they are now. Such ideas constitute a kind of central energy in the human mind, capable, like the energy of the physical universe, of assuming various shapes and undergoing various transformations. They baffle and elude the theological mechanic who would carve them to dogmatic forms. They offer themselves freely to the poet who understands his vocation, and whose function is, or ought to be, to find “local habitation” for thoughts woven into our subjective life, but which refuse to be mechanically defined.]

We now stand face to face with the final problem. It is this: Are the brain, and the moral and intellectual processes known to be associated with the brain—and, as far as our experience goes, indissolubly associated—subject to the laws which we find paramount in physical Nature? Is the will of man, in other words,

free, or are it and Nature equally "bound fast in fate?" From this latter conclusion, after he had established it to the entire satisfaction of his understanding, the great German thinker Fichte recoiled. You will find the record of this struggle between head and heart in his book entitled "*Die Bestimmung des Menschen*" ("The Vocation of Man").¹ Fichte was determined at all hazards to maintain his freedom, but the price he paid for it indicates the difficulty of the task. To escape from the iron necessity seen everywhere reigning in physical Nature, he turned defiantly round upon Nature and law, and affirmed both of them to be the products of his own mind. He was not going to be the slave of a thing which he had himself created. There is a good deal to be said in favor of this view, but few of us probably would be able to bring into play the solvent transcendentalism whereby Fichte melted his chains.

Why do some of us regard this notion of necessity with terror, while others do not fear it at all? Has not Carlyle somewhere said that a belief in destiny is the bias of all earnest minds? "It is not Nature," says Fichte, "it is freedom itself, by which the greatest and most terrible disorders incident to our race are produced. Man is the cruellest enemy of man." But the question of moral responsibility here emerges, and it is the possible loosening of this responsibility that so many of us dread. The notion of necessity certainly failed to frighten Bishop Butler. He thought it untrue, but he did not fear its practical consequences. He showed, on the contrary, in the "*Analogy*," that as far as human conduct is concerned the two theories of free-will and necessity come to the same in the end.

What is meant by free-will? Does it imply the power of producing events without antecedents—of starting, as it were, upon a creative tour of occurrences without any impulse from within or from without? Let us consider the point. If there be absolutely or relatively no reason why a tree should fall, it will not fall; and, if there be absolutely or relatively no reason why a man should act, he will not act. It is true that the united voice of this assembly could not persuade me that I have not, at this moment, the power to lift my arm if I wished to do so. Within this range the conscious freedom of my will cannot be questioned. But what about the origin of the "wish?" Are we, or are we not, complete masters of the circumstances which create our wishes, motives, and tendencies to action? Ade-

quate reflection will, I think, prove that we are not. What, for example, have I had to do with the generation and development of that which some will consider my total being, and others a most potent factor of my total being—the living, speaking organism which now addresses you? As stated at the beginning of this discourse, my physical and intellectual textures were woven *for* me, not *by* me. Processes in the conduct or regulation of which I had no share have made me what I am. Here, surely, if anywhere, we are as clay in the hands of the potter. It is the greatest of delusions to suppose that we come into this world as sheets of white paper on which the age can write anything it likes, making us good or bad, noble or mean, as the age pleases. The age can stunt, promote, or pervert preëxistent capacities, but it cannot create them. The worthy Robert Owen, who saw in external circumstances the great moulders of human character, was obliged to supplement his doctrine by making the man himself one of the circumstances. It is as fatal as it is cowardly to blink facts because they are not to our taste. How many disorders, ghostly and bodily, are transmitted to us by inheritance! In our courts of law, whenever it is a question whether a crime has been committed under the influence of insanity, the best guidance the judge and jury can have is derived from the parental antecedents of the accused. If among these insanity be exhibited in any marked degree, the presumption in the prisoner's favor is enormously enhanced, because the experience of life has taught both judge and jury that insanity is frequently transmitted from parent to child.

I met some years ago in a railway-carriage the governor of one of our largest prisons. He was evidently an observant and reflective man, possessed of wide experience gathered in various parts of the world, and a thorough student of the duties of his vocation. He told me that the prisoners in his charge might be divided into three distinct classes. The first class consisted of persons who ought never to have been in prison. External accident, and not internal taint, had brought them within the grasp of the law, and what had happened to them might happen to most of us. They were essentially men of sound moral stamina, though wearing the prison-garb. Then came the largest class, formed of individuals possessing no strong bias, moral or immoral, plastic to the touch of circumstances which could mould them into either good or evil members of society. Thirdly came a class—happily not a large one—whom no kindness could conciliate, and no discipline tame.

¹ Translated by Dr. William Smith. Trübner, 1873.

They were sent into this world labeled "incorrigible," wickedness being stamped, as it were, upon their organizations. It was an unpleasant truth, but as a truth it ought to be faced. For such criminals the prison over which he ruled was certainly not the proper place. If confined at all, their prison should be on a desert island where the deadly contagium of their example could not taint the moral air. But the sea itself he was disposed to regard as a cheap and appropriate substitute for the island. It seemed to him evident that the state would benefit if prisoners of the first class were liberated; prisoners of the second class educated; and prisoners of the third class put compendiously under water.

It is not, however, from the observation of individuals that the argument against "free-will," as commonly understood, derives its principal force. It is, as already hinted, indefinitely strengthened when extended to the race. Most of you have been forced to listen to the outcries and denunciations which rung discordant through the land for some years after the publication of Mr. Darwin's "Origin of Species." Well, the world—even the clerical world—has for the most part settled down in the belief that Mr. Darwin's book simply reflects the truth of Nature; that we who are now "foremost in the files of time" have come to the front through almost endless stages of promotion from lower to higher forms of life.

If to any one of us were given the privilege of looking back through the æons across which life has crept toward its present outcome, his vision would ultimately reach a point when the progenitors of this assembly could not be called human. From that humble society, through the interaction of its members and the storing up of their best qualities, a better one emerged; from this again a better still; until at length, by the integration of infinitesimals through ages of amelioration, we came to be what we are to-day. We of this generation had no conscious share in the production of this grand and beneficent result. Any and every generation which preceded us had just as little share. The favored organisms whose garnered excellence constitutes our present store owed their advantages, firstly, to what we in our ignorance are obliged to call "accidental variation;" and, secondly, to a law of heredity in the passing of which our suffrages were not collected. With characteristic felicity and precision Mr. Matthew Arnold lifts this question into the free air of poetry, but not out of the atmosphere of truth, when he ascribes the process of amelioration to "a power not ourselves which makes for

righteousness." If, then, our organisms, with all their tendencies and capacities, are given to us without our being consulted, and if, while capable of acting within certain limits in accordance with our wishes, we are not masters of the circumstances in which motives and wishes originate; if, finally, our motives and wishes determine our actions—in what sense can these actions be said to be the result of free-will?

Here, again, we are confronted with the question of moral responsibility which it is desirable to meet in its rudest form and in the most uncompromising way. "If," says the robber, the ravisher, or the murderer, "I act because I must act, what right have you to hold me responsible for my deeds?" The reply is, "The right of society to protect itself against aggressive and injurious forces, whether they be bond or free, forces of Nature or forces of man." "Then," retorts the criminal, "you punish me for what I cannot help." "Granted," says society, "but had you known that the treadmill or the gallows was certainly in store for you, you might have 'helped.' Let us reason the matter fully and frankly out. We entertain no malice or hatred against you, but simply with a view to our own safety and purification we are determined that you and such as you shall not enjoy liberty of evil action in our midst. You, who have behaved as a wild beast, we claim the right to cage or kill as we should a wild beast. The public safety is a matter of more importance than the very limited chance of your moral renovation, while the knowledge that you have been hanged by the neck may furnish to others about to do as you have done the precise motive which will hold them back. If your act be such as to invoke a minor penalty, then not only others, but yourself, may profit by the punishment which we inflict. On the homely principle that 'a burned child dreads the fire,' it will make you think twice before venturing on a repetition of your crime. Observe, finally, the consistency of our conduct. You offend, because you cannot help offending, to the public detriment. We punish, because we cannot help punishing, for the public good. Practically, then, as Bishop Butler predicted, we act as the world acted when it supposed the evil deeds of its criminals to be the products of free-will."

"What," I have heard it argued, "is the use of preaching about duty if man's predetermined position in the moral world renders him incapable of profiting by advice?" Who knows that he is incapable? The preacher's last word is a factor in the man's conduct; and it may be a most

important factor, unlocking moral energies which might otherwise remain imprisoned and unused. If the preacher thoroughly feel that words of enlightenment, courage, and admonition, enter into the list of forces employed by Nature herself for man's amelioration, since she gifted man with speech, he will suffer no paralysis to fall upon his tongue. Dung the fig-tree hopefully, and not until its barrenness has been demonstrated beyond a doubt let the sentence go forth, "Cut it down, why cumbereth it the ground?"

I remember, when a youth in the town of Halifax, some two-and-thirty years ago, attending a lecture given by a young man to a small but select audience. The aspect of the lecturer was earnest and practical, and his voice soon riveted attention. He spoke of duty, defining it as a debt owed, and there was a kindling vigor in his words which must have strengthened the sense of duty in the minds of those who heard him. No speculations regarding the freedom of the will could alter the fact that the words of that young man did me good. His name was George Dawson. He also spoke, if you will allow me to allude to it, of a social subject much discussed at the time—the Chartist subject of "leveling." "Suppose," he said, "two men to be equal at night, and that one rises at six, while the other sleeps till nine next morning, what becomes of your leveling?" And in so speaking he made himself the mouth-piece of Nature, which, as we have seen, secures advance, not by the reduction of all to a common level, but by the encouragement and conservation of what is best.

It may be urged that, in dealing as above with my hypothetical criminal, I am assuming a state of things brought about by the influence of religions which include the dogmas of theology and the belief in free-will—a state, namely, in which a moral majority control and keep in awe an immoral minority. The heart of man is deceitful above all things, and desperately wicked. Withdraw, then, our theologic sanctions, including the belief in free-will, and the condition of the race will be typified by the samples of individual wickedness which have been adduced. We shall all, that is, become robbers, and ravishers, and murderers. From much that has been written of late it would seem that this astounding inference finds house-room in many minds. Possibly, the people who hold such views might be able to illustrate them by individual instances:

"The fear of hell's a hangman's whip,
To keep the wretch in order."

Remove the fear, and the wretch, following his natural instinct, may become disorderly; but I refuse to accept him as a sample of humanity. "Let us eat and drink, for to-morrow we die," is by no means the ethical consequence of a rejection of dogma. To many of you the name of George Jacob Holyoake is doubtless familiar, and you are probably aware that at no man in England has the term atheist been more frequently pelted. There are, moreover, really few who have more completely liberated themselves from theologic notions. Among working-class politicians Mr. Holyoake is a leader. Does he exhort his followers to "eat and drink, for to-morrow we die?" Not so. In the August number of the *Nineteenth Century* you will find these words from his pen: "The gospel of dirt is bad enough, but the gospel of mere material comfort is much worse." He contemptuously calls the Comtist championship of the working-man "the championship of the trencher." He would place "the leanest liberty which brought with it the dignity and power of self-help" higher than "any prospect of a full plate without it." Such is the moral doctrine taught by this "atheistic" leader; and no Christian, I apprehend, need be ashamed of it.

Most heartily do I recognize and admire the spiritual radiance, if I may use the term, shed by religion on the minds and lives of many personally known to me. At the same time I cannot but observe how signally, as regards the production of anything beautiful, religion fails in other cases. Its professor and defender is sometimes at bottom a brawler and a clown. These differences depend upon primary distinctions of character which religion does not remove. It may comfort some to know that there are among us many whom the gladiators of the pulpit would call "atheists" and "materialists," whose lives, nevertheless, as tested by any accessible standard of morality, would contrast more than favorably with the lives of those who seek to stamp them with this offensive brand. When I say "offensive," I refer simply to the intention of those who use such terms, and not because atheism or materialism, when compared with many of the notions ventilated in the columns of religious newspapers, has any particular offensiveness for me. If I wished to find men who are scrupulous in their adherence to engagements, whose words are their bond, and to whom moral shiftiness of any kind is subjectively unknown; if I wanted a loving father, a faithful husband, an honorable neighbor, and a just citizen—I should seek him and find him among the band of "atheists" to which I refer. I have

known some of the most pronounced among them not only in life but in death—seen them approaching with open eyes the inexorable goal, with no dread of a “hangman’s whip,” with no hope of a heavenly crown, and still as mindful of their duties, and as faithful in the discharge of them, as if their eternal future depended upon their latest deeds.

In letters addressed to myself, and in utterances addressed to the public, Faraday is often referred to as a sample of the association of religious faith with moral elevation. I was locally intimate with him for fourteen or fifteen years of my life, and had thus occasion to observe how nearly his character approached what might, without extravagance, be called perfection. He was strong but gentle, impetuous but self-restrained; a sweet and lofty courtesy marked his dealings with men and women; and though he sprang from the body of the people, a nature so fine might well have been distilled from the flower of antecedent chivalry. Not only in its broader sense was the Christian religion necessary to Faraday’s spiritual peace, but in what many would call the narrow sense held by those described by Faraday himself as “a very small and despised sect of Christians, known, if known at all, as Sandemanians,” it constituted the light and comfort of his days.

Were our experience confined to such cases, it would furnish an irresistible argument in favor of the association of dogmatic religion with moral purity and grace. But, as already intimated, our experience is not thus confined. In further illustration of this point we may compare with Faraday a philosopher of equal magnitude, whose character, including gentleness and strength, candor and simplicity, intellectual power and moral elevation, singularly resembles that of the great Sandemanian, but who has neither shared the theologic views nor the religious emotions which formed so dominant a factor in Faraday’s life. I allude to Mr. Charles Darwin, the Abraham of scientific men—a searcher as obedient to the command of truth as was the patriarch to the command of God. I cannot, therefore, as so many desire, look upon Faraday’s religious belief as the exclusive source of qualities shared so conspicuously by one uninfluenced by that belief. To a deeper virtue belonging to reviled human nature in its purer forms I am disposed to refer the excellence of both.

Superstition may be defined as religion which has grown incongruous with intelligence. “Superstition,” says Fichte, “has unquestionably

constrained its subjects to abandon many pernicious practices and to adopt many useful ones.” The real loss accompanying its decay at the present day has been thus clearly stated by the same philosopher: “In so far as these lamentations do not proceed from the priests themselves—whose grief at the loss of their dominion over the human mind we can well understand—but from the politicians, the whole matter resolves itself into this, that government has thereby become more difficult and expensive. The judge was spared the exercise of his own sagacity and penetration when, by threats of relentless damnation, he could compel the accused to make confession. The evil spirit formerly performed without reward services for which in later times judges and policemen have to be paid.”

No man ever felt the need of a high and ennobling religion more thoroughly than this powerful and fervid teacher, who, by-the-way, did not escape the brand of “atheist.” But Fichte asserted emphatically the power and sufficiency of morality in its own sphere. “Let us consider,” he says, “the highest which man can possess in the absence of religion—I mean pure morality. The moral man obeys the law of duty in his breast absolutely, because it is a law unto him; and he does whatever reveals itself to him as his duty simply because it is duty. Let not the impudent assertion be repeated that such an obedience, without regard for consequences, and without desire for consequences, is in itself impossible and opposed to human nature.” So much for Fichte. I would add that the muse of Tennyson never reached a higher strain than when it embodied the same sentiment in “Enone:”

“And, because right is right, to follow right
Were wisdom in the scorn of consequence.”

Not in the way assumed by our dogmatic teachers has the morality of human nature been built up. The power which has moulded us thus far has worked with stern tools upon a very rigid stuff. What it has done cannot be so readily undone; and it has endowed us with moral constitutions which take pleasure in the noble, the beautiful, and the true, just as surely as it has endowed us with sentient organisms which find aloe bitter and sugar sweet. That power did not work with delusions, nor will it stay its hand when such are removed. Facts rather than dogmas have been its ministers—hunger and thirst, heat and cold, pleasure and pain, fervor, sympathy, shame, pride, love, hate, terror, awe—such were the forces whose interaction and adjustment throughout an immeasurable past wove the

triplex web of man's physical, intellectual, and moral nature, and such are the forces that will be effectual to the end.¹

You may retort that even on my own showing "the power which makes for righteousness" *has* dealt in delusions; for it cannot be denied that the beliefs of religion, including the dogmas of theology and the freedom of the will, have had some effect in moulding the moral world. Granted; but I do not think that this goes to the root of the matter. Are you quite sure that those beliefs and dogmas are primary, and not derived—that they are not the *products*, instead of being the *creators*, of man's moral nature? I think it is in one of the "Latter-Day Pamphlets" that Carlyle corrects a reasoner, who deduced the nobility of man from a belief in heaven, by telling him that he puts the cart before the horse, the real truth being that the belief in heaven is derived from the nobility of man. The bird's instinct to weave its nest is referred to by Emerson as typical of the force which built cathedrals, temples, and pyramids:

"Knowest thou what wove yon woodbird's nest
Of leaves and feathers from her breast,
Or how the fish outbuilt its shell,
Painting with morn each annual cell?
Such and so grew these holy piles
While love and terror laid the tiles;
Earth proudly wears the Parthenon
As the best gem upon her zone;
And Morning opes with haste her lids
To gaze upon the Pyramids;
O'er England's abbeys bends the sky
As on its friends with kindred eye;
For out of Thought's interior sphere
These wonders rose to upper air,
And Nature gladly gave them place,
Adopted them into her race,
And granted them an equal date
With Andes and with Ararat."

Surely, many utterances which have been accepted as descriptions ought to be interpreted as aspirations, or as having their roots in aspira-

¹ My *Spectator* critic says that I give up *approbation* and *disapprobation*; but, as already indicated, the critic writes lastly. Each of them is a subsection of one or another of the influences mentioned above.

tion instead of in objective knowledge. Does the song of the herald angels, "Glory to God in the highest, and on earth peace and good-will toward men," express the exaltation and the yearning of a human soul, or does it describe an optical and acoustical fact—a visible host and an audible song? If the former, the exaltation and the yearning are man's imperishable possession—a ferment long confined to individuals, but which may by-and-by become the leaven of the race. If the latter, then belief in the entire transaction is wrecked by non-fulfillment. Look to the East at the present moment as a comment on the promise of peace on earth and good-will toward men. That promise is a dream ruined by the experience of eighteen centuries, and in that ruin is involved the claim of the "heavenly host" to prophetic vision. But, though the mechanical theory proves untenable, the immortal song and the feelings it expresses are still ours, to be incorporated, let us hope, in purer and less shadowy forms in the poetry, philosophy, and practice, of the future.

Thus, following the lead of physical science, we are brought without solution of continuity into the presence of problems which, as usually classified, lie entirely outside the domain of physics. To these problems thoughtful and penetrative minds are now applying those methods of research which in physical science have proved their truth by their fruit. There is on all hands a growing repugnance to invoke the supernatural in accounting for the phenomena of human life; and the thoughtful minds just referred to, finding no trace of evidence in favor of any other origin, are driven to seek in the interaction of social forces the genesis and development of man's moral nature. If they succeed in their search—and I think they are sure to succeed—social duty would be raised to a higher level of significance, and the deepening sense of social duty will, it is to be hoped, lessen, if not obliterate, the strifes and heart-burnings which now beset and disfigure our social life. Toward this great end it behooves us one and all to work; and, devoutly wishing its consummation, I have the honor, ladies and gentlemen, to bid you a friendly farewell.

PSYCHOLOGICAL CURIOSITIES OF SPIRITUALISM.

BY WILLIAM B. CARPENTER, C. B., M. D., LL. D., F. R. S.

SINCE the publication in *Fraser* of the two lectures on "Mesmerism, Spiritualism, etc.," which I delivered at the London Institution near the close of last year, I have learned much more than I had previously known, both of the extent of what I hold to be a most mischievous epidemic delusion, comparable to the witchcraft epidemic of the seventeenth century; and of the very general existence of a peculiar state of mind, which as much predisposes to attacks of spiritualism as did the almost universal belief in Biblical authority for the existence of witches determine the witch-persecution in Puritan New England.

A friend residing at Boston (United States) has kindly sent me a number of excerpts from its newspapers, which give very curious indications, alike in their "advertisements" and in their "intelligence," of what has been lately taking place in that centre of enlightenment and progress. And another friend, who has recently visited that city, informs me that its "Trades' Directory" has whole columns of the names of professors of the different forms of spiritualistic "mediumship"—rapping mediums, writing mediums, drawing mediums, materializing mediums, test mediums, photographic mediums, trance mediums, healing mediums, and the like. Many of these professors occupy some of the best houses in Boston; and must be carrying on a first-class business among the "upper ten thousand." Others practise in a humbler sphere; but, though receiving lower fees, get so many of them as to be driving a very profitable trade in "interviewing the spirits." I understand the like to be true, in a greater or less degree, of many other towns, small as well as large (New York being a conspicuous example), in the United States.

A most unexpected revelation of another kind has been made by the perusal of the recently published "*Lights and Shadows of Spiritualism*," by Mr. D. D. Home, reputed in the outer world as the arch-priest of this new religion; who, professing an earnest desire to purify the system from "*the settling mass of folly and imposture which every attempt at examination discloses*," devotes not less than 200 octavo pages to such an exposure of the "Delusions," the "Absurdities," and the "Trickeries" of modern spiritualism, as, if made by any scientific opponent, would have

most assuredly subjected him to a crushing fire of the most tremendous expletives that even spiritualistic language (choice samples of which I shall presently give) can convey. No unprejudiced reader can rise from the perusal of Mr. Home's pages without the melancholy conviction that the honest believers, who (to use his words) "accept nothing as proof which leaves the tiniest loop-hole for the entrance of doubt; who try all mediums and all spirits by the strictest tests; who refuse to be carried away by enthusiasm or swayed by partisanship," are few indeed in comparison, on the one hand, with the knavish impostors who practise on the folly and credulity of their victims, and, on the other, with the *gobe-mouches* who (as Mr. Home says) "swallow whatever is offered them, and strain neither at camels nor at gnats."

My knowledge has been further extended by an elaborate review of my lectures, contributed by Mr. Wallace to the July number of the *Quarterly Journal of Science*. As Mr. Crookes is the editor of that journal, I may fairly regard this review as representing his own ideas upon the subject, as well as those of Mr. Wallace, who continually refers to him; and I regard it as a very curious revelation of the state of mind to which two honest men, both highly distinguished in the scientific world, can bring themselves, by continually dwelling on their own conclusions, and discoursing of them only with sympathizers; without bringing them to the test of *calm discussion* with other men of science, who are certainly no less competent for the investigation than themselves, and who have given a large amount of time and attention to it. According to Mr. Wallace, no one who really examines the evidence in its favor can honestly refuse to accept the facts of mesmerism from a distance and of *clairvoyance*; or can fail to see, with Mr. Wallace himself, that Mr. Hewes's "Jack," who was so completely detected in Manchester that his patron at once gave him up, was all the while a genuine *clairvoyant*. And so, every one who cannot see, as Mr. Wallace does, that the flowers, fruits, etc., "produced" at spiritualistic *séances*, are "demonstrably not brought in by the mediums," is open to the charge of willfully shutting his eyes to the most conclusive proofs. Further,

taking his cue from Mr. Crookes, who six years ago rebuked men of science generally, for their "refusal to institute a scientific investigation into the existence and nature of facts asserted by so many competent and credible witnesses, and which *they are so freely invited to examine when and where they please*,"¹ Mr. Wallace charges the periodical press with being in "a conspiracy of silence" to prevent the spread of what he regards as important and well-established truth.

Reserving for another place² my reply to the grave imputations which Mr. Wallace (indorsed by the editorial authority of Mr. Crookes) has cast upon myself personally, I shall now place before the readers of *Fraser* a series of *psychological curiosities* collected from the three sources just indicated; and, as the names of Messrs. Crookes and Wallace will continually recur in this connection, I think it well to explain my reason for so frequently introducing them.

Appreciating most highly the beautiful discoveries recently made in physical science by Mr. Crookes, and the large and varied additions to biological knowledge and doctrine made at different times by Mr. Wallace, I cannot blind myself to the fact: that the very scientific distinction they have so deservedly acquired is doing great injury to the cause which I maintain to be that of reason and common-sense. In the United States more particularly—where, since the death of Prof. Hare, who thought he had obtained *precise experimental proof of the immortality of the soul*, not a single scientific man of note (so far as I am aware) has joined the spiritualistic ranks—the names of the "eminent British scientists" Messrs. Crookes and Wallace are a "tower of strength." And it consequently becomes necessary for me, if I take any further part in the discussion, to *undermine* that "tower," by showing that in their investigation of this subject they have followed methods which are thoroughly *unscientific*, and have been led by their "prepossession" to accept with implicit faith a number of statements which ought to be rejected as completely untrustworthy.

My call to take such a part, which I would

¹ It would seem that there is no longer the same disposition to admit scientific inquirers to spiritualistic *stances*. Things do not go so well when skeptics are present: and while Mr. Home rebukes those who would exclude all but the "faithful," his reviewer says that "all sitters in circle, and communicants with the spirit-world, find it necessary to restrict the company to those who are in sympathy with one another, or of one marked form of thought, or degree of moral development."

² The forthcoming new edition of my lectures.

most gladly lay aside for the scientific investigations which afford me the purest and most undisturbed enjoyment, seems to me the same as is made upon every member of the profession to which I have the honor to belong, that he should do his utmost to cure or to mitigate *bodily* disease. Theoretical and experimental studies, extending over forty years, have given me what I honestly believe (whether rightly or wrongly) to be a rather unusual power of dealing with this subject. Since the appearance of my lectures, I have received a large number of public assurances that they are doing good service in preventing the spread of a noxious *mental* epidemic in this country; and I have been privately informed of several instances in which persons, who had been "bitten" by this malady, have owed their recovery to my treatment. Looking to the danger which threatens us from the United States, of an importation of a real spiritualistic *mania*, far more injurious to our *mental* welfare than that of the Colorado beetle will be to our *material* interests, I should be untrue to my own convictions of duty if I did not do what in me lies to prevent it. I know too well that I thus expose myself to severe obloquy, which (as I am not peculiarly thick-skinned) will be very unpleasant to myself, and unfortunately still more so to some who are nearly connected with me. But I am content to brave all, if I can console myself with the belief that this *exposé* will be of the least service, either to individuals or to society at large.

That I do not take an exaggerated view of the danger, will appear, I think, from the following citations from Mr. Home's book:

"In dealing with spiritualism, it is the custom of a certain class of weak minds to break loose from all restraint. Reason being weak and enthusiasm strong, the very thought of communion with the dwellers in another world appears to intoxicate these unfortunates almost to madness. Their vagaries are often scarcely distinguishable from those beheld in mad-houses or at the wilder kind of revival-meetings. The disease manifests itself in a variety of ways. Some of the men and women attacked by it pin themselves to a particular delusion, with a fanatical tenacity which nothing can affect."

In another place Mr. Home speaks of "the wild dances in which 'mediums' (generally females) indulge under the influence of imaginary Indian controls."

Can anything be a stronger confirmation of the doctrine of "Epidemic Delusion" than this reproduction of the "Dancing Mania" under a different form of "possession?"

PHILOSOPHY OF SPIRITUALISM.

As Moses & Son kept a poet, so does spiritualism now keep a philosopher—a Master of Arts of Oxford—who, speculating profoundly on the constitution of matter, has recently announced his conclusion that there is no logical distinction whatever between matter and spirit; and that there is, consequently, nothing at all difficult to believe, either in the “materialization” of departed spirits who return to earth, or in the “dematerialization” and “rematerialization” of solid fleshly bodies. Hence he considers it to be true, not only of the mind, but of the body, that

“Stone-walls do not a prison make,
Nor iron bars a cage”—

a doctrine that will prove extremely convenient to the inmates of these institutions, if only they can get “the spirits” to help them out. And the passage of Mrs. Guppy through either the walls, the closed doors, the shuttered windows, the floor beneath, or the roof and ceilings above, is to be regarded as, though somewhat unusual, a perfectly “natural” phenomenon.¹

Now, this reasoning seems to me so transparently fallacious as not to require wasting many words upon it. Even if we accept, as Faraday showed an inclination to do, the physical doctrine of Boscovich, that what we call a “material” body is nothing else than an aggregation of “centres of force,” and if we psychologically refine down matter, as John S. Mill did, into “a permanent possibility of sensation,” I cannot see that this carries us one single step toward the M. A.’s deduction. For the very foundation of our conception of “matter” is the *sense of resistance* which we experience when we press some part of our body against it; and as we cannot take any such cognizance of “spirit,” we cannot conceive of it as having anything in common with matter; the two remaining, just as they always have been, “logically distinct entities.”

If this be a fair sample of the result of the philosophic teaching imparted by the University of Oxford, the sooner that teaching is reformed the better for common-sense and rationality.

AMENITIES OF SPIRITUALISM.

It has been the boast of spiritualists that, if their new religion does not supersede Christianity, it is at any rate to supplement it, by carrying its teachings to a higher development, and by thus leading to the earlier prevalence of that universal

reign of peace and good-will which Christianity has as yet failed to bring about. So far, however, is the *practice* of “professing” spiritualists from being much better in this particular than that of “professing” Christians, that it seems to me to be worse; instead of being “slow to anger” and “forsaking wrath,” there are spiritualists who carry on their controversies, even among themselves, with most reprehensible bitterness; while even the scientific advocates of the system, whose position should place them above personal animosity, cannot find decent language to put down a troublesome skeptic, who imputes to them nothing worse than a too easy credulity.

Thus Mr. Home’s book affords an ample store of very choice samples of vituperative eloquence, directed, not against scientific skeptics, for these he treats with a marked consideration which Mr. Wallace might well imitate, but against certain spiritualists, whom he regards (for reasons not stated) with a very unchristian hostility. One of these is Colonel Olcott, of New York, President of the Theosophical Society, of whom I shall have more to say presently. This gentleman has lately published a book called “People from the Other World,” dedicated to Messrs. Crookes and Wallace, giving an account of the “materializations” of the Eddy brothers, which Mr. Home utterly discredits. Of this book Mr. Home says that “it is ten times more meaningless than the gospel of Mormon, or the speculations of Joanna Southcote;” that “seldom before have human minds been astonished at such utterances;” and that while “other productions of the kind infest spiritual literature, there are few which display such an utter lack of principle, such a happy audacity in assertion, or so complete a disregard of facts.”

Of course, Mr. Home will “catch it” in his turn from the spiritualistic critics of his book. The following are a few excerpts from the only review of it that I have seen:¹

“Mr. Home can have no pretense whatever to occupy that lofty and interior plane from which spiritualism proper is capable of being apprehended. He is simply a phenomenal medium, and we have yet to learn that this class contains any of those gifted with glowing inspiration, placid wisdom, or pure disinterestedness. . . . The clay of human mortality is attached to him so firmly that not for one moment does he soar into the higher realm of spiritual light and principles [which is, of course, inhabited by his critic]. . . . Rightly or wrongly, Mr. Home has been most cruelly attacked by a

¹ “Is there any such Thing as Matter?” By M. A. (Oxon.). *Human Nature* for May, 1877.

¹ *Human Nature, a Monthly Journal of Zoistic Science*. May, 1877.

legion of opponents, who have had to invent most varied excuses for being his implacable foes. Strangely enough, these adversaries are, most of them, in the same sphere of spiritual activity with himself. They are mediums—physical or phenomenal mediums—of one kind or another, and therefore brought into close juxtaposition with their elder brother. . . . This inflated selfishness only leads to mutual detraction and evil-speaking, which, when reproduced and carried from country to country, becomes a perfect host of devils, sufficient to goad to madness any one who lives on the plane of their action. . . . The whole proceeding is an instructive illustration of the too-extended development of physical mediumship, unsanctified by spiritual love and unselfish beneficence."

So much for Mr. Home personally; now for his book:

"Take the book as a whole, from beginning to end, it is a superficial compilation without an original thought or inspired purpose, and, as all such performances are, it is charmingly illogical."

See how these spiritualists love one another.

I now turn to Mr. Wallace, an old friend with whom I have never had the slightest personal disagreement, except that which has arisen (on his side) out of our difference of opinion on the subjects discussed in my lectures.

In the review of these lectures to which I have already referred, Mr. Wallace charges me with "complete misrepresentations of the opinions of his opponents," with making "vague general assertions, without a particle of proof offered, or which can be offered;" and, what is far worse, with willful and repeated *suppressio veri*. One passage in particular, reflecting upon what I considered Mr. Wallace's too ready acceptance of "the slenderest evidence of the greatest marvels," is denounced by Mr. Wallace, *first*, as "an utterly unjustifiable remark;" *secondly*, as not having "even the shadow of a foundation;" and *thirdly* (when he has worked himself up to the highest pitch of virtuous indignation), as a "reckless accusation, which he cannot adequately characterize without using language which he would not wish to use." The terrific force of this last dreadful denunciation (equivalent to the speaker's fearful threat of "naming" an honorable member) makes me thankful that, as spiritualism is not yet a dominant power in the state, I can at present be only *morally* "pilloried." Looking, however, to the case of the unfortunate minister who was hanged during the Salem epidemic, for having dared to call in question the very existence of witchcraft, I cannot contemplate without a shudder the doom that might befall me if I

were put on trial for my spiritualistic heresy, with Messrs. Crookes and Wallace for my judges, the Oxford M. A. as attorney-general for the prosecution, and Mrs. Guppy Volckman as the principal witness against me!

Having introduced these citations merely as choice samples of the "amenities of spiritualism," which remind one of the "brief" instructions given to the counsel for a defendant—"No case; abuse the plaintiff's attorney"—I pass on to the next "curiosity."

WHAT MR. WALLACE MEANS BY "DEMONSTRATION."

Every one who has studied the subject of evidence knows perfectly well that to "demonstrate" a certain proposition is, as Dr. Johnson defined it, "to establish so as to exclude possibility of doubt or denial;" the *type* of demonstrative reasoning being the mathematical, in which every step in the deductive process is so completely indubitable—either the contrary, or anything else than the proposition affirmed, being "unthinkable"—that we have as firm an assurance of the final Q. E. D. as we have of the axioms from which we first started.

No evidence as to either scientific or ordinary facts *can* be, in the strict sense, "demonstrative;" for it is open to various sources of fallacy, such as errors of *observation*, errors of *interpretation*, and errors (intentional or unintentional) of *statement*. But what we ordinarily proceed upon in the formation of our convictions is a concurrence of testimony given by competent and disinterested witnesses, which, if it does not *absolutely* "exclude possibility of doubt or denial," does so to such a degree as to establish the highest *moral probability* that the case admits of. Where, on the other hand, there is a reasonable ground for doubt, either as to the *sufficiency* of the testimony for the establishment of the *factum probandum*, or as to its *trustworthiness* (which may be questioned not only on the ground of intentional deceit, but on many others), it would altogether confuse the meaning of terms to call such evidence "demonstrative."

This, however, is what Mr. Wallace has repeatedly done; charging me with willfully shutting my own eyes to, and endeavoring to hide from the eyes of others, what *he* considers the demonstrative evidence in favor of certain propositions; which evidence, so far from being free from "the possibility of doubt or denial," appears to me open to question on every one of the grounds I have just specified.

It has also appeared to me that the "spiritualistic" production of flowers, fruits, etc., in dark *séances*, which is now one of the commonest "mediumistic" performances, should, even more than the moving of tables and the production of "raps," be regarded as so completely *ex rerum natura*, as to justify the assumption that it is a mere piece of jugglery, which a thorough investigation *must* detect; the fact of its non-detection merely showing that the investigation has not been complete. There can be only two hypotheses about the matter: either that the fruit, flowers, etc., have been brought into the room by the "medium," or by some confederate, or that they have been *dematerialized*, that is, resolved into their component atoms, which after passing through either walls, doors, or window-panes, have not only come together again in their original forms, but, in the case of living bodies, have renewed their vital activity. Of course, if we believe this possible of live eels or lobsters, we may believe it also of Mrs. Guppy. But, to myself, the one is as inconceivable as the other; and even Mr. D. D. Home, who has witnessed many instances in which this "passage of matter through matter" was said to have occurred, agrees with me in considering that they "could one and all be explained by less far-fetched theories." (*Op. cit.*, p. 351.) Yet Mr. Wallace complains of my not accepting the flowers and fruits "produced" in his own drawing-room, and those which made their appearance in the house of Mr. T. A. Trollope at Florence (related in the "Dialectical Report"), as "demoustrably not brought by the medium."

I shall now, with Mr. Home's assistance, inquire into the probative value of each of these cases:

"Let me give" (says Mr. Home, *op. cit.*, page 352) "an idea of how the bringing fruit, fish, etc., into a darkened room is often accomplished. The expectant circle, we will suppose, is seated round the table. The stream of harmony gushes forth as usual. Presently the 'medium' (generally a lady—ladies' dresses offer such facilities for concealment) feels and announces the presence of the 'spirits.' She commences to speculate as to what they will bring. 'Let me see! at our last *séance* the dear spirits brought in some cabbages. Suppose they were to bring lilies-of-the-valley this time, how nice that would be! Oh, dear, no! We must not ask for lilies-of-the-valley. Let us think of something else. What would any of you like?'"

"Naturally a voice proceeds from some one in the circle, 'I would like to have lilies-of-the-valley.'"

"The 'medium' energetically repudiates the suggestion. 'Perhaps the dear spirits could not bring them. Why *will* you ask for such out-of-the-way things?'"

"If they bring lilies-of-the-valley, I shall consider it a test."

"The next instant a scattering sound is heard. A 'spirit-voice' probably announces, 'We have brought you the lilies, since you wish for them so much.' And, sure enough, on a light being struck, the table is found strewed with the flowers in question. And the next issue of some spiritual journal describes, as a 'good test,' that 'at Mrs. —'s *séance*, a few days ago, Mr. A— wished for some lilies-of-the-valley, which the spirits 'instantly brought.'" (*Op. cit.*, p. 353.)

This "suggestive" method is well known to be employed by conjurers; who can "force a card" upon the most unwilling victim, or compel him to select, out of a dozen or two of handkerchiefs, the one suitable for his trick. The only difference is, that the suggestion is conveyed orally in the one case, and presented visually in the other. But, besides this unconscious confederacy, there is full opportunity for the intentional complicity which Sergeant Cox has exposed in the case of the "materialization" imposture; and not even members of the family or the most intimate friends can be in strictness regarded as beyond the pale of suspicion. Clever as they are, however, "mediums" are sometimes caught in their own trap.

"I recall an instance" (says Mr. Home) "in which about half a pint of gooseberries were thrown on a table in the dark. 'There,' cried the 'medium,' 'is not that a beautiful manifestation? Don't you think it is perfectly astonishing?' A burst of indignation ensued when the two other persons present 'could find nothing astonishing in it.' 'What!' said the wonder, 'you think I had the berries in my pocket, do you?' And to prove the honesty of all this wrath, the said pocket was turned inside out. Alas for the result! The 'medium' had forgotten the little withered ends [of the corolla] which adhere to the gooseberry. At least a dozen of these were disinterred from the depths of that pocket."

The "medium," however, was quite equal to the occasion: "Evil spirits must have placed them there!"

Does Mr. Wallace accept this explanation? If not, why not? It is surely just as likely as the "dematerialization" itself.

Now it will scarcely be believed that in Mr.

¹ Provided always (says Mr. Home) they are in season. The "spirits" never bring flowers which are out of season, or the products of distant lands.

Wallace's own case *no precautions whatever had been employed!* The "medium" was Miss Nichol (of whom more anon); and the production took place for the first time, and "at a very early stage of her development." The only shred of evidence adduced by Mr. Wallace that the flowers and ferns had *not* been brought in by the "medium," consists in what he asserts to have been their condition—they being "all absolutely fresh as if just gathered from a conservatory, and covered with a fine, cold dew." This, in Mr. Wallace's opinion, made it "absolutely impossible" for Miss Nichol to have kept them concealed about her person "in a very warm, gas-lighted room four hours before the flowers appeared." Now, granting Mr. Wallace's testimony on this point—as to which I fully admit that he was specially qualified to judge—to have been entirely unbiased, there is one little defect in his narrative, which, as will presently appear, seriously impairs its probative value. The whole thing happened more than ten years ago; and such a triviality as Miss Nichol's having left the room during these four hours, or having had an opera-cloak brought in to prevent her feeling chilly (it being mid-winter), may have escaped Mr. Wallace's attention at the time, or slipped his memory since. But, even taking the case exactly as Mr. Wallace puts it, what is the proof of his "absolute impossibility?" Every one has seen conjurers tumble piles of bouquets out of a hat, in which it was "absolutely impossible" that they could have been all contained. And most people who have been long in India have seen the celebrated "tree-trick," which, as described to me by several of our most distinguished civilians and scientific officers, is simply the greatest marvel I ever heard of. That a mango-tree should first shoot up to a height of six inches, from a grass-plot to which the conjurers had no previous access, beneath an inverted cylindrical basket whose emptiness has been previously "demonstrated," and that this tree should appear to grow in the course of half an hour from six inches to six feet, under a succession of taller and yet taller baskets, quite beats Miss Nichol. Does Mr. Wallace attribute this to "spiritual agency," in like manner as Mr. Benjamin Coleman insists that Messrs. Cooke and Maskelyne, in spite of their disclaimer, "are the best of living mediums for the production of physical effects?" Or, like the world in general, and the performers of the "tree-trick" in particular, does he regard it as a piece of clever jugglery? If the former, we are free to entertain our own opinion

of the healthful condition of Mr. Wallace's mind. If the latter, what is the probative value of the "demonstrative" performance in Mr. Wallace's drawing-room?

But now for the other case specially cited by Mr. Wallace, that of Mr. T. A. Trollope. Here the "medium's" dress had been carefully examined by Mrs. Trollope before the *séance* began, and a previous search of the room had been made by the gentlemen of the party. Now, considering how cleverly (as will be presently shown) the concealment of the "properties" required for "spirit materialization" can be managed by ingenious ladies, it would have been more satisfactory if the examination of Miss Nichol's dress had been effected by an experienced female searcher; and the assistance of a clever detective might have been a useful help to the gentlemen-searchers of the room. But even if all these precautions had been adopted, a trick so simple that (as M. Robin the conjurer said) "it makes one laugh to see how easily people can be deceived," would have been quite sufficient to get over the little difficulty.

In the case of a "medium" known to Mr. Home (*op. cit.*, page 353), "in more than one instance, after the most rigid scrutiny of her dress had been made, flowers, and even small branches of shrubs with the leaves attached, were brought, in total darkness, of course." One evening, however, a gentleman who had come too late to be admitted to the *séance*, but to whom, after its conclusion, one of the little "spirit-branches" had been given to examine, happened to notice a leaf hanging from the lower part of the red opera-cloak worn by the "medium;" and, finding that it corresponded exactly with the leaves of the twig he held in his hand, he caught up the cloak, and showed to all present that the "spiritual" productions had been concealed in its lining. And "it was then remembered that the 'medium' had, *after* being searched, complained of feeling chilly, and had requested permission to put on the red opera-cloak which she had left (quite promiscuously, of course) in the hall."

Thus, in addition to a very thorough search, alike of the "medium" and of the apartment, before the *stancer*, it would be essential that after its commencement *nothing should be brought in*.

Even this precaution, however, would not suffice to "demonstrate" the "spiritual" introduction of the articles in question. For there would remain full scope for the exercise of *confederacy*, which, says Mr. Home, "plays a great part on these occasions. . . . I have known of

cases," he continues, "where servants of the house were bribed into acting as accomplices." And Sergeant Cox, speaking of the "materialization" performance, refers to "people who knew it was a trick, and lent themselves to it."

"The lesson," continues Sergeant Cox, "to be learned from all this [the system of cheating he has honestly exposed] is, that no phenomena should be accepted as genuine that are not produced under strict test-conditions. *Investigators should be satisfied with no evidence short of the very best that the circumstances will permit.*"

I feel sure, therefore, that, as an experienced criminal judge, Sergeant Cox will bear me out in saying that, in the case now under discussion, the only "test-condition" that could be considered "demonstrative" would be *a careful search of every individual admitted to the séance*. Such a test, however, would probably be objected to by Mr. Wallace, as showing an unreasonable degree of suspicion, which might deter the "dear spirits" from favoring the *séance* with their gifts; and he would argue that failure under such "rigid conditions" proved nothing against the genuineness of successes obtained under more favorable circumstances. But I believe that the common-sense of such as have not surrendered it to the spiritualistic "prepossession" will bear me out in the conclusion that Mr. Wallace's "demonstration" is no demonstration at all; and that, until some better shall have been given, we are fully justified in deeming it more probable that there is imposture *somewhere* than that "matter can pass through matter."

That there is good ground for suspecting even ladies who are above receiving money as professional "mediums" of occasionally amusing themselves in this way for the mere pleasure of deception, I pointed out in my lectures, as a probability well known to medical practitioners, of which Mr. Wallace has not had—what I have had—personal experience. And I shall now give the particulars of a case of this kind, referred to in my second lecture, my account of which has been called in question by Mr. Wallace.

In his zeal to defend a "lady-medium," whom he considers that I have most unjustly aspersed, Mr. Wallace suggests that my informant "manufactured the evidence;" asks for "independent testimony that the salt was not applied to the flowers *after* they appeared at the *séance*;" and states that "some of the flowers were sent to a medical man in the town, and that no trace of ferrocyanide of potassium could be detected." As Mr. Wallace has no reserve about the case, I

may now say that the "medium" was Mr. Wallace's favorite performer—Miss Nichol, afterward Mrs. Guppy, and now Mrs. Guppy Volkman—the subject of the celebrated aerial transportation from her house in Highbury Hill Park into a securely-closed room in Lamb's Conduit Street; and that the *séance* was one of several held during the meeting of the British Association at Belfast, three years ago, in a house into which Mrs. Guppy had been received as a guest. Having myself seen one of the hollyhocks "produced" on that occasion, and having learned that a fraud had been chemically detected by a young gentleman present at the *séance*, I put myself into communication with him, and soon received an explicit statement of what had passed, not only at this, but at a previous *séance*, with full permission to publish it. The following *verbatim* extract from this statement, which, having lain in my desk for more than *three years*, has not been "manufactured" to meet Mr. Wallace's objections—as its precise "fit" might seem to suggest—contains all that is essential to the case:

"Having observed [in previous *séances*] that the flowers were soaked in wet (dew does not soak to the heart of a flower), I considered that the dew on them was artificially produced; and on August 21st I mixed a small quantity of solution of potassium ferrocyanide with the water on the wash-stand in Mrs. Guppy's rooms.

"*Séance* No. 4, August 23, 1874.—Fifteen persons sat; of these five were strangers—viz., Mr. and Mrs. Guppy, and three gentlemen introduced by them, one a professed medium. The candle was put out, and the table began to oscillate violently. We were asked to wish for three kinds of flowers. The table now jolted violently, and I struck some matches. It at once stopped. Mrs. Guppy got very angry, and said it was as much as to say they were cheating. Being pacified, the candle was again extinguished, after we had found on the table some sand, a plant like an onion, etc. The table rocked violently, and scent was squirted from one of the mediums. A large quantity of flowers were thrown from their side of the table, among which were china-asters, which I took out, and, having wet a piece of white blotting-paper with the 'dew' off them, poured some ferrous-sulphate solution on it. The result was the ordinary Prussian-blue color. A spike of pink hollyhock gave a very decided blue color. Similar flowers, fresh from the garden, gave no reaction. The flowers were allowed to remain in my laboratory, the door of which was not locked, till the morning of August 25th, when I took some in to Dr. Hodges, and he with several friends could find no trace of the salt in them. I immediately wrote to a

friend who had been present at the *séance*, and who had taken an aster with him as a keepsake, to have it tested. He writes: 'I have had the plants analyzed to-day by Professors Delfs, of Heidelberg, and Roseoe, of Manchester. The asters showed unmistakable signs of ferrocyanide of potassium, and in no small quantity either.' I believe the reason Dr. Hodges could find nothing in the hollyhocks was, that the fresh flowers had been substituted for them on Monday evening (24th), when every one was from home at Sir J. Lubbock's lecture, except the mediums."

Being able to add, from inquiries I have made, that my informant bears an unblemished character, as does also the friend to whom he refers, I ask, Which is the more to be trusted—the testimony of these two gentlemen, or the honesty of Mrs. Guppy? It will be observed that we have here *no evidence whatever* that the flowers were *not* brought in by the medium; while the *immediate* detection of the salt by one of the witnesses, and the subsequent confirmatory testimony of the other, affords the strongest assurance that the flowers had been watered out of the decanter in Mrs. Guppy's room—*by whom?* I can only say, as an ex-professor of medical jurisprudence, that I have not the least doubt, supposing this to have been a case of poisoning, as to the verdict that an intelligent jury would return.

WHAT MR. WALLACE DEEMS "RIGID CONDITIONS."

The failure of each of the three claimants for the Burdin prize, as narrated in my second lecture, is thus accounted for by Mr. Wallace: "The reader might well doubt if offering a prize for *reading under rigid conditions* was an adequate means of sifting a faculty so eminently variable, uncertain, and delicate, as clairvoyance is admitted to be." Now, what were these conditions? In the *first* case, Mademoiselle Emélie was not permitted to acquaint herself by ordinary vision with the contents of a book which she was to read with her occiput. In the *second*, Mademoiselle Pigeaire, whose eyes were covered by a black-velvet bandage, was required to read a book held *directly opposite her face*, and was not permitted to hold it for herself in such a position that she could see it *downward* beneath the bandage. And, in the *third*, M. Teste's *clairvoyante* was not allowed to open the box in which the test-lines of print were inclosed! From these examples it may be judged what are the tests which Mr. Wallace would consider adequate.

WHAT MESSRS. WALLACE AND CROOKES REGARD AS "TRUSTWORTHY TESTIMONY."

Every one who has followed the recent history of spiritualism has heard of the exposure of the American "Katie King," to which I referred in my lectures as a matter of public notoriety. It is well known that Robert Dale Owen had sent to a Boston periodical a narrative of the "materialization" manifestations, to which he pledged his credit; that when this exposure took place, he tried (in vain) to prevent the appearance of his narrative; and that its publication so distressed him as to have had much to do with the mental and bodily illness to which he succumbed not long afterward. Mr. Home, together with (as I am in a position to show) the most respectable American spiritualists, including the family of Robert Dale Owen, altogether disown her. But in order to support the charge which Messrs. Wallace and Crookes make against me, of a "reprehensible eagerness to accept and retail whatever falsehoods may be circulated against mediums," a witness is brought forward to rehabilitate "Katie King," by giving the results of a reinvestigation of the case by "a gentleman connected with the New York daily press." Now, who is this reinvestigator, whose judgment is to be set in opposition to the verdict of the committee—composed not of hostile skeptics, but of honest spiritualists—by which the case was originally examined? None other than the very Colonel Olcott, whose indorsement of the Eddy imposture has drawn forth Mr. D. D. Home's severest reprobation. But, as it may be said that Mr. Home's is a prejudiced judgment, I shall call Colonel Olcott himself as a witness to his own character. Among other vagaries of the Theosophical Society of which he is president, is the dispatch of a newly-affiliated member to Tunis and Cairo, with the charge to find and bring back an "African sorcerer, who will, for a small fee, show you images of the dead, and enable you to converse with them in an audible voice. They will walk self-levitated in air; climb poles which rest upon nothing, until they go out of sight, and dismember themselves even to decapitation without injury. . . . You have the opportunity to introduce to Western scientists, under the patronage, restrictions, and guarantees of a scientific society, those proofs of occult powers, for lack of which they have been drifting into materialism and infidelity." ¹

¹ I give this extract on the authority of Mr. Home (*op. cit.*, p. 247), whom I can scarcely suppose to have deliberately forged, even to blacken Colonel Olcott,

The inditer of this precious stuff is the *trust-worthy witness* whose assurance that he has proved, "under the most rigid test-conditions," that "Katie King" could not have been personated by Eliza White, is adduced by Messrs. Wallace and Crookes in support of the above charge!

MR. CROOKES AND HIS "SCIENTIFIC TESTS."

As Mr. Crookes has in more than one instance pledged his scientific reputation to the genuineness of the performances of "mediums," on the strength of what he describes as "scientific tests," the *probative value* of these tests constitutes a most legitimate subject of inquiry; and the following history will afford some means of estimating this:

About three years ago, there came to London from Louisville, Kentucky, a good-looking young woman, who, having come out as "a physical and mental test medium," and having in that capacity made the tour of the principal cities and towns of the United States, gave a series of performances in the Hanover Square Rooms, at one of which I was myself present. A short preliminary lecture was given by a gentlemanly-looking man, styling himself "Colonel" Fay, whose relation to the lady was then spoken of as paternal, though elsewhere it seems to have been marital. The "colonel" candidly informed his audience that he purposely abstained from saying anything about the nature of the "manifestations;" he did not claim for them a "spiritualistic" character; on the other hand, he did not present them as conjuring tricks. He left every one free to judge for himself or herself; as the showman said to the little girl, it was "whichever you please, my pretty dear."

The performance consisted of two parts: the first, or "light *séance*," being a new version of the "cabinet-trick" originally introduced by the Davenport brothers; while the second was a "dark *séance*," for "manifestations" of a different order. Having previously seen Maskelyne and Cooke's presentation of the cabinet-trick, "with new and startling effects," I felt perfectly sure that they could, without the least difficulty, reproduce everything done by Eva Fay; her performances being all explicable on the very simple hypothesis that her hands were not really tied

what he puts forward as a public document. And I may add that it is fully borne out by information I have received direct from New York; which, without at all calling his honesty in question, makes it clear that he is the very type of those *gobe-mouches* who, as Mr. Home says, are ready to swallow anything from gnats to camels.

behind her so tightly as they seemed to be. And Mr. Maskelyne states ("Modern Spiritualism," page 121) that while these "manifestations" were running on at the Hanover Square Rooms, Mr. Cooke was actually giving *an exact reproduction of them* twice a week at the Egyptian Hall.

At the conclusion of the first part of the performance, the cabinet was moved out of the way; and Eva Fay having taken her seat on a stool in the centre of the stage, the "colonel" requested the occupants of the two front rows of reserved seats to come up and sit on a circle of chairs placed around her, joining their hands together, so that the "circle" (of which the colonel, like myself, was a component) should be complete. Eva Fay then began clapping her hands together with a steady rhythmical beat; and we were directed to keep our attention fixed upon the *continuity* of this, after the lights should be turned down, as a proof that any "manifestation" which should require manual instrumentality *could not be her doing*. Various "properties"—such as guitars, bells, and fans—were then laid about "promiscuously," some of them on the knees of the sitters; and the gas having been put out on and near the stage, and turned "down to the blue" elsewhere, the darkness on the stage was so complete that nothing whatever could be discerned by any one not habituated to it. Immediately there was a rustling sound within the circle, as of "spirits" moving stealthily about; guitar-strings were twanged, bells were rung, open fans were moved before our faces, our legs were struck, our arms were pinched, our whiskers were pulled, and some "old fogies" were chucked under the chin—while all this time the clapping sound was continuously heard! Now, granting that there was no confederacy, that the "colonel's" hands were held during the whole time, so that he could not give any assistance to his partner, would it not become clear to any man of average shrewdness not "possessed" by an idea, that, while Eva Fay was doing all this "business" with one hand, she could keep up the clapping sound by striking her forehead, cheek, or bared arm, with the other? But if this should be openly suggested by any troublesome skeptic (which did not happen when I was myself present), the "colonel" was prepared with another "manifestation." "To show the impossibility of such a thing, one gentleman shall now be allowed to hold the medium's hands: still, a bell shall be rung, a guitar be thrummed, and possibly the gentleman holding the medium's hands shall have his face fanned." All this, says

Mr. Maskelyne, can be very easily accomplished. "Miss Fay will pass a bell to the colonel's mouth, which he will shake as a terrier does a rat, while his boot operates upon the guitar-strings, and produces the thrumming; and the 'medium,' with a fan held between her teeth, will gently wave it in the face of him who holds her hand." And he thus explained to his audience at the Egyptian Hall every one of the apparent marvels of Eva Fay's "dark *séance*;" these being, as he truly says, "too simple and absurd to bear any other treatment."

But, while not putting forth any public claim as a spiritualistic "medium," Eva Fay asserted herself in private to be such; and, for good reasons of her own, sought to convince the London spiritualists in general, and Mr. Crookes in particular, that she really was so. Accordingly, Mr. Crookes subjected her to what he considered to be "scientific tests;" which, as I am assured on good authority, could be evaded by a "dodge" so single (reminding one of Edgar Poe's well-known story of "The Lost Letter") that Mr. Crookes's highly-trained scientific acumen could not detect it.¹ And this is confirmed by the statement of Mr. Maskelyne ("Modern Spiritualism," p. 122), that, while this testing was in progress, Miss Fay's business agent made Mr. M—— an offer, at first verbally, and then confirmed by letters in his possession (dated Birmingham, May 12 and 15, 1875)—copies of which I have myself seen—that for an adequate sum of money the "medium" should expose the whole affair, "scientific tests" and all—"complicating at least six big guns, the F. R. S. people"—as she was not properly supported by the spiritualists!

This offer having been declined by Mr. Maskelyne, and her London audiences dwindling away, Eva Fay returned to the United States, carrying with her a letter from Mr. Crookes, which set forth that, since doubts had been thrown on the spiritualistic nature of her "manifestations," and since he, in common with other Fellows of the Royal Society, had satisfied himself of their genuineness by "scientific tests," he willingly gave her the benefit of his attestation. This letter was published, in *fac-simile*, in American newspapers; and Eva Fay announced her spiritualistic *séances* as "indorsed by Prof. Crookes and other Fellows of the Royal Society!"

Unluckily, however, for her own reputation and for that of Mr. Crookes, it happened that a

young gentleman of New York, Mr. Washington Irving Bishop, of excellent social position—his father being a very eminent lawyer, and Washington Irving having been his godfather—was moved to bestow a great deal of time and attention on the pretensions of the spiritualistic "mediums."

"A friend whom he loved, as did every one else who enjoyed his acquaintance—a young man full of promise, intellectual, gifted, brilliant—became ill, and was sent to a foreign country for treatment. Here he finally fell under the infernal arts of the spiritual mediumistic healers, who restored him to his home and friends hopelessly insane; and thus he remains to this day. Mr. Bishop covenanted with himself—those bonds are strong ones when made in thorough earnest—that he would leave no stone unturned until he had ferreted out the explanation of the whole mediumistic business."—(*Boston Herald*, November 6, 1876.)

Convinced that there was deception in the matter, he devoted many months to the investigation, and finally discovered the clew. He then trained himself to do everything done by Eva Fay, "a woman who had successfully cheated two hemispheres; who had fairly drained money from rich and poor, high and low; who fooled men of the sharpest intellects, men of science and close students of human and every other nature;" and exhibited to his circle of private friends, which included several of the most distinguished members of the clerical and medical professions in New York, an exact counterpart of Eva Fay's performances. Two of the latter, one of them well known in this country as an eminent physiologist as well as an able surgeon, and the other an ex-surgeon-general in the United States Army, addressed to him the following letter:

"NEW YORK, March 30, 1876.

"W. IRVING BISHOP, ESQ.

"DEAR SIR: It has given us great pleasure to witness the very satisfactory manner in which you show the fraudulent nature of the pretensions of the so-called spiritual mediums, especially those of Annie Eva Fay, who has received the indorsement of Mr. William Crookes and other Fellows of the Royal Society. We believe the performances of these people are calculated to produce evil effects upon the credulous and disordered imaginations of many persons; and, with a view to put an effectual stop to them, we earnestly request you to communicate to the public the manner in which the so-called spiritualists conduct their deceitful practices. Such an *exposé* as we refer to can only be productive of good results; and we trust, therefore, in view of the importance of the whole

¹ I shall give the whole explanation in the new edition of my lectures.

matter, that you will accede to our request. With great respect, we are your obedient servants,

"WILLIAM A. HAMMOND, M. D.,

"ALEXANDER B. MOTT, M. D."

This having been followed a month later by a requisition to the same effect by twenty-four gentlemen, mostly well-known clergymen of various denominations and eminent M. D.s, a public performance was arranged, which consisted (1) in the repetition of the most mysterious of the "mediumistic" feats, including "slate-writing" and "flowers from an invisible garden;" and then (2) in the exhibition and explanation of the whole *modus operandi*, in full view of the spectators. From among the various attestations to the completeness of this exposure, I select the following, because, as Dr. Bellows is a valued personal friend of my own, I can bear the strongest testimony to his intellectual ability, moral worth, and practical clear-headedness.¹ The style in which Dr. Bellows delivers his testimony will confirm my own estimate of his vigorous and thorough grasp of the subject:

"NEW YORK, 232 EAST 15TH STREET,
"October 16, 1876. }

"DEAR SIR: I had the pleasure and profit of attending your exposure of the acts by which the alleged proofs of spiritualism are foisted upon a credulous public. You showed in a most effectual and convincing way that a most intelligent audience could be entirely deceived by the testimony of its own senses, in regard to matters which were afterward shown openly by you to be mere tricks, in which sleight of hand and a diversion of attention from the real to the artificial and chosen conditions were the means of success. After puzzling the audience, as no juggler could puzzle them, for an hour and a half, with feats that seemed supernatural, you untied all the riddles. I felt convinced that *nothing* that spiritualists pretend or believe is done by spirits beyond the reach of a clever juggler, who possesses unusual suppleness of joints, strength of muscles, and agility of movements, perfected by practice, and skillfully plays upon the credulity of our common nature.

"I am of the opinion that your exhibition is

¹ It may, however, be not amiss for me to state that Dr. B. was the originator and organizer, and was then appointed by universal acclaim the chairman, of that great volunteer Sanitary Commission which, throughout the war between the Northern and Southern States, supplemented the work of the military organization of the North in every way that could contribute to the health and welfare of the army; the extent of its operations being such that Dr. Bellows assured me that *a million and a half of pounds sterling* passed through his hands during his four years of office.

one of great public importance, and tends to disabuse the public mind of a very mischievous and very general delusion, which indeed is becoming a vulgar religion with thousands. No description of it can take the place of an actual sight of it. It might advantageously be repeated in every town, where the pretended *sciences* of the modern necromancer have played upon the weaker portion of communities. Without attributing any exalted motive to the business which engages you, I deliberately think, independent of any ends you seek, that your exhibition is one of the most instructive and useful I have ever seen, as well as one of the most interesting and successful. I wish you a long succession of fortunate spectators.

"Yours truly,

"HENRY W. BELLOWES."

The immediate effect of Mr. Bishop's exposure upon Eva Fay's *status* was, we are assured by the *Boston Herald*, "to reduce her to the level of a pitiful street performer, obliging her to take out a license as a juggler before she could carry on the nefarious business by which her ill-gotten gains could be continued." It is, perhaps, to be wished that a similar legal process could be applied to the like class in this country. Let them not be martyred by criminal prosecutions; but let them be "ticketed" as "licensed jugglers;" and then be allowed to carry on their vocation without let or hindrance as long as they find people ready to pay for seeing them.

The fame of Mr. Bishop's performances having reached Boston, he was invited by a committee composed—like that of New York—of some of its most distinguished members of the medical and clerical professions (the honored name of Oliver Wendell Holmes standing at the head of a requisition now before me, dated October 18, 1876), to repeat them in that great intellectual centre; and the result was equally satisfactory. The newspapers were filled with the accounts of his exposures, not only of Eva Fay, but of various other "mediums," including the Hardy trick of the moulding of paraffin-hands, and the so-called "thought-reading"—the first of which I shall presently notice; and they also contain "illustrations" of the manner in which all the tricks were worked. It is not a little significant of the effect produced by Mr. Bishop's most laudable exertions that the *American Graphic*—which had so far given in to the "materializations" of the Eddy brothers as to send a special "commissioner" to report upon them (the Colonel Olcott of whom I have already spoken), who was known to favor the doctrine—thus decidedly ex-

pressed itself after seeing in private Mr. Bishop's imitation of them, as well as of "Katie King," whom the *Graphic's* "commissioner" had previously tried to rehabilitate:

"Mr. Bishop unraveled the Katie King mystery, that seemed for a time to defy the most rigid scrutiny; and more recently he has been engaged in revealing the method by which the Eddy brothers produced those sub-mundane entertainments, which long harassed the public mind and imposed upon the credulity of many thoughtful and intelligent men."—*Graphic*, April 12, 1876.

Returning to the subject a month afterward (May 10th), the *Graphic* says:

"It certainly would be a laudable thing for clergymen, physicians, and leading citizens generally, to invite Mr. Bishop to exhibit in every city and town in the country; for the exposure he gives of the mediumistic tricks is so complete that it could not but convince even the most credulous that 'spirits' have nothing to do with these manifestations."

MATERIALIZATION SÉANCES.

It is, I suppose, now generally known that spiritualists claim not only to hold intercourse with "the spirits" by raps, slate-writing, and the like, but also to induce them to clothe themselves afresh in a "materialized" form, possessing the substance and weight of ordinary mortals. It was Mr. Home, I believe, who first "produced" spirit-hands; but he has been so far outdone by those who "materialize" whole figures, that he feels it incumbent upon him not only to denounce them as impostors, but to make a full exposure of the various modes in which the trick is played. As I have never myself been present at any of these performances, and could therefore only describe from hearsay, I borrow Mr. Home's account of them:

"Nothing is offered that can in the slightest degree be considered as approaching a test; the imposture is often of the baldest and grossest character; yet the 'medium' is congratulated on the success of the *séance*, and credulous fools are happy. Perhaps the sitting is for 'materialized' forms or faces; in such case the proceedings are regulated according to the character of the persons present. Should these be unknown, or regarded as possessing a fair share of common-sense, nothing goes well. The circle is described as 'inharmonious.' The cabinet is jealously guarded. A distressingly tiny ray of light having been introduced, 'materialization' takes place. All that the persons present can perceive is something white; shape and features there are none. Such is a faithful portraiture of perhaps the majority of

sittings for 'spirit-forms.' If, however, the audience consists of known and enthusiastic dupes, the conditions are at once pronounced favorable. A larger share of light is admitted; the form appears, and moves about among the believers present. Their credulity rapidly mounts to fever-heat. Patched and darned shawls are discovered to be 'robes of delicate texture and surpassing gorgeousness.' A kerchief twisted round the head becomes an unmistakable turban; false whiskers and Indian-ink produce 'a manly and noble face;' rouge and pearl-powder, in conjunction with a skillfully-arranged head-dress, are sufficient to send the credulous into raptures over the 'vision of surpassing loveliness' presented. The familiarity of the spiritual visitors is charming; they have been known to seat themselves at the tea-table, and make a hearty meal, 'inquiring jocularly whether the muffins were well buttered.' They have mixed stiff glasses of grog for the sitters, and, not satisfied with mixing, have themselves partaken of them. In such little *réunions*, tests are never employed or mentioned. Not a dupe present but would rather perish than take a suspicious peep into the cabinet while the materialized form is out and moving about the room. Not a hand among the party but would rather be cut off at the wrist than grasp in detective fashion the said form. The spirit is in every respect at home, and may walk in or out of the cabinet as he or she lists.

"The darkness of the *séance* is thus proportioned to the sense of the sitters. Where skepticism is rife, the most jealous precautions are taken lest that skepticism should behold too much. If they be of an inconvenient nature, the impostor whom they are intended to unmask usually declines them. If, on the other hand, they appear such as may be eluded by jugglery or confederacy, they are at once adopted."

In the simplest form of these performances, only one "spirit" appears; and, if it should be objected that it "is very like the medium," the incredulous are sometimes admitted into the back-room, or cabinet, where either a "dummy" has been prepared, or a confederate introduced, to represent the "medium" as in a state of trance; no light being allowed but that of a bottle of phosphorized oil, or some similar glimmer; and no handling being permitted. A wicked skeptic has been known to endeavor to identify the "spirit" and the "medium" by squirting ink on the arm of the former, and pointing out its presence on the arm of the latter on his (or her) return to the company; or by smearing ink on his own hand, and then, by a friendly grasp, imparting some of it to the hand of the "spirit," who unsuspectingly reappears as the "medium" without washing it off. But this little incident,

it appears, is referable to the "well-known law of spiritualism," that any impression of this kind made on the spirit is transferred to the medium. Such a test as the free opening of the doors, and the examination of both figures under a full light, is, of course, not to be thought of.

In another set of cases, a spirit "dummy" is made up with a life-sized doll head and shoulders, and long, flowing robes; this may be held up by the medium, who is ensconced behind the curtains, and who passes his or her hand between them; or else two spirits may appear at once, performed by the medium and the dummy, the latter being made to appear to sink into the floor by a very simple contrivance.

That multitudes of men and women, who claim to be sensible and well educated, should be victimized by such an obvious imposture, especially after its repeated detection and exposure, seems almost incredible; to me it is one of the most pitiable facts in the mental condition of our time. Mr. Home tells us that he does not believe that there are more than five of these "materializing mediums" who have not been found out; and yet the thing goes on. The fact seems to be, that the respectable spiritualists who have countenanced it in the first instance, being generally ashamed of their gullibility, refrain from publishing the detection themselves, and do their best to keep others quiet. Sergeant Cox, however, who seems to have been partly taken in at first, has since honestly and vigorously denounced the cheat; a long letter from him being published in Mr. Home's book, which contains a set of instructions given by a "medium" to her pupil; by which we find *inter alia* that, in order to evade the search for "properties," which is sometimes made on entrance, she brings in a veil under her drawers!

Now, so far is Mr. Crookes from having been a cautious scientific investigator of these "materializations," that it can be shown from his own utterances that he has "gone in" for them most enthusiastically. One of his favorite "spirits" is the English (not the American) "Katie King;" of whose "entrancing loveliness" he thus speaks:

"But photography is as inadequate to depict the perfect beauty of Katey's face as words are powerless to describe her charms of manner. Photography may, indeed, give a map of her countenance; but how can it reproduce the brilliant purity of her complexion, or the ever-varying expression of her most mobile features, now overshadowed with sadness when relating some of the

bitter experiences of her past life, now smiling with all the innocence of happy girlhood when she had collected my children round her, and was amusing them by recounting anecdotes of her adventures in India?—

"Round her she made an atmosphere of life.
The very air seemed lighter from her eyes;
They were so soft and beautiful, and rife
With all we can imagine of the skies;
Her overpowering presence made you feel
It would not be idolatry to kneel."¹

Truly, as has been well said, "the 'scientist' who writes like this is much too far gone for investigation." We shall now see how Mr. Crookes, fascinated by these "spiritual" charms, lent himself to Katie King's influence, and was rewarded by her fullest confidence. This, he says—

"Gradually grew until she refused to give a *séance* unless I took charge of the arrangements. She said she always wanted me to keep close to her and near the cabinet; and I found that after this confidence was established, and she was satisfied I would not break any promise I might make to her, the phenomena increased greatly in power, and tests were freely given that would have been unobtainable had I approached the subject in another manner. She often consulted me about persons present at the *séances*, and where they should be placed; for of late she had become very nervous, *in consequence of certain ill-advised suggestions that force should be employed as an adjunct to more scientific modes of research.*"²

This last refers to an unpleasant circumstance which took place in an early stage of the "Katie King" materialization—the unceremonious clasp-
ing of her spiritual waist by an incredulous "Dialectical," for whom "materialization" seems to have been a little "too strong," and who was rewarded for his impudence by a very forcible tug at his beard, which is said to have despoiled it of some of its beauty.

Further, the Rev. C. Maurice Davies, a well-known author, who was far from being unfavorably disposed to spiritualism, and who was at the time a member of the Council of the British National Association of Spiritualists, thus describes, in his "Mystic London," the part taken by Mr. Crookes (whom he styles "the professor") at a *séance* at which he was present:

"The professor acted all the time as master of the ceremonies, retaining his place at the aperture; and, I fear, from the very first, exciting suspicion by his marked attention, not to the medium, but to the ghost."

And he afterward speaks of Mr. Crookes's

¹ *The Spiritualist*, June 5, 1874.

² *Ibid.*

conduct in the matter as having given the final death-blow to his belief that there might be "something" in the face-manifestations!

It has been rumored that Mr. Crookes has *privately* admitted that some of his "mediums," when they could not evoke the "manifestations" by *fair* means, have done so by *foul*. Now that he knows (if he did not know before) how his name and reputation are being traded upon in the United States, and that the Royal Society is being trailed through the dirt by his instrumentality, it may be hoped (if this rumor be true) that he will honestly come forward, and, by *public* admission that he has been even occasionally duped, will do all he can to repair the mischief he has done by his inconsiderate "indorsement" of one of the grossest impostures ever practised—that of Eva Fay.

"THE LAST NEW THING" IN SPIRITUALISTIC MATERIALIZATIONS.

Everybody knows that Paris "sets the fashions" in ladies' dress; and, in like manner, Boston (United States) "sets the fashions" in spiritualism. The latest "manifestation," which has not yet (so far as I am aware) been imported into England, is the production of likenesses of the *lunds* of departed friends, "moulded" by "the spirits" in paraffin. A "circle," including the "medium," is constituted round a table, beneath which is placed a bucket of hot water, wherein some lumps of solid paraffin have been placed, so as to form when melted a floating stratum two or three inches thick. After a longer or shorter interval, the "spirits" announce by raps that the process is complete; the table-cloth is lifted up, and a hand moulded in solid paraffin is found on the floor, or on the knees of the "medium," which the "faithful" accept as their indubitable production. Of course the hand is "demonstrably not brought in by the medium;" for how could such a brittle affair have been carried in her pocket, or hid in the folds of her dress? Suspicious half-believers may observe shreds of cotton-wool adherent to the hand; or may notice that the hand "produced" at one *séance* has a very suspicious likeness in shape, or in some little defect or fracture, to one they have previously seen. But, of course, the cotton-wool has been brought by the "bad spirits;" and, as even "good spirits" sometimes bungle their work, there is nothing extraordinary in the same defect being repeated, when the same spirits are the operators. Everything that can be thus

readily explained away goes for nothing with those who are predetermined to believe.

But how about the following? A set of troublesome skeptics, Mr. Home tells us, bought a proper quantity of paraffin-lumps, and had them carefully weighed, and their weight recorded by the dealer. After the conclusion of the *séance*, when the water had cooled and the paraffin had solidified again, the whole of it was collected; and, on being taken back to the same dealer, *was found to weigh exactly the same as it had weighed before*. Of course, the explanation is ready: either the gentlemen who planned this test, and the dealer on whose independent verdict the result depended, were leagued together to "manufacture evidence," or else the "spirits" could not only mould the hand, but could supply the paraffin. To doubt the "medium," in Mr. Wallace's view, is to have "a reprehensible eagerness to accept and retail whatever falsehoods may be circulated to her disadvantage." To doubt the honesty of the skeptics, on the other hand, is perfectly legitimate. I cannot question that "the spirits" could as easily have supplied paraffin as mould it into a hand; but then what was the need of the bucket under the table? Messrs. Crookes and Wallace, however, may say that it is Mr. Home who has put together these "idle tales," without either "time, place, or circumstance;" and that his testimony, on account of his obvious *animus*, ought not to be received. I will give them, therefore, another case, the testimony in regard to which, having been given on oath by a gentleman whose high character and social position are thoroughly vouched for, my opponents are bound to admit until they can succeed in discrediting it.

On Sunday evening, October 29, 1876, a *séance*, convened by public advertisement in the *Boston Herald*, was held, "for moulds and the materialization of spirit-forms," by Mrs. Hardy, residing at No. 4 Concord Street, Boston; described in the *Herald* as a "substantial structure in one of the most fashionable neighborhoods in Boston." To this *séance* the *Herald* sent a reporter, who was accompanied by a "skeptical expert"—no other than the troublesome Mr. W. Irving Bishop. The usual bucket having been brought in, and all who desired being allowed to examine the pail and its contents—"some of them, in the eagerness of their curiosity, even dipping their fingers into the oleaginous liquid in which angel-hands were soon to dabble"—the *Herald* representative followed their example; and, "while he plunged his finger into the trans-

parent fat, he emptied from the hollow of his palm an ounce or two of that harmless substance with which the New England dairy-women are wont to give a red color to their cheeses, and stirred it in with his finger." Mrs. Hardy seems to have "smelt a rat;" for at first "she declared that it was doubtful if there would be any manifestation of spiritual presence, for the reason that some foreign substance had been put into the pail," the "pure spirits with whom she dealt abhorring all chemical combinations." Having been asked, however, whether they could favor the company, they promised that in seven minutes the materialization of a spirit-form would be produced; and, after only five minutes of breathless expectation, Mrs. Hardy announced that the spirits had done their work. The table-cloth being removed, there lay, within six inches of Mrs. Hardy's right foot, a beautiful model of a human hand, *cold as marble, and white as alabaster*. "There were exclamations of surprise and wonder from all parts of the room, and some there were who felt themselves in the presence of the sublime realities of the unseen world. But the *Herald* observer was not of that number." While this model was being passed round for inspection, he dipped four fingers again and again into the now cooling paraffin in the bucket, until they were incased by the material; and then, as it hardened, he peeled it off and rolled it into a little ball of the size of a nutmeg. He then pointed out that, as the hand was admitted by all to be *cold*, it could not have been produced out of the paraffin in the pail, which could not have thus completely cooled in so short a time; and that, as it was pure *white*, it did not correspond with the material in the pail, of which the sample he had taken was distinctly *red*, as all could see. Some demur having been made to this conclusion, on the ground that the coloring-matter might have been unequally mixed, so that some of the paraffin in the pail might have remained untinged, Mrs. Hardy was offered twenty dollars to mould a white hand out of it, which challenge she declined. Mr. W. Irving Bishop then took another sample from the pail, and broke off a piece of the hand. The next day he took both samples to Prof. Horsford, of Cambridge University; and the day after that he made the following affidavit:

"I, W. Irving Bishop, of New York, on oath depose and say, that on Sunday evening, October 29, 1876, I was present at a *séance* held by Mrs. Hardy, 4 Concord Square, for the production of moulds and materialization of spirit-hands. A paraffin-form

of a hand was produced, which Mrs. Hardy alleged was made by the spirits, from the contents of a pail of melted paraffin placed under the table. And I here state that coloring-matter had been placed in the said paraffin, and that I took a piece of the hand produced, and also, by dipping my finger into the heated paraffin, obtained an impression of the contents of said pail, for the purpose of comparison.

"That, subsequently, I submitted both pieces to Prof. Horsford, of Cambridge, who placed a portion of each in test-tubes, and, by the application of proper chemicals, found that the paraffin taken from the pail exhibited a slight reddish color, while that from the mould gave no appearance of the existence of coloring-matter.

"W. IRVING BISHOP,
of 98 Fifth Avenue, New York.

Suffolk, ss.

"Sworn and subscribed to this 31st day of October, 1876.

CHARLES J. BROOKS,

"Justice of Peace."

May we not now affirm with Prince Hal, that "these lies are like the father that begat them, gross as a mountain, open, palpable?" Well might the reporter of the *Herald* say of the moulded hand that "it symbolized the cunning and the craft of the woman who produced it, and who for years had speculated upon the credulity of the community, and made heartless traffic of the tenderest sympathies of human nature." Well might he be convinced that "all the much-vaunted spiritual manifestations at the Hardy mansion are the grossest impostures, and that they deserve to be ranked in the same category with those of such charlatan pretenders as Katie King, the Eddy brothers, and Mrs. Bennett, the exposure of whose consummate knavery was recently made in those columns." And well might he urge that the time has surely now come when the strong hand of the law should be invoked to protect the public from such chicanery and fraud.

SPIRITUAL REVELATIONS.

"By their fruits ye shall know them" is an adage as to which experience is entirely in accord with authority. And I shall close this survey of the present aspect of spiritualism by a brief notice of its teachings.

The *highest* form of these, we are assured by Mr. Wallace,¹ is to be found in the spoken addresses of one of the most gifted "trance-mediums," Mrs. Emma Hardinge, of which he gives selected samples. The idea which runs through the whole is that the future life is one of prog-

¹ See his "Miracles and Modern Spiritualism," p. 110.

ress; and that, according to the elevation we attain in this life by the right use of the powers intrusted to us—"not one jot of what we learn, or think, or strive for here, being lost"—will be the height of the platform (so to speak) from which we shall commence our ascent from the lower to the higher spheres of the next.

Now, surely "it needs no ghost to tell us that." "To understand that we are spirits, and that we live for immortality, to know and insure its issues," though to spiritualists *the best and noblest* "bright page which God has revealed to us," is surely a fundamental doctrine of every form of Christianity; and the particular idea of *continuity and progress* has been the teaching of the religious community (that of Channing and Martineau) in which I was myself brought up, as far back as I can remember.

Mrs. Hardinge's new Ten Commandments, again, if an improvement on the old, are only so in as far as they engraft Christian morality upon the Judaic code. And, looking to the exhibitions of "envy, hatred, malice, and all uncharitableness" which are to be found in the quarrels of "mediums," even "advanced" spiritualists would seem not to be at all more free from these faults than ordinary Christians.

For the following samples of the *lower* forms of Spiritualistic communications made by "spirits" who must be still in Mrs. Hardinge's "Hades," I am indebted to Mr. Home. (*Op. cit.*, p. 304.)

An American "circle" has been informed by John Wilkes Booth, the assassin of President Lincoln, that "I and Lincoln often have a cozy chat up here. We agree that it was just as well I shot him. You see it was set down in the order of things for me to do it; and I don't see why I should be blamed for accomplishing my destiny. The world was all the better for it."

The inspirational source of this philosophy is obviously that doctrine of human automatism of which it seems to me to be the legitimate outcome. Although Mr. Home elsewhere classes me with the "materialists" because I do not accept *his* form of "spiritualism," I am entirely at one with him in the conviction that, were such doctrines as the foregoing generally accepted among spiritualists, "spiritualism would be the greatest curse which could befall mankind;" the negation of those moral instincts which lie deep-est in our nature being (as I have elsewhere

endeavored to show) the most convincing proof of their really unscientific nature.

The following is a specimen of those elevated teachings which are brought to us by the "spirits" from "another and a better world," inhabited by purer and higher natures than are left in this: "Wisdom is what is wise. Wisdom is not folly, and folly is not wisdom. Wisdom is not selfishness, and selfishness is not wisdom. Wisdom is not evil, and evil is not wisdom. All is not wisdom, all is not folly." I have heard of a little boy to whom Sundays were made to be days of gloom and weariness; and who, when told that heaven would be "all Sundays," replied that if that were the case he should not wish to go there. I quite agree with those who prefer annihilation, if the twaddle just quoted is a true sample of the conversation of the blest.

As Prof. Huxley said, when invited to take part in the investigations of the Dialectical Society: "The only good that I can see in a demonstration of the truth of spiritualism is to furnish an additional argument against suicide. Better live a crossing-sweeper than die and be made to talk twaddle by a 'medium' hired at a guinea a *séance*."

Although the spiritualistic genuineness of the foregoing communications is utterly discredited by Mr. Home, they will probably be regarded by Mr. Wallace, who has a much larger receptivity, as proceeding from "spirits" who have made very little progress since they left the earth. The following, however, cited by Mr. Home from *Le Flambeau du Spiritisme*, will, I should hope, be too strong even for my *quondam* friend:

"The spirit-authors' are represented as being no less personages than the twelve apostles of Christianity. We are gravely assured that at various periods they dictated this incomparable production to the person who has caused a few copies to be published. The subject is the Life of Christ. *The mixture of ribaldry, insanity, and absurdity*, is almost incredible. One of the apostles favors us with particulars regarding the everyday doings of the twelve. 'We always took a small boy with us to clean our shoes. The Master liked us all to look well, and he was very particular that our shoes should be nicely blacked.' The ordinary attire of Christ consisted of a flowing robe and 'bright blue boots.' On one occasion he was reviled as an impostor. The incident is thus described: 'How can you call me an impostor?' said the Master, turning round. 'Don't you see my yellow curly hair and my nice blue boots? Would I have such things, do you think, if I were an impostor?' An apostle gives vari-

¹ Preface to the fourth edition of "Principles of Mental Physiology."

ous facts respecting a journey to Jerusalem: 'We were very poor, and we sold little pamphlets of the life and doings of Jesus, to bring us in money. We made great haste to get to Jerusalem, for fear that the newspapers should get hold of our coming, and announce it.'" (*Op. cit.*, p. 309.)

This, I should think, will be quite enough; but any one who wishes for more of a yet worse kind (such as "the Master, after a supper, joins in a round dance with his apostles and Mary Magdalene") will find some of it in Mr. Home's volume, and plenty more in the three hundred pages of "the nauseous stuff"—parts of which (says Mr. Home) "it is simply impossible to quote"—which constitutes *Le Flambeau du Spiritisme*.

The celebrated "John King" finds little favor with Mr. Home. For, though this spirit of "an evil and famous man" has announced that "it is at once his duty and his pleasure to do good to his fellow-men, he is the reprovcr of the sinful and the comforter of the sad; his is a divine mission, and in it he finds his glory, the glory of an angel;" yet he is terribly carnal in some of his proceedings—throwing a sofa-cushion at the head of a skeptic; rubbing a paper tube over an inquirer's cranium, and remarking, "This is hair-brushing by machinery;" pouring tea out of a teapot "in the usual way" for a party of enthusiastic old women; and expressing his own preference for "regular baths and a bottle of Guinness's stout after dinner. . . . Such is the fashion," says Mr. Home, "in which John King makes his progress to higher states of purity." (*Op. cit.*, p. 312.)

Now, it must be evident to every reader of Mr. Home's "Lights and Shadows of Spiritualism," that he agrees with me in the fundamental principle of deciding upon the genuineness of a large number of the asserted "spiritualistic" revelations, by what seems to him their *inherent probability*; trusting rather to the evidence of his "sense" than to that of his "senses." And I would commend to Mr. Wallace's attentive study the "Modern Spiritualism" of Mr. Home, as a far more complete defense of that position than anything I could myself have made—my knowledge of the wilder vagaries of the system being extremely limited.

"It is not," says Mr. Home, "to drink tea and play on the fiddle, to give blasphemously-ludicrous communications regarding Christ and his apostles, to strut about in skull-caps and yellow boots, to beat people over the head with paper tubes, to throw cushions at skeptics, to hold up murderers

as respectable objects, to tell people by what omnibuses to travel, or to describe the next world as a place where humanity deteriorates, that departed spirits return to earth. Their mission is great—their opportunities are limited. What time have they to waste in idiotisms of which a schoolboy would be ashamed? Let us refer such to their proper sources; some to insanity, some to knavery—many to this world, few to the next. Let us recognize the height and the holiness of phenomena which show how

'The beloved, the true-hearted,
Revisit earth once more.'

Let us put from our path all which savors of folly and fraud, and press steadily and undeviatingly toward the truth. It is full time the errors I have been treating of should 'die among their worshippers.'" (*Op. cit.*, p. 323.)

I feel that the cause of common-sense has been so greatly served by Mr. Home's fearless exposure of the knavery of "mediums" and the credulous folly of their votaries, that I would not here call in question his own belief in the phenomena whose "height" and "holiness" he regards as demonstrating the return of departed spirits to earth. But to me there seems nothing either morally or spiritually elevating in the "elongation" of Mr. Home's already tall body; or in his moonlight sail out of one window and in at another, even at a height of sixty feet from the ground. Nor can I see anything peculiarly "holy" in Mr. Home's putting hot coals on his own hand, or in his heaping them on the head of a bald gentleman. I should myself have thought such performances no less a waste of the limited time and opportunities of the departed spirits who revisit earth, than those which Mr. Home "pillories" so cruelly. And I merely claim to exercise, in regard to the validity of Mr. Home's own pretensions, the independent judgment as to what is inherently probable, which he himself so freely passes upon the pretensions of others.

Writing upon this subject six years ago,¹ I remarked upon "the unhealthy craving which now prevails for some 'sign' that shall testify to the reality of the existence of disembodied spirits, while the legitimate influence of the noble lives and pregnant sayings of the great and good who have gone before us is proportionately ignored." And I referred to the two great men in whose obsequies I had been not long before called upon to take part—Sir John F. W. Herschel and George Grote—as having left behind them an influence far more elevating, more wide-spread, as well as

¹ *Quarterly Review*, October, 1871.

more enduring, than any that their "spirits" could exert by playing tunes on accordions or rapping out passages from their works. May I not now say the same—though I have the honor to be her brother—of the noble-hearted woman whose recent loss has been mourned, not alone by her family and personal friends, but by a world-embracing circle that ranges through all grades of society, from the very highest to the very lowest? The life devoted by Mary Carpenter to the rescue of the "dangerous and perishing classes" from brutal ignorance and degrading vice was "controlled" in the first instance by the "spirit" of the Great Teacher of that faith in the fatherhood of God and the brotherhood of man which "possessed" her whole nature; next, by that of the earthly father who had trained her, alike by precept and example, to a life of service to mankind; and then by those of Joseph Tuckerman—the Oberlin of Boston, Massachusetts—and of Rammohun Roy, the great Hindoo reformer. It was under these influences that she did, in the second half of a life of seventy years, a work for which the first half was the training; and which, I venture to affirm, has not been surpassed in its power, its range, or its productiveness, by that of any other single philanthropist, male or female. And when the history of that life, the details of that work, shall have been fully given to the world, I cannot doubt that the

"spirit" of Mary Carpenter will animate the zeal and direct the activity of those who follow in her footsteps far more effectively than if her "materialized" image were to appear among the inmates of her reformatory, or her "raps" or her "slate-writing" were to signify her instructions to the women of India.

Those who, while living, have been "epistles known and read of all men"—who have achieved the truest greatness by laboring in the service of others ("whosoever will be great among you, let him be your minister")—leave behind them an influence which, no less than that of the great in intellectual power and in moral worth, diffuses and deepens in each succeeding generation. I feel sure that any one who has tried to shape his (or her) life under the "spirit-control" of John F. W. Herschel, of George Grote, or of Mary Carpenter, would far rather that anything he may have well done should help to transmit that influence to those who come after, than that, if permitted to "revisit the glimpses of the moon," he should be placed at the disposal of the professional "mediums" who trade in "spiritual communications," and should be made to pander to the vulgar curiosity of those who will delight to be assured that he is "pretty jolly up there," or "very miserable down below," according to their respective conceptions of his deserts.—*Fraser's Magazine*.

SUN-SPOTS AND FAMINES.

By J. NORMAN LOCKYER AND PROF. W. W. HUNTER.

THE Madras famine gives emphasis to a series of researches made by isolated observers during the last twenty years. The common result to which these researches point is a more direct connection between solar activity and the atmospheric conditions of the earth than was previously suspected. This conclusion has been arrived at independently of *a priori* considerations. Indeed, one of the most remarkable features of the gradual building up of the connection has been, the aversion on the part of each investigator to draw general inferences from the special result at which he had arrived.

We think that the time has now come to examine the common direction to which these isolated observations point, and to inquire how far

the ecumenical result is in accord with the conclusions which might have been anticipated *a priori* from recent solar work.

Exactly a century ago scientific men were discussing the startling announcements made by De la Lande concerning the constitution of the sun. Dr. Wilson, of Glasgow, had discovered, as he thought, that the solar spots which for upward of two centuries had proved a stumbling-block for astronomers, were simply great, yawning chasms in the outer atmosphere of that luminary. De la Lande had fallen upon this conclusion with his accustomed vigor, and declared that they were nothing but the higher and more irreducible parts—the mountains, in fact—of a solid sun exposed from time to time by the ebb and flow of

a sea liquid, fiery, and so transparent that round the bases of these solar hills the shallower portions of the molten ocean might be detected.

This announcement gave a tone to subsequent work. To Sir William Herschel, who outstripped even De la Lande in imaginative power, the spots were parts of a cool, habitable globe. We are told of mountainous countries with peaks six hundred miles high, and the outer shining envelope, according to him, was so constituted that, while it gave light and heat to all the members of the solar family, its brilliance was tempered in such a manner to the inhabitants of the cool solid sun beneath as to render life possible.

The science of the nineteenth century has swept away these beautiful dreams. In such inquiries the telescope has given place to the spectroscope, and no fact is now more certain than that the sun is a huge incandescent globe, the very coolest visible portion of which is glowing with a heat which transcends all our earthly fires.

This is no vague statement put forth without evidence, or in the absence of ascertained facts. The chemical composition of the exterior of this vast furnace is now to a great extent known, and the physical astronomer can easily detect when a fresh supply of the vapor, now of iron, or now of magnesium, is shot up from below to recruit the glow of the exterior.

We have called the sun a furnace, but this word must be used with a qualification. The heat of the sun is due, not to combustion as in our ordinary fires, but to the vivid incandescence of each particle brought about by the original contraction of the vaporous globe, or by causes even more remote and unknown. But this we know, that the energies at work on the sun are not always constant. At times, there are spots on its surface of such enormous magnitude that they are visible to the naked eye; at others, it is apparently as spotless as the most eager of Galileo's adversaries, who had the dictum of Aristotle to defend, could have desired. At times, again, glowing vapors rush up from its bowels with such persistence that the careful observer is sure to catch a sight of their eruptions whenever he looks for them. At other times they are invisible for months together.

Strange forms are also seen, exquisite in color, fantastic beyond description in outline, and of stupendous magnitude. These are the solar prominences or red flames, the existence of which was formerly revealed to us in eclipses only. Like the spots, and like the eruptions, they wax and wane. At one time a dozen may be visible

round the edge of the sun, some of them a hundred thousand miles high; at other times there is scarcely the most feeble indication of this form of solar activity. The sun, then, may not only be likened to a furnace the heat of which is beyond expression; but it may be likened to a furnace the intensity of which is apparently variable.

The next point is that the apparent variation in activity is not irregular and therefore unpredictable, but that it is regular and predictable, at all events within certain limits. The variation is in fact periodic, and the solar phenomena to which we have referred vary together; that is, when we have the greatest number of uprushes of heated matter from below, we have the greatest number of spots and the greatest number of prominences.

All these phenomena ebb and flow once in eleven years. So that every eleven years we have the greatest activity in the production of uprushes, spots, and prominences; and between the periods of maximum we have a period of minimum, when such manifestations are almost entirely wanting. In fact, the spots may be taken as a rough index of solar energy, just as the rainfall may be taken as a convenient indication of terrestrial climate. They are an index, but not a measure of solar activity; and their absence indicates a reduction, not the cessation, of the sun's energy. Whether this reduction means one in a hundred or one in a thousand, we do not know.

If we now pass from the sun, the great reservoir of energy in our planetary system, to our own earth, we find a very different order of things. The incandescence of our planet is a thing of the past; and the loss by radiation of its internal heat is now so small and varies so slightly in a long period of time that, as compared with a period of eleven years, we may regard this heat as a constant quantity.

It was, perhaps, scarcely necessary thus to clear the ground for the general statement, now an accepted fact of science, that, with the exception of tide-work, all our terrestrial energies come from the sun. In the great modern principle of the conservation of energy, we have not only proof that the actual energy stored up in our planet is constant, but that the solar energy is the great prime mover of all the changeable phenomena with which we are here familiar, especially in the inorganic world.

That energy gives us our meteorology by falling at different times on different points of the aerial and aqueous envelopes of our planet, thereby producing ocean and air currents, while, by

acting upon the various forms of water which exist in those envelopes, it is the fruitful parent of rain, and cloud, and mist. Nor does it stop here. It affects, in a more mysterious way, the electricity in the atmosphere, and the magnetism of the globe itself.

If the energy radiated from the sun were constant, we should expect that the terrestrial conditions which depend on the amount of solar energy received at any one place would be constant too. The daily change due to the earth's rotation, the yearly change brought about by the earth's revolution, would be there; but there change would stop. The fire, as well as the air, earth, and water, would be constant quantities. But, suppose the fire to be variable; in other words, suppose the solar energy to change in amount from year to year. To the daily and annual changes of our terrestrial phenomena would then be added another change—a change absolutely irregular and unpredictable if the variation in the amount of the solar energy were subject to no law; but a change as regular as the daily and the yearly one, if the variation in the amount of solar energy were subject to a law. The period of the additional terrestrial change would agree with the period of the solar change, whatever that might be; and to the daily and yearly response of the earth to the solar energy, there would be superadded an additional change, depending upon and coincident in the main with the period of the solar change. We have said coincident in the main, because it is easy to imagine, in the case of meteorological phenomena dependent upon a long train of intermediate influences between the impact of the solar energy and the final result, that time would be taken for their development. In this case, although the dependence would be there, an exact coincidence would not. There would be a lagging behind, and this lagging behind would possibly not be the same at different latitudes.

We come now to the facts, accepting sun-spot frequency as the index of solar activity. Without dwelling upon previous work, the actual enumeration of sun-spots was undertaken in 1826 by Hofrath Schwabe, of Dessau, and patiently carried out by means of a daily scrutiny of the sun's surface. His eye-observations have been improved upon by accurate measurements of the solar-spotted area, by the late Mr. R. C. Carrington at Redhill, and by the solar work at the Kew Observatory, conducted by Dr. W. De la Rue and Prof. Balfour Stewart. Similar observations are now in progress, and photographs of the sun-spots

are being taken in France, Germany, Russia, Italy, and Greenwich. Dr. Rudolf Wolf has reduced the materials thus obtained to a uniform standard, and published a list of the relative number of sun-spots for each year since 1750; the data for the earlier years being, however, of less value than for the later period, during which daily delineations of the sun's surface have been going on. Dr. Wolf's list exhibits eleven complete cycles of sun-spots, from 1750 to 1870, giving an average of, as nearly as possible, eleven years to each cycle. The individual cycles vary within certain limits, but the largest variations appear in the last century and early in the present one, before the commencement of Hofrath Schwabe's continuous observations in 1826.

Are these cycles of solar activity coincident with any well-marked cycles in the atmospheric or other conditions of the earth? The inquiries into such a coincidence have been directed to four classes of terrestrial phenomena. They are: 1. Periodical variations in terrestrial magnetism and electrical activity; 2. Periodical variations in temperature; 3. The periodicity of wind-disturbances, hurricanes, and cyclones; 4. Periodicity in the rainfall. It is with the last class of phenomena that we have specifically to deal in this article. But it may be well to summarize the results arrived at with respect to the first three.

First, then, with regard to terrestrial magnetism and electrical activity. A freely-suspended magnet, although it points in one direction, is, nevertheless, within small limits, always in motion. Certain of these motions depend, as is well known, upon the hour of the day, but the magnet is also liable to irregular, abrupt fluctuations, which cannot be connected with the diurnal oscillations. While Hofrath Schwabe was engaged in delineating the sun-spots, Sir Edward Sabine was conducting a series of observations with regard to these spasmodic affections of the needle. He found that such fluctuations are most frequent in years of high sun-spot activity. Van Swinden had suggested, but only suggested, a periodicity in the irregular movements, as far back as 1785. Gauss had made further discoveries between 1824 and 1837. Arago's observations from 1820 to 1830 were reduced and published in 1854, in such a form as to prove that a minimum period of magnetic variations had occurred in 1823-'24, a year of minimum sun-spots; and that a maximum period of such variations had occurred in 1829, a year of maximum sun-spots. In 1851 Dr. Lamont, of Munich, pub-

lished his long-continued researches, indicating the existence of a cycle in magnetic variations, occupying on an average ten and a third years. Sir Edward Sabine, in 1852, carried forward the work by a paper in the "Transactions of the Royal Society." He subsequently communicated the results of a series of records between 1859 and 1864, of the horizontal and vertical force magnetometers at the Kew Observatory, with a note showing their connection with the sun-spots and giving interesting historical details. He observed, too, that the fluctuations of the magnet were almost invariably accompanied by displays of the aurora borealis, and came to the conclusion that auroral displays occur most frequently in years of maximum sun-spots. Dr. Wolf, now of Zurich, and M. Gautier, of Geneva, had independently remarked, in 1852, the coincidence of Lamont's decennial magnetic period with Schwabe's period of sun-spots. In 1865 Prof. Loomis, of Yale College, supplied further evidence on the range of magnetic declination and auroras, in their relation to sun-spots. He concluded that the auroras observed in Europe and America exhibit a true periodicity, closely following the magnetic periods, but not perfectly identical with them. He believed that a sun-spot is the result of a disturbance of the sun's surface, with some emanation from the sun which is felt almost instantly upon the earth. Signor Schiaparelli, in 1875, brought out with great clearness the relations between the sun-spot periods and the variations in the declination of the magnetic needle. In the same year, also, Sophus Tromholtz contributed to the *Zeitschrift der österreichischen Gesellschaft für Meteorologie* a note on the connection of auroras with the sun-spot periods. In 1876 Dr. J. A. Broun presented the results derived from observations of magnetic declination made during nearly a quarter of a century at Trevandrum. He gave the mean duration of the magnetic cycle at 10.45 years, and supplied a very valuable chart showing the decennial period of the diurnal range of magnetic declination and sun-spot area from 1784 to 1876. The curves of this elaborate and most interesting chart place the general coincidence of the magnetic and sun-spot cycles in a clear light. Dr. Broun came to the conclusion that while the sun-spot activity is not an exact measure of magnetic action, "each is a distinct result due to the same cause." The whole question has, during the present summer (May, 1877), been reviewed by Prof. Balfour Stewart, a distinguished worker in the same field. He has exhibited the solar

spots, magnetic declination, and aurora displays, from 1776 to 1872, in curves which follow each other with an indisputable coincidence. He further examines the connection of these three coincident cycles with planetary configurations: a question discussed by Mr. Fritz in the "Proceedings of the Royal Society" in 1871, and previously studied with much care by Dr. De la Rue and Prof. Balfour Stewart, at Kew (1854-'66). To sum up: magnetic observers now hold that not only do the spasmodical affections of the needle follow curves closely coincident with the solar spots, "but its diurnal oscillations are not less dependent on the state of the sun's surface."

Such magnetic disturbances have very practical results. Telegraphy and telegraphic lines form one of the most conspicuous of the new commercial undertakings of our day. During periods of maximum magnetic disturbance, telegraphic communication between points so close as London and Dover is sometimes interrupted. Mr. Charles V. Walker, superintendent of telegraphs, presented an important paper in 1861 to the Royal Society, on magnetic storms and earth-currents. He described the remarkable disturbances in communication which took place in 1848, a year of maximum sun-spots, and in the autumn of 1859, just before the next year of maximum sun-spots (1860). The first period of disturbance appeared to his staff to be an altogether "abnormal" one. "We did not then know," writes Mr. Walker, "as we now do, that these disturbances have a cycle of about eleven years from the maximum period of activity to the next maximum." An idea of the violence of such magnetic storms may be derived from the Dover clerk's entry on September 2, 1859: "This morning, on opening the office, I found the needles of both instruments firmly blocked over to the left, and, although the handles were firmly held over to the right to counteract the power, to my surprise I found that our battery-power had not the slightest effect. . . . I am sorry to say that there is not the slightest possibility of our working the instrument; needles continuing firmly fixed over, and this has continued for upward of half an hour." This disturbance was of such magnitude and of so long duration that the operators were unable to supply an adequate narrative of it, as "they were at their wits' end to clear off the telegrams which accumulated in their hands, by other less affected but less direct routes." Mr. Walker has retained no record of the earth-currents during the last period of maximum sun-spots (1870), but the dis-

turbances on the lines were not of so marked a character. He holds as an established fact that "earth-currents, disturbed magnetometers, and auroræ, are parts of the same phenomenon," and, in a recent letter to one of the writers of this article, he reaffirms his conviction regarding the relationship between earth-currents, telegraphic disturbances, and sun-spots.

The second class of phenomena, in which a periodicity coinciding with the sun-spot cycle is believed to have been discovered, has reference to solar radiation and thermometric variations. For reasons which would require too much space to detail, various difficulties complicate this line of research, and we should state, at the outset, that the evidence is less complete and satisfactory than that which connects magnetic disturbances and rainfall with sun-spots. A moment's consideration will show the kind of complication to which we refer. If the earth had no atmosphere, all the solar energy would be incident and operative on the earth's surface, where perforce our measuring instruments are placed. But the earth has an atmosphere, which is the vast scene of the play of the solar energies; and the work done there is of such a nature that the more energy there is in operation, the more effectively is the direct energy of the sun screened from the surface. Further, there is not wanting evidence to show that the vapor of water, like the vapors of the metals, exists in various molecular conditions, some of which are transparent and others opaque to those rays which affect our thermometers.¹ The thermometric inquiry divides itself into several distinct branches, such as the direct solar radiation or calorific intensity of the sun's light, the daily temperature range, and the mean annual temperature. We shall very briefly state the conclusions at which observers have arrived during the last ten years, without criticism or any expression of opinion.

In 1867 Mr. Joseph Baxendell communicated the results of a scrutiny of the Solar Radiation Registers, kept at the Radcliffe Observatory, Oxford, from 1856 to 1864. He came to the following conclusions, among others: 1. That the calorific intensity of the sun's light is subject to periodical changes, the maxima and minima of which correspond respectively with those of sun-spot frequency. 2. That it seems probable that the heating rays of the sun consist of two

kinds, differing in intensity, and subject to periodical changes; the times of maxima of one kind, and those of minima of the other, corresponding respectively to the times of maximum frequency of solar spots. Mr. Baxendell also pointed out a connection between the mean monthly variation of solar radiation on cloudless days and the mean monthly daily range of the magnetometer. In 1871 he published his further researches on the changes in the distribution of barometric pressure, temperature, and rainfall, under different winds, during a period of solar-spot frequency. He found that changes had taken place in the three elements under discussion, which corresponded very closely in the times of their maxima and minima with those of sun-spot frequency. In 1875 Mr. H. T. Blandford, Meteorological Reporter at Calcutta, stated, from experiments conducted in Bengal: "The result is to me very striking, and, if not absolutely conclusive as to the direct variation of the sun's heat with the number of spots and prominences, certainly, as far as it goes, strongly confirms Mr. Baxendell's conclusions."¹ In the same year Professors Balfour Stewart and Roscoe, from an investigation of the heating effects of the sun, came to the conclusion that there is more sunshine at London in years of maximum than in years of minimum solar disturbance. Next year, 1876, Prof. Balfour Stewart found that the winter temperature range at Kew apparently depends on the sun-spot period, being greatest at times of maximum sun-spots, and least at times of minimum sun-spots. This year, 1877, he has raised, and produced evidence upon, the interesting question whether the mean daily range does not depend, among other influences, on the state of the sun's surface with regard to spots.

Meanwhile, another series of observations had been going on, not with black-bulb thermometers for solar radiation, but with reference to the mean annual temperature. In 1870 Prof. Piazzi Smyth, the Astronomer Royal for Scotland, published the result of observations made from 1837 to 1869, with thermometers sunk in the rock at the Royal Observatory, Edinburgh. He came to the conclusion that a great heat-wave occurs every eleven years and a fraction, its maximum slightly lagging behind the minimum of the sun-spot cycle. Next year, 1871, Mr. E. J. Stone, the Astronomer Royal at the Cape of Good Hope, ex-

¹ There is evidence to suggest that the aqueous vapor produced at the period of minimum sun-spots would be more transparent to the heat-rays than that produced at other times.—J. N. L.

¹ We should add, however, that a communication has just appeared (*Nature*, October 11, 1877), from Mr. Hill, in Northern India, differing from Mr. Blandford's conclusions.

amined the temperature-observations recorded during thirty years at the Cape under his predecessor, Sir T. Maclear. He stated that the temperature and sun-spot curves presented an agreement so close as to compel him to believe that the same cause which leads to an access of mean annual temperature leads equally to a dissipation of solar spots. Here, also, we find the maximum heat slightly lagging behind the minimum spots. In 1873 Signor Celoria, from a comparison of the sun-spot periods with the rainfall at Milan from 1763 to 1872, came to the result that the coincidence was marked, but not very decidedly. Dr. W. Köppen's papers in the *Zeitschrift der österreichischen Gesellschaft für Meteorologie* for August and September, 1873, form the most important contribution upon the question. He endeavored, with an elaboration and completeness not previously attempted, to present the earth's temperature in connection with sun-spots for the hundred years preceding 1870. He divided the thermometric returns into two great classes—those taken within the tropics, and those belonging to the extra-tropical zones. The barest summary of his researches would occupy several pages. In a carefully-prepared chart he exhibited the rainfall and sun-spot curves from 1768. During the earlier part of this period he had thermometric returns only from the northern temperate zone. The curves do not show a coincidence; whether from the local character of the temperature returns, or from the uncertain value of the sun-spot curve, we need not here inquire. After the year 1826, when the sun-spot data become more trustworthy, the case is entirely different. The curves follow each other in a most striking manner; and, indeed, he states that, from 1816 to 1854, the coincidence of temperature-changes with the sun-spots does not merely extend over the average length of the cycles, but reflects all the leading disturbances and peculiarities of the sun-spot periods. Dr. Köppen further points out that, as the period of increase from the minimum to the maximum year in the sun-spot cycle is almost always shorter than the period of decrease from the maximum to the minimum, so, on the whole, is that feature reflected in the temperature-changes. The parallelism in this series of returns, he says, with reference to his table dealing with the period from 1820 to 1854, is so great, that there can be no question of accidental coincidence of variations independent of each other. On the other hand, his figures disclose many anomalies. Thus, in the tropics, the maximum of warmth occurs a full year before the year of

minimum sun-spots; while in the zones beyond the tropics it falls two years after the minimum. The regularity and magnitude of the undulation of the temperature-curve are most strongly marked in the tropics, and decrease toward the poles.

With regard to the third class of phenomena, wind-disturbances, the evidence, although less abundant, is more uniform. The frequency of such disturbances at times of maxima sun-spots has been observed independently by two meteorologists on the opposite sides of the globe. In both cases their observations were made in the tropics, where wind-disturbances have so violent and so well-marked a character as to admit of more easy enumeration than in the extra-tropical zones. To our countryman Dr. Meldrum, government-astronomer at Mauritius, belongs the honor of originating, with the chief credit of prosecuting, this research. By a series of careful observations he had, more than five years ago, established the existence of a coincidence between the frequency of cyclones and sun-spots. In 1872 one of the writers of this article thus summarized the results: "Mr. Meldrum tells us that the whole question of cyclones is a question of solar activity, and that, if we write down in one column the number of cyclones in any given year, there will be a strict relation between them—many sun-spots, many hurricanes; few sun-spots, few hurricanes. Mr. Meldrum points out that, in those years in which we have been quietly mapping out the sun-spot maxima, the harbors were filled with wrecks and vessels coming in disabled from every part of the great Indian Ocean." Next year, 1873, M. Poëy, who had conducted a similar research into the hurricanes of the West Indies, communicated his results to the Académie des Sciences at Paris. He enumerated 357 hurricanes between 1750 and 1873, and stated that, out of twelve maxima, ten agreed. A careful re-examination of his materials discloses striking coincidences, but at the same time, we ought to add, very serious discrepancies. The discrepancies, however, chiefly belong to the last century and the earlier part of the present one. Since the commencement of Schwabe's continuous sun-spot observations in 1826, the common periodicity is more strongly marked, as Table III., on page 139, will show.

During the present summer, 1877, an effort has been made to ascertain whether the periodicity thus observed in the wind-disturbances of the tropics produces any well-marked results upon the shipping of the world. Mr. Henry Jcula,

secretary to the late Statistical Committee of Lloyd's, obtained the returns of marine casualties posted on Lloyd's loss-book, from 1855 to 1876. Conjointly with one of the writers of this article, he worked out and tabulated the information thus derived with regard to the two periods of eleven years from 1855 to 1876. It was found that the marine casualties disclosed a cycle closely corresponding with the sun-spot period. The percentage of casualties on the registered vessels of the United Kingdom was seventeen and a half per cent. greater during the maximum two years in the common cycle than during the minimum two years. The percentage of losses on the total, posted on Lloyd's loss-book during the eleven years, was fifteen per cent. greater during the two maximum years of the common cycle than during the two minimum ones. This cycle of marine casualties coincides with that of the tropical rainfall, and it will be exhibited side by side with the tabulated periods of the rainfall at Madras. It should be remembered, however, that the two periods of eleven years for which the returns of marine casualties are available form a very narrow basis for a statistical induction.

We now come to the fourth and last branch of the inquiry. We have already seen that Mr. Joseph Baxendell, in 1871, found that changes had taken place in the rainfall as well as in the temperature and barometric pressure, which corresponded very closely in their maxima and minima periods with those of the sun-spots. Dr. Meldrum, from a comparison of the rain-returns at Mauritius, Adelaide, and Brisbane, came to the conclusion that the evidence of a connection between its maxima and minima periods, and the corresponding sun-spot periods, although not absolute, was very striking, and demanded further inquiry. In 1872 one of the writers of this article published a paper entitled "The Meteorology of the Future," in which was developed the idea of a connection between sun-spots and rainfall, and further evidence was produced. In 1872-'73 frequent contributions appeared on the subject, but at first with conflicting results. In opposition to individual coincidences, Sir R. Rawson rejoined that, "assuming that sun-spots affect all parts of the globe equally, and that periodicity prevails in all alike, the experience of Barbadoes is opposed to the theory." Dr. Carl Jelinek, of Vienna, from an examination of fourteen stations between 1833 and 1869, showed that, while a coincidence held good in fifty-two cases, it failed in forty-two. In 1873 the inquiry branched out in a new direc-

tion. Gustav Wex made an examination into the depths of water recorded in the Elbe, Rhine, Oder, Danube, and Vistula, for the six sun-spot periods from 1800 to 1867. He came to the result that the years in which the maximum amount of water appeared in the rivers were years of maximum sun-spots; while the minimum amount of water occurred during the years of minimum sun-spots. Mr. G. M. Dawson, geologist to the B. N. A. Boundary Commission, made a similar inquiry in America. In 1874 he stated that the correspondence between the periods of maxima and minima in the solar-spot cycles, and in the fluctuations of the Great Lakes, though by no means absolute, was sufficiently close to open a new field of inquiry. In the same year, Mr. J. H. Hennessey, from an examination of the rainfall at Masuri in India, arrived at a similar conclusion. In 1874 also Dr. J. A. Broun, in an analysis of the returns from ten stations, considered it probable that a difference of about two inches in the rainfall might be expected between the years of greatest and the years of least sun-spot area. Prof. John Broeklesby, in the *American Journal of Science*, stated that the results of his examination pointed to a connection between variations in the sun-spot area and the annual rainfall; the rainfall rising above the mean when the sun-spot area is in excess, and falling below the mean in periods of small sun-spots.

At the close of 1876 it was the duty of one of the writers of this article to examine the Madras rainfall in connection with the anticipated famine. It soon became apparent to him that inquiries which deal with the rain-supply of India as a yearly unit must be essentially inadequate. Native usage and speech strongly mark the existence of two distinct factors in the annual rainfall; and the local system of agriculture is merely a practical recognition of this meteorological fact. The summer monsoon, with its stately and ever-shifting procession of rain-clouds, marching over India in aerial battalions from the southern ocean to their resting-place in the Himalayas, formed a theme dear to the Sanskrit poet. It seemed as if the continent "beloved of Indra" had only to sit still and receive in her lap the treasures which the winds gathered from distant tropical seas. Indra, the personification of the watery atmosphere, won his way to the supreme godhead of the Sanskrit pantheon by the all-powerful influence which he exercised, for weal or for woe, on a population of husbandmen. Himself gracious and beneficent, ever seek-

ing to shower his treasures on the thirsty earth, he was nevertheless restrained, and from time to time prevented, by the evil spirit, Vrita. Next to Indra came Vāyu, the Wind, representing in his single personality the combined Maruts or storm-gods. The same Indra and Vāyu, the watery atmosphere and the wind, whom the Sanskrit race adored centuries before the commencement of our era, still decide each autumn the fate of the Indian people.

The meteorological year at Madras divides itself into three parts. The first of them extends from January to the end of April, with a nominal rainfall of but half an inch *per mensem*. The second commences toward the end of May or early in June, and lasts till the end of September, or beginning of October. It is popularly known as the southwest monsoon, and if we include in it the month of May, it supplies 17 inches of the yearly rainfall of $48\frac{1}{2}$; if we exclude the month of May, it yields 15 inches. In October the northerly wind sets in, and the last three months of the year derive from its influence a rainfall of close on 29 inches. In an inquiry such as the present, the first four months of the year, with their sporadic rainfall of half an inch *per mensem*, may be dismissed. The two overruling factors in the rainfall are the southwest monsoon from May to September, and the northeast monsoon from October to December. If either of these monsoons fails to bring its supply of rain, or if they both fail partially, the result is famine. Of the five Madras famines since the institution of rain-gauges, three have been caused by the failure of the winter monsoon, one by the failure of the summer monsoon, and one by the partial failure of both.

The Madras rainfall, therefore, furnishes three distinctly-marked elements for comparison with the cycle of sun-spots. There is first the northeast monsoon during the last three months of the year, bringing its average rainfall of nearly 29 inches; second, the southwest monsoon from May to September, supplying over 17 inches, or 15, if we take it as commencing from June; and third, the total yearly rainfall of $48\frac{1}{2}$ inches. Does sun-spot activity exercise any influence upon the supply which the two great water-carriers collect from the ocean-tract stretching from the southern pole to India, and then shower upon that country?

As regards the principal factor, the northeast monsoon, which brings 29 inches out of the whole yearly rainfall of $48\frac{1}{2}$ inches, the statistics are these: Of the six years of minimum sun-

spots, including 1876 as one, since rain-gauges were kept at Madras, the northeast monsoon has in five had a distinctly deficient rainfall. The average rainfall of the northeast monsoon during these six years of minimum sun-spots has been only 16.94 inches, against the average of 28.90 inches which the northeastern monsoon annually brought during the last sixty-four years. The northeast monsoon in years of minimum sun-spots brings therefore 41.39 per cent. less rain than in ordinary years; or, put differently, it brings 70 per cent. more rain on the average of sixty-four years than in the years of minimum sun-spots. Nor is this deficiency confined to the exact year of minimum sun-spots. Taking the years of minimum sun-spots together with the preceding years, the northeastern monsoon yielded $25\frac{1}{4}$ per cent. less rainfall, during the twelve years thus made up, than its average yield during the sixty-four years for which returns exist. Or, put in other words, the average water-supply brought to Madras in ordinary years by the northeastern monsoon is $34\frac{1}{4}$ per cent. greater than that which it brings during the years of minimum sun-spots and the years immediately preceding them.

The southwest monsoon yields little more than one-half the rainfall which the northeastern one supplies to Madras. Its deficiency during years of low solar spot activity is, however, well-marked. If we take the southwest monsoon as commencing in June, it yielded in each of the six years of minimum sun-spots less rain than in ordinary years. Its water-supply during the six years of minimum sun-spots averaged only 12.12 inches or 20 per cent. less than its normal rainfall of 15.13 inches in ordinary years. If we include the rainfall for May in the southwest monsoon, it yielded less than its normal average in five out of the six years of minimum sun-spots. In only one year of minimum sun-spots did the southwest monsoon (including the May rainfall) yield more than its average supply, taken over the sixty-four years. It is very doubtful whether the exceptional year, 1843, was really an exception. A great rain-storm took place in May, before the monsoon had established itself, and of a character different from the regular monsoon rains. This storm poured down a sudden deluge of over 14 inches on Madras, and completely disguised the average for the monsoon months, the ordinary rainfall in May being just two inches. Deducting this rain-storm in 1843, the southern monsoon has proved deficient at Madras, whether we take it to commence in May or June, during every year of mini-

imum sun-spots since the returns began in 1813. This deficiency is well-marked, not only in the years of minimum sun-spots, but in the years preceding and following them. Thus, even including the month of May and the exceptional rain-storm of May, 1843, the southern monsoon during the six years of minimum sun-spots, and the years immediately preceding them, yielded, during the twelve years thus made up, 20 $\frac{3}{4}$ per cent. less rain than its average yield in the sixty-four years. Or, expressed in another form, the water-supply brought to Madras by the southern monsoon is 26 $\frac{1}{2}$ per cent. greater in ordinary years than in the years of minimum sun-spots and those immediately preceding them.

The two monsoons are the great factors of the rain-supply at Madras, and their fluctuations are distinctly marked in the third element of comparison, the total rainfall for the year. In five out of the six years of minimum sun-spots the annual rainfall fell short for the average supply, calculated over the sixty-four years. The exceptional year was 1843, and its exceptional character was due to the sporadic rain-storm in May, already mentioned. Even including that rain-storm, however, the six years of minimum sun-spots had an average rainfall of less than 34 $\frac{1}{2}$ inches, against

the ordinary annual rainfall of 48 $\frac{1}{2}$ calculated over the sixty-four years. The minimum years of sun-spots, therefore, brought 29 per cent. less rainfall than ordinary years: or, put into another form, the average annual rainfall supply at Madras is 40 $\frac{1}{2}$ per cent. greater than in years of minimum sun-spots.

In each of the three elements of comparison, the deficient rainfall is not confined to the minimum year of sun-spots, but includes the preceding year as well. But it should be clearly stated that no numerical proportion exists between the actual number of sun-spots and the number of inches. There is a rain-cycle of eleven years at Madras, which coincides with the cycle of sun-spots. The periods of maxima and minima in these two cycles disclose a striking coincidence. That coincidence is common to all the three elements of comparison: namely, the rainfall of the year, of the great northern monsoon, and of the southwestern monsoon. The following table will show this. The cycle of eleven years starts from 1876, and runs back to 1813, at which year the rain-returns commence. The eleventh, first, and second series in the cycle include all the years of minimum sun-spots since 1810, and form the minimum group of rainfall:

TABLE I.
ELEVEN YEARS' CYCLE OF SUN-SPOTS AND RAINFALL AT MADRAS.

SERIES OF YEARS IN THE CYCLE OF ELEVEN YEARS.	Average Annual Relative Number of Sun-Spots (Wolf's List, 1877), 1810-75.	Total Average Annual Rainfall at Madras, 1813-76.	Northeast Mon- soon, Madras, Oct.-Dec. Average Rainfall, 1813-76.	Southwest Mon- soon, Madras, May-Sept. Average Rainfall, 1813-76.
	Inches.	Inches.	Inches.	Inches.
Minimum { Eleventh ¹ series.....	16.3 {	37.03 {	18.76 {	15.78 {
group } First ² and second ³ series	10.5 { 12.6 av.	42.97 { av. 40.39	26.49 { av. 23.92	14.08 { av. 14.65
Third ⁴ and fourth ⁵ series.....	48.6	49.12	32.87	14.9
Fifth ⁶ and sixth ⁷ series.....	88.3	54.64	31.48	19.63
Seventh ⁸ and eighth ⁹ series.....	65.3	52.36	30.64	18.93
Ninth ¹⁰ and tenth ¹¹ series.....	38.5	49.02	27.67	18.53
Eleventh ¹² series.....	16.3	37.03	18.76	15.78

¹ Namely, 1876, 1865, 1854, 1843, 1832, 1821, [1810, sun-spots only].

² " 1866, 1855, 1844, 1833, 1822, [1811, sun-spots only].

³ " 1867, 1856, 1845, 1834, 1823, [1812, sun-spots only].

⁴ " 1868, 1857, 1846, 1835, 1824, 1813.

⁵ " 1869, 1858, 1847, 1836, 1825, 1814.

⁶ " 1870, 1859, 1848, 1837, 1826, 1815.

⁷ " 1871, 1860, 1849, 1838, 1827, 1816.

⁸ " 1872, 1861, 1850, 1839, 1828, 1817.

⁹ " 1873, 1862, 1851, 1840, 1829, 1818.

¹⁰ " 1874, 1863, 1852, 1841, 1830, 1819.

¹¹ " 1875, 1864, 1853, 1842, 1831, 1820.

¹² " 1876, 1865, 1854, 1843, 1832, 1821, [1810, sun-spots only].

The cyclic coincidence may be tested in another way. If there is a true coincidence it should disclose a well-marked minimum group at the extremities of the cycle (in the eleventh, first, and

second years), and a well-marked maximum group in the middle of the cycle (the fifth and following years). The years on both sides of the central maximum group should yield intermediate results, and

when taken together should form a well-marked intermediate group. Dividing the cycle, therefore, so far as the number admits, into three equal groups of four years, we get the following results:

TABLE II.
ELEVEN YEARS' CYCLE OF SUN-SPOTS AND RAINFALL IN MADRAS.

YEARS.	Average Relative Number of Sun-Spots (Wolf's List, 1877), 1810-'75.	Total Average Annual Rainfall at Madras, 1812-'76.	Northeast Monsoon, Madras, Oct.-Dec. Average Annual Rainfall, 1812-'76.	Southwest Monsoon, Madras, May-Sept. Average Annual Rainfall, 1812-'76.
		Inches.	Inches.	Inches.
MINIMUM GROUP.				
Eleventh, first, and second years of the cycle of eleven years.....	12.6	40.39	23.92	14.65
INTERMEDIATE GROUP.				
Third, fourth, ninth, and tenth years of the cycle of eleven years.....	43.5	49.07	30.27	16.71
MAXIMUM GROUP.				
Fifth, sixth, seventh, and eighth years of the cycle of eleven years.....	76.8	53.50	31.06	19.31

Has this recurring period of deficient sun-spot and rainfall any practical result on the food-supply of the people? It is well known that at the end of the last century, and during the earlier years of the present one, Southern India suffered an almost perpetual distress. But for these years we have no rain-register; and the desolation spread by native misrule, together with the drain of food for great armies in the field, sufficed to intensify every local scarcity to the starvation-point. A march of Tippoo Sultan left a worse blight on a district than a dozen inches of deficiency in the rainfall; and Mahratta raids were a more direct and frequent factor of famine than the sun-spots. We are destitute of the first conditions for a scientific study of the food-supply, until we reach the period of settled British rule and rain-gauges.

It would be fruitless, therefore, to extend the inquiry beyond the year 1810, the earliest year in the sun-spot cycles with which we deal. The years of famine at Madras since that date have been 1811, 1824, 1833, 1854, 1866, and 1877. These famines were caused by deficient rainfall in the preceding years, namely, in 1810, 1823, 1832, 1853, 1865, and 1876. Now, five out of these six years of drought fell within the three years' group of minimum rainfall and sun-spots shown in the foregoing tables; the remaining drought (1853-'55) extended over a year immediately preceding the minimum group and two years within that group; the famine itself resulting within the minimum group. Three of the six years of drought fell exactly in years of minimum sun-spots; one fell in the year preceding a year of minimum sun-

spots; one fell in the second year preceding a year of minimum sun-spots; the remaining drought, 1853-'55, fell in the first, second, and third years preceding a year of minimum sun-spots.

There have been other years of scarcity in Madras. But the above six years were selected by Sir William Robinson, sometime acting governor, as the years of true famine, without any acquaintance with the writer's speculations on the rainfall, or of any cycle being supported or disproved by them. No famine in Madras has been recorded from 1810 to 1877, caused by a drought lying entirely outside the minimum group of sun-spots and rainfall (as shown in the foregoing tables). The only drought which could be claimed as an exception, 1853-'55, extended over two years within the group and the year immediately preceding them. It is shown as an exception in Table III.

The foregoing statistics refer to the single station of Madras. They are, however, of special value for testing the coincidence between sun-spot frequency and the rainfall, which the northeast monsoon brings to Southern India. For that monsoon strikes the land with all its first vigor at Madras. By the time it crosses the Eastern Ghats, and finds its way to the central plateau, it has got rid of the aqueous burden which it has carried down the bay of Bengal. To the table-land of Mysore it brings only eight inches, while at Bellári and in Hyderabad it only supplies three. But even at Mysore a deficiency of rainfall in years of minimum sun-spots is disclosed. Of four years of minimum sun-spots for which materials exist (1876 to 1887), not one had quite the full annual rainfall; and the

average rain-supply brought by the forty years was close on sixteen per cent. greater in Mysore than the rainfall in the years of minimum sun-spots.

To Bombay the northeast monsoon brings scarcely any rain, and the returns lately published omit it as being "immaterial" in twenty out of sixty years. The southwest monsoon is at Bombay the great factor of rainfall. According to those returns, the rainfall at Bombay was more or less below the average in every one of the six years of minimum sun-spots during the sixty years. The average rain-supply of the sixty years was eighteen per cent. greater than the average rainfall in the six years of minimum sun-spots. A well-marked coincidence exists between the eleven years' cycle of sun-spots and the rainfall at Bombay. This will be clearly shown in Table III.

Passing from these two points on the great Indian Ocean lying north of the equator, to another station in the south, we find similar results. The periodicity in the rainfall of the Cape of Good Hope is even more strongly disclosed in the following table than that of Madras or Bombay. The Australian stations do not lie upon the Indian Ocean, and are separated from it by a great continent. The evidence which they yield on the subject is meagre and irregular; but, such as it is, it scarcely bears on an inquiry which deals with the water-supply collected by the great periodical winds from the Indian Ocean.

The collateral evidence with regard to a common periodicity between the sun-spots, wind-disturbances, and rainfall, may therefore be ranged under ten heads. These are: first, magnetic declination; second, electrical displays (auroras); third, Dr. Meldrum's list of cyclones in the Indian Ocean; fourth, M. Poëy's hurricane-lists for the West Indies; fifth, the marine casualties posted on Loyd's Loss-book; sixth, the rainfall at Madras brought by the northeastern, and seventh, by the southwestern monsoon; eighth, the annual rainfall at Madras; ninth, the annual rainfall at Bombay (almost entirely brought by the southwestern monsoon); and tenth, the annual rainfall at the Cape of Good Hope. We have stated the facts as regards solar radiation and mean temperature; but they do not, in our opinion, supply a sufficiently firm basis for induction. The rest of the evidence is exhibited in the table on the next page.

The main point of inquiry in that table may be thus stated: Is the variation in solar activity, as indicated by the waxing and waning of solar up-rushes, spots, and prominences, reflected in terrestrial phenomena? Consequently, does a

common cycle exist in solar and terrestrial phenomena, in addition to and independent of the two ordinary cycles, caused by the diurnal and by the annual revolutions of the earth?

To answer this question we have examined the results separately arrived at by students of five classes of phenomena; namely, the sun-spots as an index of solar energy, terrestrial magnetism, temperature, wind-disturbances, and rainfall. We find that as regards sun-spots and terrestrial magnetism a common cycle of eleven years is now an established fact; that there are indications (although not proofs) of an eleven years' cycle in solar-radiation and mean temperature; that there is ample evidence of such a cycle in wind-disturbances; and absolute proof of a cycle of eleven years in the great factors of tropical rainfall. We further find that the eleven years' cycle in the separate classes of terrestrial phenomena correspond with the eleven years' cycle of sun-spots; and that, with regard to the three sets of terrestrial phenomena on which we possess fullest evidence (magnetism, wind-disturbances, and rainfall), the correspondence is most clearly established. At the commencement of the paper we saw that on *a priori* grounds, arrived at from recent solar work, there was reason to suspect an eleven years' cycle common to the phenomena of the earth and the sun. We have now shown, by an induction from widely-separated but converging series of facts, that such a cycle exists.

This induction has a very practical interest. We have seen that the eleven years' cycle in terrestrial magnetism has a direct and important influence on telegraphic enterprise; that the cycle of wind-disturbances produces distinct results upon the percentage of casualties among the shipping of the world; and that the cycle of tropical rainfall has a portentous coincidence with a cycle of famine. One of the writers of this article has dealt with the subject purely as a statistician, whose duty it was to collect and tabulate all collateral evidence bearing upon the discovery which he had made regarding the cyclic character of the factors of the Madras rainfall. The other writer has re-examined that evidence in its bearings on solar physics. The conclusions at which they have jointly arrived are: 1. That, notwithstanding many apparent anomalies and a large area of unexplained facts, the evidence suffices to establish the existence of a common cycle; 2. That the subject merits the earnest attention both of men of science and of those who have to deal with the great present problem of Indian administration.

TABLE III.

ELEVEN YEARS' CYCLE OF SUN-SPOTS, TERRESTRIAL MAGNETISM, ELECTRIC DISPLAYS (AURORAS), WIND-DISTURBANCES, MARINE CASUALTIES, RAINFALL, AND FAMINE.

SERIES OF YEARS IN THE CYCLE.		Relative Number of Sun-Spots. 1872-1910. Wolf.	Diurnal Inequality of Magnetic Declination reduced to Stewart. 1871-1913. Balfour Stewart.	Electric Displays: Auroras observed. 1871-1911. Stewart. from London.	Number of Cyclones, Indian Ocean, 1871-96. Midrum.	Relative Area of Cyclones, Indian Ocean, 1871-96. Midrum.	Number of Hurricanes, West Indies, 1872-1910. Hunter.	Percentage of Losses on Registered Vessels of United Kingdom, 1876-96. Deila and Hunter.	Percentage on Total Losses each Eleven Years, 1873-96. Deila and Hunter.	Madras Rainfall, Southwest Monsoon, 1872-93. Hunter.	Madras Rainfall, Annual, 1876-93. Hunter.	Banday Rainfall, Annual (Banded from Southwest Monsoon). 1876-93. Hunter.	Cape of Good Hope, Annual Rainfall, 1876-93. Hunter (from Stone's Returns).	Madras Famine-causing Droughts, 1876-1910. Hunter.
AVERAGE OF										Inches.	Inches.	Inches.	Inches.	Actual No.
Minimum { Eleventh series.....		15.3	6.73	32	8.0	2.75	3.30	9.93	7.64	18.76	37.03	70.22	21.19	4
Group.... } First and second series.....		10.8	6.75	20	7.0	1.77	2.15	11.91	9.32	26.49	42.97	68.02	20.98	1
Third and fourth series.....		4.6	7.93	31	8.5	1.70	2.15	11.05	8.64	32.87	46.12	67.36	23.92	0
Fifth and sixth series.....		8.3	10.08	57	13.5	7.51	5.00	12.21	9.31	31.48	54.64	71.22	28.11	0
Seventh and eighth series.....		65.3	8.81	54	13.0	10.88	3.50	12.82	9.81	30.64	52.36	79.34	27.80	0
Ninth and tenth series.....		3.5	7.51	50	8.0	5.09	3.30	11.84	9.09	27.67	40.02	76.42	23.56	1
Eleventh series.....		16.3	6.73	32	8.0	2.75	3.30	9.93	7.64	18.76	37.03	70.32	21.19	4
MINIMUM GROUP.														
Eleventh, first, and second series.....		12.63	6.74	26	7.33	2.10	2.53	11.25	8.74	23.92	40.29	68.78	21.05	5
INTERMEDIATE GROUP.														
Third, fourth, ninth, and tenth series.....		43.55	7.72	42	8.25	3.39	2.72	11.41	8.86	30.27	49.07	71.89	23.59	1
MAXIMUM GROUP.														
Fifth, sixth, seventh, and eighth series.....		76.80	9.45	55	13.25	9.21	4.25	12.52	9.56	31.66	58.50	75.28	27.55	0

THE SAME SHOWN IN GROUPS.

A study of the rainfall is one of the first duties of a civilized government in India. Indra and Vāyu, the Watery Atmosphere and the Wind, are still the prime dispensers of weal or woe to the Indian races. Hundreds of thousands of lives lie every year at the mercy of the rainfall. The population is a constant (or rather an increasing) quantity, emigration on any adequate scale being incompatible with the feelings of the people. The area of tillage is also a constant quantity throughout a great part of India, spare land being no longer available. But whether the yield of the one constant quantity will or will not suffice for the necessities of the other, depends each autumn on the rainfall—a quantity which has hitherto been regarded as altogether inconstant and beyond calculation. We believe that the supposed inconstancy of the rainfall is simply the measure not of its freedom from law, but of our ignorance. We do not think it wise, from the data here collected, to prophesy future famines at Madras; although five out of the six famine-causing droughts of this century, since 1810, happened at Madras within the minimum group of our cycle, and the sixth fell in that group together with the year immediately preceding it. The time for safe prediction has not yet come. But we do think that the cyclic character of the Madras rainfall must henceforth enter into considerations connected with the food-supply of the people, and into arrangements for husbanding and distributing the water-supply of Madras. The problem is how best to conserve and utilize the rainfall, not merely of the year, but of the cycle.

Fortunately, while the study of the rainfall forms a prime state duty in India, there is perhaps no country in the world better suited than India for meteorological research. If a meteorologist were to sit down and construct a model field for his inquiries, he would make a continent stretching from near the equator up into the temperate zone. He would cut off his field by a great wall on the north, with smaller coast-walls running down toward the southern extremity, and with two distinct, regular, and well-ascertained sets of winds playing from a vast expanse of ocean upon each side. India is precisely such a model.

If we are ever to reach the great laws which regulate the weather, it will be by combining meteorological observations with statistical inductions in a country like that, where the general laws have a sufficient space to produce general results, and where the disturbing influences are regular and well ascertained. The first step is to find the quantitative value and variations of the several factors of the Indian rainfall. Nothing will be accomplished by jumbling together rain-returns from unhomogeneous stations, at which, from their situation and surroundings, the same factors act in a totally dissimilar manner. Thus, if the northeastern monsoon produces a periodicity in the rainfall of Madras, where it contributes twenty-nine inches of the total rainfall, there is no cause for surprise in not finding a similar periodicity at Bellāri or Hyderabad, where it only yields three. The figures for which we have found space in the foregoing pages establish the cycle of rainfall at only two stations in India; but they are the stations for which returns exist for the longest periods; and at which the two great factors of the Indian rainfall can produce clearly-marked effects. If, out of each thousand pounds spent on famine-relief this year, ten shillings were laid aside for an inquiry into the physical laws of famine, we should await the next calamity with a very different power of dealing with it. The people of England, both now and beforetime, have displayed a noble liberality to their suffering fellow-subjects in the East. On the present occasion, however, they have not only been liberal of their money; they have disclosed an earnestness to understand the real meaning of an Indian famine, and to find out its causes and its remedies. Splendid as have been their acts of national sympathy and benevolence, this desire to arrive at a truer understanding of the facts will prove of not less service to the Indian races, and of not less help and encouragement to those on whom rests the anxious task of Indian administration.

It may be that we have here another instance of how a patient study of the abstract truths of science is fruitful of practical benefits to mankind.—*Nineteenth Century.*

THE MORAL AND SOCIAL ASPECTS OF HEALTH.¹

By J. H. BRIDGES.

THE objects of this society are, I believe, of an extremely practical kind. It wishes to give the English people pure air, pure water, wholesome food, and habitable houses. It would give us, if it could, good drains to carry noxious refuse from the houses into the street, and it would not empty that drain into a river near the reservoir of a water-company, but would yield its contents to the all-receiving, purifying earth, where the miraculous agencies of vegetation are at hand to turn death into life, foulness into beauty. Finally, it would wage war against the unseen demons of infectious poison, and against the dull, heavy forces of ignorance and prejudice and indifference that help them in their death-dealing work. It would teach a laundress that when her children have scarlet fever she must not kill other people's children by sending back infected linen to their houses. It would also teach some of those other people that, when scarlet fever is in their houses, they must not send infected linen to the laundress, and expose her to the terrible choice of starvation or crime. It would teach the milkman to rinse his cans with pure water, so as to avoid disseminating typhoid fever through a hundred houses. It would teach the country squire to see that the milkman and all other tenants of his estate have pure water at their disposal. Finally, it would reiterate the well-worn lesson that to unvaccinated people small-pox is more terrible than cholera or the plague; that an anti-vaccination orator is a homicide; and that a careless vaccinator, letting fall from his lancet some dust of disease or death, and supplying fuel to the agitator, is a homicide no less.

This being so, I feel that some apology is needful for occupying the time of men and women intent on purposes of immediate practical utility with talk which, as I give fair warning, will seem to many discursive, vague, theoretical, and misty. But I have to say, in the first place, that being occupied with practical work myself of a kind not foreign to the objects of this society—having something to do, for instance, with the business of providing hospital accommodation for the chronically sick among the poorest class of

London—my own personal experience has not convinced me that work which is called immediate and practical involves the shutting out from one's thoughts of deeper and wider considerations. It has, indeed, led me to quite the opposite conclusion. Almost every practical reform, however necessary, however obvious, suggests questions of a startling kind; sometimes leading you to doubt whether or not the remedy may itself be the source of new evils in the future; and always inducing thoughtful minds to ask themselves whether the amount of attention given to temporary palliatives may not be excessive, and may not be distracting attention from the deeper evils. At least there can be no harm, there can be nothing but good, in now and then mounting to the point of view from which, so far as our poor faculties admit, the problem before us can be looked upon as a whole.

A whole, I say. For it is no mere play of words to dwell on the primal meanings of the word *Health*. Wholeness, soundness, entireness. Integrity—the meaning of the Latin word being Untouched—as you would say of a perfectly ripe fruit in which there is no symptom of decay. The essential thought inherent in the word is that in every organism, every living thing, if one part suffers, the others suffer also. This is the distinction between living things and things that are not living. You cut off a piece from a lump of gold or iron; all that happens is that you have two small lumps instead of one large one—nothing else. The weight of the two lumps is equal to that of the one. But in a living thing it is quite otherwise. You prune the roots of a tree, and you alter the relations of leaf and blossom. You irritate a point in the skin of an animal, and the whole creature is thrown into convulsions. The whole art of medicine is based on the study of these correlations of functions. The first great object of the physician is to find out what is the matter with his patient. He does this by observing symptoms. That is to say, the observation of a change in some part of the body which he can see, leads him to infer a corresponding change in some part of the body which he cannot see. By the state of the pulse he infers the state of the heart and blood-vessels all through the body; by the state of the tongue, that of a long tract of

¹ Delivered before the National Health Society, June 20, 1877.

mucous membrane; looking through his ophthalmoscope at a diseased retina, he infers in certain cases diseases of the nervous system, diseases of the vascular system, of the secreting system. A glance at a child's teeth will every now and then indicate to the practised eye a constitutional unsoundness of a very precise kind inherited from his parents. And so on through countless instances.

We have here before us the most important and fundamental of all the facts connected with living things—the sympathy, or, if you like the Latin word translated from the Greek, the *consensus*, or in plain English the *fellow-feeling*, of all the parts of the same organism. For the purposes of this lecture I shall have to dwell much on this point. Meanwhile, I remark in the first place that this sympathy, though very real, is by no means complete or perfect. There are parts which are more bound together, and parts which are less bound. You cannot cut away the principal roots of a tree without risking its life; but you can cut away leaves, flowers, and even branches, without any very marked effect. In man and other animals, as we know, hair can be cut, nails, hoofs, and cuticle, may be partially removed, without any *consensus*, any affection of the rest of the organism. On the other hand, there are parts which are vital. A bullet through the heart means instant death. There is a very small and well-defined place in the upper part of the spinal cord, and if that be injured, life ceases in a moment. Thus there are parts that are more bound together, and parts that are less bound.

And observe, in the second place, that, as we rise higher in the scale of life, we find two great distinctions gradually growing upon us, and forming a slowly-increasing contrast between the higher forms of life and the lower. We find, in the first place, a greater variety of parts; in the second place we find a greater oneness, a stronger binding together. The slightest consideration will show this. The huge ocean sea-weeds, hundreds of feet long, are formed of monotonous repetitions of similar parts; there are millions and billions of cells, bound no doubt together by material contact, like bricks in a long wall, but with very little vital connection. No simultaneous thrill, no wave of excitement, can pass through such an organism as this. The parts are all alike, and they have very little vital union. You may vivisect such an organism as this with perfect impunity. Pass upward to the exogamous plant—to any one, for instance, of our commonest trees or shrubs. Here you have many more

differences—root, stem, leaf, calyx, corolla, stamens, ovary, seed, and so on. Moreover, if you look at it closely, you will find difference of tissues; not merely cells, but the coalescence of cells into fibres of various textures. And here, as we have seen, there is complete unity, though still very imperfect. It is still very difficult to say whether the plant is an individual or whether it is a collection of individuals. You can cut off a twig, and place it in the soil under suitable conditions, and it becomes a new tree. You can repeat this process any number of times. Pass upward from the plant to the vertebrate animal, and you find a vastly greater multiplicity of parts or organs—brain, heart, lungs, intestines, etc., etc.—these organs when analyzed resolving themselves into a relatively small number of tissues, but still far more numerous than the tissues of the highest plant. And, corresponding to this divergency, we find that strongly-marked *consensus* of which I have already spoken. Here, then, we have the meaning of that very profound remark of Coleridge—though possibly, like so many others, it was not his own thought—“Life is the tendency to individuation.” That is to say, the higher forms of life are more distinctly individuals than the lower. To use philosophic language, in the higher forms of life, as compared with the lower, there is increased differentiation coupled with increased integration. There is at once greater variety of parts and greater unity of the whole.

So much for plants and animals. Let us now ask ourselves whether anything of the same kind can be traced in the comparison of different nations, or of nations in different stages? What, in a few words, is the difference between the savage state and the civilized state? Is it not this: that in the savage state people have very little to do with one another, and are very like one another; in the civilized state, people have very much to do with one another, and are very much unlike one another? In the one case there is independence without individuality; in the other case there is dependence *with* individuality. This is quite contrary to the common democratic prejudice that Rousseau imported into the world, which is widely diffused in America. It differs from the opening statements in Mr. Mill's “Essay on Liberty.” But I think it will be found true. I suppose Shakespeare was a strongly-marked individual. Well, try for a moment to think of Shakespeare quite apart from the whole history of England and of Europe before him. You might just as well try, to think of the blossom of

the aloe existing and growing apart from its leaf and root. If any one should bring himself to doubt that increased civilization means increased dependence of human beings on one another, let him simply read the city articles in the *Times*. Let him see there how an earthquake in Peru brings desolation into an English parsonage. Let him think how other widows than Bulgarian and Bosnian have been ruined by Russian and Turkish wars. Let him remember how Lancashire starved because three hundred years ago Columbus took Africans across the Atlantic. The fact is, that the whole science of sociology, by far the greatest and most momentous of the many acquisitions of science in our century, consists in the study of this *consensus*—how it has grown, how it works, how it can be modified.

But we are here now to think of its effect on health. Let us, then, compare the savage and the civilized man in this respect. It is quite clear at the outset that there is a balance of advantages which is not easy to strike. On the side of the savage there is the open-air life; the constant muscular exercise; there is the ignorance, in most cases, of alcohol in all its forms from gin to sherry; there is the weeding out, either by direct infanticide or by rigorous climate, of unhealthy elements in infancy; there is the absence of certain fearful hereditary blood-poisonings; there is the absence of harassing business and harassing pleasures; the fever of speculation, mercantile, philosophical, or religious, is not there—all these well-known causes of disease are absent. And you find, as the result of it, that the minute processes of growth go on differently in the savage and in the dwellers in cities. I well remember Livingstone, after his first journey to Africa, telling me of his surgical operations, removal of tumors, and so on. The two edges of the cut skin grew together, he said, with extraordinary rapidity. If you read Cook's voyages you will find the same thing. We need not travel so far as Africa and Polynesia to see this. A savage, of course, approaches the state of a horse or a dog. Wounds in horses or dogs heal with the same rapidity. I do not mention this as an excuse for vivisection either in the one case or in the other.

There are many obvious and weighty things, no doubt, to be placed in the opposite scale of the balance. The want of shelter, the want of clothing, the want of warmth, the long intervals of insufficient food, the absence of all those aids and appliances of life which depend on helpful intercourse of man with man—all these weigh

heavily on the other side. The brain, too, though less easily goaded to dangerous excitement, is more easily stupefied by paralyzing fear or despondency. Perhaps it is from this reason that epidemics are so fearfully fatal. Perhaps it is also from this reason that at the sight of civilized man, with his magic instruments of death and the resistless appliances of his industry, hope and energy are struck down. The wish to live, the wish to reproduce their kind, ceases; the race dies out. Wise, enlightened, persevering sympathy might possibly preserve them, and slowly render back their strength. But that agency is rarely at hand.

I have touched, in passing, on many points which it would be interesting to examine. But as we are not proposing to go back, like Rousseau, to the savage state, it interests us mainly from the light it throws on the contrasted state of civilized man. And, out of many aspects of the subject that might be dwelt on, I would draw attention specially to the two ways in which health is affected by civilization, namely, first, that the body is acted upon by a more active, more excitable, and more complicated brain; secondly, that there is a more complicated and more stimulating social environment. All this comes to the same thing as saying that there is *more life*; for life consists in the adjustment of the interactions of organism and environment. Where there are more of these interactions, there is more life. Where the adjustment of these interactions goes on harmoniously and without shock, there is health. And since a complicated system is more difficult to maintain in working than a simple system—since, for instance, a watch or a steam-engine is more difficult to keep in order than a windlass or a plough—we may infer that, though health in civilization may be more perfect, it most assuredly is more difficult, than health in savagery.

Let us again compare some simple social states with others that are less simple. If we are tired of the savage, let us look at a peasant proprietor in a French village, or at a wealthy squatter far away among the gum-trees in Australia. The contrast between their life and that of the dwellers in large towns might, for many purposes, be summed up in two epithets borrowed from geometry (and you know modern mathematics are capable of explaining everything). It might be spoken of as the *vertical* state as opposed to the *horizontal*. Remark that to the colonist it is of *comparatively*—I need not say I lay great stress on the word—little importance what his neighbor or the rest of the world do. His food comes to a

great extent vertically upward to him from the ground; water comes vertically downward to him from the sky. His clothing, whether of wool, or flax, or skin, grows on the spot; his house is built from a quarry in his field, or from logs in his own bit of forest; the refuse from his house and person is buried in the soil, and so on. Contrast all this with the *horizontal*ity, so to speak, of town arrangements. Water is brought from reservoirs twenty or fifty miles away; food comes from farms miles distant, perhaps from the other side of the Atlantic, or from the other side of the Pacific; clothing from any part of Europe or Asia. As for refuse substances, no vertical removal of them is possible; complicated labyrinths of tunnels, arterial systems, pumping-stations, sewage irrigations, acts of Parliament, and what not, have to be instituted to prevent us from poisoning one another. Think again of all the horizontality implied in highways, railroads, and telegraphs.

I would not strain my geometrical metaphor further than it will bear. Dwell on one more aspect of the same subject. Think how much historical phenomena have to do with the matter. For good or for evil, for good infinitely more than for evil, but yet for evil also, we have to bear the burden of the past. The treasures are mixed with dross. Take the single instance of house-provision. A squatter in the bush can build his house where he likes, he has hill and vale to choose from; but a house commonly lasts longer than a man, and in towns we have to choose from the houses provided by other generations. Put yourself in the position of a workman who must live near his work, say within a mile of where we are now. Think of the structure of London between Regent Street and the Tower—I speak of the courts, back streets, and lanes, which I would advise you to walk through this evening or tomorrow, they are much more interesting than the lanes of Venice—and then ask the question, How much of all this is due to the intolerably bad domestic government of England from the restoration of the Stuarts down to, let us say, the reign of Dr. Chadwick, thirty to forty years ago? Think how it would have been if London, after the Fire, could have been rebuilt under the eye of Cromwell, instead of the unholy brood who for a whole generation threw England to the dogs, and whose mere names, were it possible, we would forget! Then follow the growth of London into the next century by the light of Hogarth's pictures—take the one picture of *Cruelty*, for instance—and think how very little forethought

might have changed the growth of St. Giles's, Bloomsbury, or St. Anne's, Soho. And then, when by reading, and also by ocular inspection, you have become familiar with the anatomy and physiology of a London court, including the *Embryology* of it, that is, the way in which it arises, under the motive power of high rents, by the simple process of building rows of small houses at the end, and ultimately at the sides, of back gardens, the wind from each one of the four quarters of the sky hermetically shut out, and the ignorant greed of the builder uninterfered with by wisdom or by policemen of any sort or kind; then, I say, when the lesson has been well learned, go to Hackney, or to Stratford, where new London is ravaging the green fields rapidly, and ask how far is the next generation to be compromised by what the speculative builders are doing there at this moment, and compare the rate of velocity of their proceedings with that of Sir Sidney Waterlow's most admirable building society or of the Peabody trustees.

But since we have thus ventured on historical ground, let us follow on a little farther. Why is it that we have been obliged to pay such attention to public health in England? We have taken the lead, it is admitted, in this matter; is this solely and entirely owing to our superior wisdom and morality, or are there other reasons?

I suppose the facts calling for sanitary interference in this country may be condensed into two: the fact that half the nation is living in large towns, and the fact that milk and pure water are unattainable in country villages. I cannot touch on this latter point; but I think you will find it connected with the disappearance of the numerous freeholds of between twenty and fifty acres that existed till a century ago. But it is worth while to dwell for a moment on the first, because, next to the Norman conquest and the Puritan Revolution, it is certainly the most important event, or set of events, in English history. You are aware, of course, that it is an entirely modern fact. Till almost eighty years ago the growth of towns in England had gone on with steady, quiet progress, from the time of the Tudors downward. Then began the most stupendous torrent of bricks and mortar that the world has ever seen. In 1801, London—I mean the whole area of the Metropolitan Board of Works—had about 900,000 people. It now has four times that number. Manchester, Glasgow, Birmingham, and Liverpool, were all much below 100,000. They now exceed or approach the half-million.

The rest of Lancashire and the West Riding of Yorkshire has increased in the same way.

Why and how is this? Every one is ready with the answer. It is the steam-engine—the steam-engine and all the other engines which grew up around it, some before and some after: the spinning-jenny, Arkwright's rollers, Crompton's mule, Cartwright's power-loom, Brindley's canals, the iron-puddling machinery, dye-works, telegraphs, and all the other countless applications of mathematics, physics, and chemistry.

All this was in the air, was germinating long before; the brains of Descartes, Galileo, Bacon, and Newton, the brains even of Archimedes and the Greek geometers, contained the germs of it. The thing itself, the conquest of Nature by man, was normal, was predestined, is still in great part to come. But our question still is, "Why did it come about in England with such terrific and abnormal rapidity?" There was science in France as well as in England. There is wealth at this moment in France, after payment of her milliards, as well as in England. But France is not devastated by the hail-storm of hideous towns that has visited this country. When you go from Charing Cross to Paris, the two ends of the journey are not alike. I have looked in Paris for a Stratford or a Lambeth, but I have never found it. Misery enough; but not the same wide diffusion of unorganized meanness, shabbiness, and squalor. There must be a reason for this.

And, again, I go back to the second of my three great events of English history—I mean the Puritan Revolution—and ask myself, "How would it have been if that revolution had not come to so violent and abortive a close?" Put prejudice aside, and realize for a moment, by the aid of Milton, Bunyan, and Thomas Carlyle, what the government of Cromwell and his Ironsides meant. Think that England was really for a series of years governed by a set of plain, hard-headed men of business, to whom the Christian religion was the most intense reality, a thing to put into every-day working practice in the management of life, public as well as private. And is it not probable, or rather certain, that if their influence could have been maintained, in however modified a way, the industrial development of England would have been widely different; that while there would have been no Buddhist or monastic indifference to material progress, yet that politics (that is to say industry, which is modern politics) would have been subordinated to morality, to a degree of which the French Convention alone, perhaps, in subsequent history has

given the world some imperfect glimpse? You will say that 1688 followed thirty years after Cromwell's death, and that the good side of Puritanism was preserved, its extravagances sifted away. I reply that *the men* were gone. England had driven them out. The torch of republican progress was in French hands. The most strenuous types of manhood since the best days of the Roman commonwealth had been chased beyond seas—to Holland, to Geneva, and finally across the Atlantic, where they were not heard of for a hundred years, and then were heard somewhat too loudly.

I am not indulging in any spirit of paradox, nor in any feeling of detraction of our own modern time. I recognize the renewal in our own immediate generation of a nobler spirit of public morality, underneath all outward discouragement. Our political economy, for instance, imperfect though it be, is widely different from the base doctrines taught publicly thirty or forty years ago; and many other signs there are of the same kind. But the eighteenth century in England seems to me a time when, owing to the banishment or suppression of her noblest and bravest men, public morality was dormant or dead; when the greatest statesman, with the applause of his fellow-citizens (you may read it on Chatham's pedestal in the Guildhall now), deliberately waged war for the sake of commerce; when all harmonious proportion between the aspects of man's many-sided life was lost; when all the sentences of the old prayer were forgotten, except that which asks for daily bread; when all the scientific energy of the nation was concentrated in the alchemistic search for gold, until at last the uncouth Genius came at our bidding, streaming down, with profuse irony, his inky gifts of crowded town and hideous, trailing suburb, and blackened fields, and devastating chimneys—has come at our bidding, and as yet refuses to go. Like the Athenians with their nether-gods, so we, euphemistically trembling, decorate him with an imposing title. We call him Beneficent Law of Supply and Demand; and put up what poor earthworks of defense we may in the shape of sanitary appliances, drainage-works, and pollution-of-river commissions. But most of us still believe that his dominion will endure forever.

So much for the first of the two modes in which civilization affects health. It creates a complicated set of circumstances, a complicated social environment which may or may not be favorable to health. This is the political side of the subject. Now a few words—and they must

be but few—on the second mode. The results of civilization, the gains of human tradition, from the savage of glacial epochs to Londoners and Parisians of the nineteenth century, are condensed, in the shape of faculties, emotions, desires, aspirations, instincts, activities, within a storhouse of energy which we call the Human Brain. This brain is either at one with itself, or it is at discord with itself. Its reaction on the body will vary accordingly. The complicated social environment; the complicated brain. These are the two aspects of the matter. The first is the political side of health, the second the moral side.

There is a great deal of discussion about the brain in our time, and some of it is curious. There are people who open the skulls of animals (not yet of men, which would be more rational possibly) and thrust electric wires into the brain, and then watch to see what happens. They think much light will be thrown on human nature in this way. I say nothing here of the right or wrong of this, but one word as to its sense or nonsense. To me such people seem like a man who, instead of standing in front of one of Raphael's pictures to look at it, should go behind the frame, pick out a few fibres from the canvas, and, by the help of great botanical knowledge and a strong microscope, should decide what species of hemp or flax it was made of. You remonstrate. "Oh," he says, "your way of standing there looking at the picture is mere superficial, empirical observation; that is not the scientific way of proceeding. Let us first decide the species of the flax and the chemical composition of the pigments, then, perhaps, a thousand years hence we shall get to know something of the way in which they were put together." So be it. Let us go our way, and him his. Let us be content to follow far behind in the track of Aristotle and Shakespeare, and study the brain as it shows itself in thoughts, energies, and feelings.

Our first question, then, is this: Do thoughts, energies, and feelings, act upon bodily health at all?

In novels people always die of broken hearts; in real life it is said they never do. Very shallow practical men rather pride themselves in exposing the flimsy fallacy; yet the common-sense of mankind in general, and the less common sense of poets, philosophers, and experienced physicians, is not so entirely against the novelists as might be supposed. Where does the truth lie?

I suppose, the truth is pretty well illustrated by what occurs in Indian famines. No one in an

Indian famine, as we know, ever dies of starvation. This would be contrary to official rule. There are deaths, of course. Somehow or other the death-rate rises a little, then it rises a good deal, and at last enormously above the average; but these are deaths not from famine, but from liver-disease, dysentery, fevers of various kinds, and so on. We are all of us so wonderfully willing to submit to the dominion of words that this account of the matter is very apt to satisfy us. Such a person dies of bronchitis. Bronchitis is a respectable medical entity, with a regular set of symptoms, with a proper set of drugs appropriated to it, with a recognized place in the records of the registrar-general; so that, when we have set it down that a man dies of bronchitis, what more can be wished for? So in India—"No deaths from famine have occurred this week." What energy on the part of the administration!

Yet, without disparaging this energy, which every candid man knows to be very great, often heroic and self-sacrificing, it may be permitted to go one foot deeper below the surface, and to ask what brought this bronchitis or this dysentery on? Was it that the tiny cells that form the outer coating of the membrane that lines the air-tubes had become more short-lived, more liable to decay, reproducing themselves in unhealthy multitudes more rapidly than usual, and thus forming the substance that we know as purulent matter? And is this rapid growth of unhealthy cells, that ought to have developed themselves into healthy fibres and membranes, but could not, a symptom or outcome of poor blood ill supplied with fat or starch or gluten? And, if this be so, is it very important which was the particular portion of the mucous surface, whether in lung or intestine, which some slight outside irritant, or some slight inherited weakness, caused to give way first? Death from insufficient food—surely that is the right answer—whether it was in the bronchial membrane or the intestinal membrane that the mischief first revealed itself. Throw a cricket-ball along the turf, and ultimately some one particular little tuft of grass stops it; but I suppose the explanation of stoppage lies in a very great number of similar grass-tufts, insufficiently resisted by the hand that threw.

So it is with the moral antecedents of disease. There are cases where the sudden shock of unforeseen calamity is transmitted with such intense violence from the brain to the heart as to stop its action there and then, and the man falls down dead. But such things are as rare as

deaths from pure unmitigated starvation. For one such case as this, how many thousands, how many millions, where the balance of functions undergoes some slight, unperceived, accumulating disturbance! There is an instinct within us which, without analyzing it further just now, we may call the self-preserving instinct. When we stumble, the arm is thrust out violently to restore the balance. When a stone or insect flies too near the eyes, the lids close involuntarily. When the air in the lungs becomes too highly charged with refuse, this instinct shows itself in the *besoin de respirer*, and deep draughts of fresh air are taken in. And so with every other function of the body. This instinct (I am not now discussing whether it be simple or complex) takes cognizance, as it were, of the uneasy sensations that indicate the need of food, of drink, of exercise, and of every other natural function.

Now see what happens when, from any cause whatever, this instinct is interfered with. Take simple instances to begin with. Watch animals. *Vivinspection* is a much more fruitful way of reaching truth of this kind than *visisection*. Watch a favorite dog that has been waiting an hour or two for his dinner, and then, just as it is brought, invite him for a walk. The excitement of joy utterly overwhelms hunger, the whole muscular system is violently agitated—*non ha membro, che terga fermo*, as Dante would say; and the meal is for the moment utterly forgotten. I often watch this little spectacle, and it seems to me to have a great deal of instruction in it. Here we have an interruption to the self-preserving instinct, but it is a disturbance of a thoroughly healthy kind; the sense of hunger returns in very good time; meantime there has been a good walk, the blood has been purified, the digestive organs are readier for their work. Such a disturbance as this is like the discords of the musician which pave the way to higher harmony. This temporary superseding, and, so to speak, natural and spontaneous discipline, of the lower instincts lies at the very root of the higher forms of health.

But now take instances of the opposite kind. Watch a dog that has lost its master, or a wild creature newly taken captive. See the paralysis both of animal energy and vegetal energy that results. Note the failure of muscular activity, the failure of respiration, the failure of digestion and appetite. I saw a parrot not long ago refuse its food for two days from jealousy of a white dove whose cage had been placed in the same room. I say again, watch your animals; don't vivisect them, *vivinspect* them, and see what wis-

dom can be got out of them that way. You see, then, even among them, what an element of disturbance or of strengthening the health emotion may be. And now follow out these rudimentary truths to their legitimate logical consequences among savages, and then among civilized man. See how we tend more and more to live by the brain. More than ever is it evident now that man lives not by bread alone. "We live," says Wordsworth, "by admiration, hope, and love; and, even as these are well and wisely fixed, in dignity of being we ascend." And do you suppose that it is of no consequence to that harmonious vigor of bodily functions whether these things *are* well and wisely fixed, or whether they are fixed at all? Are you so credulous as to suppose that carking care and fretful discontent and feverish excitement and thwarted ambition and cankering remorse can do their work for years and show no sign? Read what poet Blake thought as he wandered about London streets, looking at what passed him like a ghost in a city of ghosts:

"I wander through each chartered street
Near where the chartered Thames does flow,
And mark in every face I meet
Marks of weakness, marks of woe.

"In every cry of every man,
In every infant's cry of fear,
In every voice, in every ban,
The mind-forged manacles I hear.

"How the chimney-sweepers' cry
Every blackning church appalls!
And the hapless soldier's sigh
Runs in blood down palace-walls!

"But most through midnight streets I hear
How the youthful harlot's curse
Blasts the new-born infant's tear,
And blights with plagues the marriage-hearse."

There are many types, both bad and good, of the opposite kind. All concentrated unity of moral purpose, bad or good, tends to harmony of bodily functions, to physical vigor, to health. Life-long avarice, successful ambition, have this result very often. There is selfish unity of purpose, and there is unselfish unity. But remark that the first can only exist in the few that are strong and successful: in the two or three misers that win fortunes, the two or three slaves of ambition that wade their way through slaughter to a throne. Thwarted ambition, thwarted avarice, lead to a very different result. The only unity which is perfect, the only unity which is attainable by the weak as well as by the strong, is that which goes side by side with union—at once the source of it,

and the result. Those who have seen the perfect type of unselfish old age, where love is as bright as in the days of childhood, will understand this. But I must not pursue this subject any further.

And now, after all this expatiating over a very wide extent of country, it is time to ask myself, as you will no doubt have asked me, the question: "What does it all come to? What is the practical drift? What are we to do?"

Undoubtedly, this question should have been before us from the outset. Disquisitions on the structure of society, which are intended to leave us where they found us, have always filled me with a sense of unutterable *ennui*. Sir Isaac Newton, as we all know, compares scientific discoverers to children picking up shells on the sea-shore. Well, shells on the sea-shore may be polished and put into a cabinet, or something pretty may be made of them; but analysis of the evils of society, unless something is to come of it, is more like a little boy pulling his drum to pieces to see what is inside. We had so much better spend our time in listening to Wagner or looking at Mr. Burne Jones's pictures. Yet, if I am not wholly wrong, there is an intensely practical object in the kind of thoughts which I have tried to set before you. And I speak with the less diffidence, that they are none of my own originating. The seeds of all of them were sown by another.

Let us see to what we have come. We have seen that for civilized man health is an infinitely deeper and more complex word than is generally supposed; that it implies the vigorous and harmonious working together of all functions, not physical only, but mental and moral; not lungs merely and heart and muscle and digestive organs, but of nerve and brain; that a very great deal more enters into the subject than considerations of pure air, and pure water, and unpoisoned food, and wholesome houses, and disinfection, and vaccination, and drainage, and sewage irrigation; that these things are of real, and urgent, and unquestionable moment, but that they are not all that is wanted, nor yet nearly so much as half what is wanted; and, further, that so long as they are considered as being all, so long as exclusive consideration is given to them, precisely so long will their attainment be impossible. We have all looked at Dr. Richardson's beautiful picture of Hygieia, the city of health, and the thought forces itself upon some of us, Where will the servants be lodged? The people who clean the chimneys and brush the beautiful parquet flooring—what wages will they get, and where will

they live? Will there be any costermongers, any poor Irish, any pauperism, any wholesale out-relief, any ignorant or indolent almsgiving, any sectarian soup-kitchens; and, as a consequence of all these things, any poor people flocking from far and wide toward this vision of food without work; and then, when their patronesses have run away from Hygieia for the London season, ready to do charring-work for eighteen-pence a day? Or is there to be no London season for the happy and contented dwellers in this wonderful city? No imperious calls on dress-makers, and temptations to their work-women to break the factory act or starve? No sudden revolutions of fashion from silks to velvet, from alpaca to cashmere, turning myriads of spinners and weavers out of work in Bradford or in Coventry, and overtaxing the factories of other places, thus driving in country-people to the towns before houses can be built for them, demoralizing them by sudden flushes of high wages, poisoning them in overcrowded lodgings, and then, when the tide of fashion changes, again turning them adrift? Or, again, will there be any house-speculators in this city? Will the town-council be empowered to pass building by-laws? if so, will it be elected by universal suffrage, and in that case is it certain that there will be no vestryman or councilman anxious for rents and glad to get the building-standard a little lowered? Or will publicans be excluded by law, and the alcoholic question satisfactorily solved? The luxury problem—one man's labor for a day being consumed by another in five minutes; the new machinery question—involving sudden privation of work to hundreds, sudden accession of unwholesome work and wages, and demoralizing town-conditions to thousands; the capital and labor question in every one of its aspects—how for a moment can we dream of cities of Hygieia without taking account of these things? And even supposing it were otherwise, fancy what a city of valetudinarians it would be! Fancy a life in which the preservation of health were made the one great object of concern. Think of the commonplaces of every-day talk. How one would yearn for the small-talk and scandal of the vulgarlest watering-place, by comparison!

We must not forget that the highest health, like the highest virtue, supposes the unconsciousness of its own existence. Struggling, as we in England, and more especially in London and Lancashire, are now, against social diseases of a special and altogether exceptional kind, produced by revolutionary confusion and by one-sided

industrial development, we have, like other sick people, to think a great deal about our symptoms, and to surround ourselves, so to speak, with medicine-bottles and nursing appliances. But pitiable, indeed, were the prospect if this state were to be the normal condition of civilized man. One should be tempted in that case to try Plato's drastic remedies—banish all physicians from the republic, let Death work his will, and let none but the sound and strong survive.

Nay, as I said before, it is one of the conditions of cure, even in the practical present that surrounds us, that we do not concentrate too disproportionate an amount of attention on the physical and material side of the malady. There are many of the evils and dangers which confront us which it is best to attack indirectly rather than directly—by a flank movement as it were, or by the slow process of undermining the citadel. The temperance problem is a case in point. People are now beginning to see the futility of adding an eleventh commandment to the Decalogue, Thou shalt not drink gin; or rather they now propose to alter it thus: Thou shalt forget the dull dreariness of thy daily burden in bright, wholesome, social pleasures, a sufficient share of which we will provide for thee.

I have tried to show that the health problem is but the visible outcropping of far deeper-rooted spiritual evils; one among the many results of a disorganization of life visible and explicable to those who try to render to themselves an account of the changes of faith and opinion in later European history. There is no use in disguising it, the root of the matter lies here. A very fundamental change in our way of regarding man and his life upon this earth; a careful examination of the laws of development by which we have reached all that is good in our present state of progress; a reverential study of the lives of the great men who in accordance with these laws of development have been the agents of this progress; a submission to this human order, and the conviction of the possibility of wisely modifying it, and, as the final upshot of all this, a new ideal set before all men, the humblest no less than the wisest, toward which they may set their faces and their footsteps in steadfast hope and courage: all this, nothing less than this, is in the world now, is surely and silently germinating, and when it has branched out a little, the public-health question, like a good many other questions, will find their natural and speedy solution.

To put it in another way: it is universally

held that for individual sick men, medicine without physiology, the art of healing without a knowledge of the laws of life and growth, is mere quackery and empiricism. So it is with public health and public diseases. There must be a study of the laws of social life and social growth before there can be any attempt to cure.

It will be seen, then, that, like a previous lecturer before this society, I believe in the efficaciousness of education. Only, are we sure that we all mean the same thing by this word? We know what Aristotle meant by it. He meant an agency for the implanting of sound and virtuous habits. Nothing else would satisfy him for a moment. And what he wanted was not realized till three hundred years afterward, when St. Paul planted the shores of the Mediterranean with Catholic societies. And to take lower ground for a moment, I cannot but think that we have gone a little backward and downward in our notion of education from the time when, fifty years ago, Owen and his band of dreamers included in that word all the influences that surround life and that form character. I would not disparage the London School Board for a moment, entertaining as I do a great respect for their operations; but it has always seemed to me that education was a rather ambitious word to use for the process by which many thousands of little children are taught by other children nearly as little to read and write imperfectly.

If, however, I were asked, What or where is my solution of the public-health problem, my cure for the degradation of civilized life which makes it needful to consider that problem? I, too, should say with others, Nowhere but in education can it be found. But then I should propose to define education, not the teaching the little children of the poor to read and write imperfectly, combined in the case of a few clever ones with a "laborious inacquaintance" with geography and English grammar; nor even the technical teaching now so much in vogue, which is to teach men trades, make them better instruments of production, and enable us to hold our own in the European struggle for commercial existence; nor even that *crème de la crème* of university culture, the capacity for writing mediocre verses in a dead language. Of all these things I would speak with the varying measure of respect which belongs to them; but for the purpose before us, namely, the purpose of securing the healthful life of a nation, I would define education as the effort to place before children, men, and women, whether rich or

poor, the highest ideal that we can frame to ourselves of human life.

I believe that this will be regarded as utterly visionary. I fear that even Mr. Ruskin, himself perhaps a visionary in some things, would demur to it. But surely it is only our amazing want of faith and settled conviction of any sort that makes us say so. Look at it in this way. The Bible is not yet driven out of our schools, though many excellent people, from motives which I understand and respect, are trying very hard to secure this object. But from a simply secular view, what is the Bible but the highest culture of a remarkable people two thousand years ago? If Abraham, and Moses, and David, and Isaiah, have become familiar names to the humblest, where lies the impossibility of enlarging the scale a little, and instead of driving out the Bible in order to give more time for the study of adverbs, adjectives, industrial products, and the like, *add* to the Bible some continuous chain of the great poets, thinkers, and statesmen, that make up the tradition of humanity. A Catholic, who has his lives of saints linked together through the middle ages, might understand this better. A Jew, perhaps, or a Chinese, whose tradition is unbroken for three thousand years, might understand it better still. In a word, the education needed for healthful national life is such as to restore to England the old Puritan energy and devotion. But, Puritanism with a larger Bible.

Do you ask again, What has all this to do with public health? I reply, It has everything to do with it. Public disease springs from indifference to life, because life has been made worthless. If you would have public health, you must make life valued, and to that end you must make it valuable.

I need not say that to make these elemental truths living and vital, to bind them not merely by rote upon the tongue, not merely by reason upon the intellect, but to stamp them upon the heart and the character, something more will be needed than philosophic lectures. Of deeds, of conduct, of life, of example, I say nothing here; but for the mere reception of the thought into the mind something more than speech is needed. Speech is good, but art is better; and here lies the true future of art—a golden future indeed. The five sisters, Architecture, Sculpture, Painting, Poetry, Music, each and all must work their magic in our favor, kindling the dry fuel of philosophic force into the flames of inspiration and energy. Bear with me if I seem to take refuge in Utopia for a moment, remembering only, what you will

find borne out in history, that the Utopias of one generation are very often the familiar dwelling-places of the next, and that though some are marsh-fires that lead astray, others are stars that guide.

Is it, after all, so very chimerical to conceive some rich man building somewhere east of the Bank a somewhat stately room, not meaner, perhaps, in its proportions than the beautiful hall of the Reform Club—for this is to be a reform club too—and that the walls and corridors should be trusted to a painter and a sculptor for handling of the noblest subject that human imagination will ever be able to conceive—the growth of social life, symbolically treated as in Homer's shield of Achilles, and the series of great men who best represent the stream of the noblest human progress. Take, if you can find it, some grander programme for this purpose than is set forth in the historical calendar of Auguste Comte; or take that, if you can find, as I can find, none better: there would be a large agreement between every one on this head, whichever list was chosen. Endow some reader to read at intervals from the great world poets; some musical choir to render such passages from the great musicians as, being simple and grand and tender, shall take the hearts of all that hear them captive; finally, from time to time, let some man who knows, by a few simple words, point the moral of the whole, and would you not have in some such scheme as this a civilizing and, in the truest sense, a health-giving agency? Would it not, I again say, conduce to the public health, in the narrowest and most superficial as well as in the widest sense of that word, that something of the pomp, and stateliness, and dignity, and splendor, of human life should be brought within the reach of the humblest? Who that has seen the grand, ragged Roman beggars resting in the warmth and magnificence of their vast churches but has had some glimpse of this?

Art is far more accessible to the ignorant than we suppose. People who read and write, and who come of parents who read and wrote, are very apt to judge of others by their own incompetence. But the sons of shoemakers, carpenters, and blacksmiths, are born with hands far better prepared than ours. Let us remember that there were men in the glacial epochs, say fifty thousand years ago, who carved bones and drew pictures of animals very far better than many of us here can do. Or, again, go into the worst hovels of Westminster or Clerkenwell, you will find, no books, but the walls lined with pictures. Science,

book-learning, and so on, are not natural to man, but art is.

Then, side by side with art, try Nature. Side by side of the worship of humanity, or, if you please, *reverence* for humanity, try the worship of the earth and sky. Remember Miss Nightingale's story of the dying man in hospital, where the windows were too high from the ground: "He didn't know anything about Natur', but he should like to have one look out at window before he died." You think the colonist's earth-hunger, the passion of the French peasant for his freehold, is mere sordid greed. It is that; and it is also something infinitely larger and higher than that. It is the earth-worship instinctive in the race. If you doubt it, look at the geranium-pots in the back alleys of Bethnal Green.

This brings me to the last point I will obtrude upon you. In the name of public health, the health of London and Liverpool, as well as of England generally, make the most of what of the rural population is still left to us. Six out of each eleven persons living in London were born outside it. If you talk to them, you will find they do not regret their country villages. There is no homesickness. Why? Because village life is dull; because in London, with its vile lodgings and precarious struggle for existence, there is excitement, there is life by the brain. There is a rich multiform drama every Saturday night in the Whitechapel Road. Flaring gas-lights; strong lights and shadows; carts of vegetables and cheap fruits; variety of strongly-seasoned food; toys, colors, shop-windows, street-cries, collisions, medleys of all sorts, and stimulating social intercourse—what is there in country villages to compare with this? The very fairs, instead of being made decent, have been abolished. Then in London there is independence. There is no farmer to turn one adrift at a week's notice, or to strip the ripe grapes from the pretty cottage walls or the ripe cider-apples from the trees. I speak of things I have myself seen and known. And I lived for years on the estate of a most philanthropic nobleman.

In the interests of town and country alike, is there not some reasonable percentage among the twelve thousand gentlemen who possess two-

thirds of the soil of England, who are ready to become great citizens, who are prepared to stop the velocity of this exodus from villages, by making village life more bright, more free, more strong—in one word, more healthy? Some slight restoration of the twenty-acre freeholds of past times, some fixed ownership of house and garden, some genial simulating culture—difficult of attainment though all this be—is it so chimerically impossible? Must the whole work of rural progress be left to Joseph Arch and other subsequent antagonisms far more fierce and far less manly?

I have done; but in ending, as in beginning, let me deprecate very earnestly the thought that by any implication I have disparaged other projects of reform, more practical apparently and more immediate, in the obtrusion of my own. And especially let it be granted me to say one word in thankful praise of the lecture and of the lectress who opened the course this year by her plea for Open Spaces. From the precept and example of Miss Octavia Hill I have always thought it a privilege to be a learner. Her close contact with the hard, dry, minute, tedious facts of misery, whether in Barrett Court or in out-relief committees; her attempts to lessen, not so much physical pain, as moral degradation; her up-hill struggle against the miserable indulgence of indolent or sectarian almsgiving; and her last patient and eloquent pleading for green breathing-spaces and resting-places close to the homes of the poor, are all precious, not merely for their immediate beneficence to the needy, but still more because they seem to me a sort of object-lessons in large type *for the rich* in elementary social ethics—lessons which can hardly fail to lead the pupils in her school to larger and deeper issues. Moreover, they will bear, as many other remedial measures will not bear, the test which should be applied to all palliatives; that is to say, being beneficent for the immediate present, they are such as to facilitate, not such as to prejudice, the future. They are not impediments, but installments, of that guiding ideal toward which each one of us, I believe, whatever his point of departure, whatever the path he may have chosen, proposes to strive.—*Fortnightly Review*.

ÆSTHETIC ANALYSIS OF AN OBELISK.

By G. A.

I HAD climbed with a friend up the steep down which overhangs Ventnor, and reached the obelisk at Appuldurcombe. From its base the eye ranges over the loveliest panorama in the Isle of Wight. The Solent gleams blue in the sunlight to northward, and the Channel, studded with white sails, spreads below us to the south; while at the eastern and western ends of the island, the great chalk-cliffs of the Culvers and the Main Bench stand out in dazzling purity against the purple waters of Sandown Bay and Freshwater Gate. Around us on every side stretches an undulating reach of tilled or wooded country, all the more grateful, perhaps, for its trim neatness to an eye wearied with the rank luxuriance of tropical hill-sides. But what strikes one most in the prospect is the singular way in which every conspicuous height is crowned by some kind of monument or landmark, giving to each portion of the scene an individuality and a topographical distinctness of its own. Here, close at hand, is the Appuldurcombe Obelisk, built on a commanding point of view by Sir Richard Worsley, the former owner of the great house which stands in solitary grandeur, shrouded by the elms of the park, at our feet. The obelisk has been struck by lightning and shaken to its very base; while the topmost stones have fallen in a long line on the down, still preserving their relative positions, and impressing the visitor with a very massive idea of ruin. Looking northward, we see the monument on Bembridge cliffs and the sea-mark on Ashley Down; while on the opposite side the St. Catherine's beacon and Cook's Castle stand out among a number of minor pillars. We had been discussing some question of æsthetics on our way, and, as we gazed round upon this exquisite view—a mere hackneyed English scene, it is true, and perhaps on that account not worth the trouble of a description to those who measure Nature with a foot-rule, but lovely, indeed, to any one who worships beauty for its own sake, and acknowledges it wherever he may find it—my friend inquired of me, "How do you account, on general æsthetic principles, for the pleasure we derive from an obelisk?"

The question was not one to be answered in a moment. Indeed, the actual analysis into simple psychological elements of any æsthetic object, however slight, is a lengthy task; for many sep-

arate factors, intellectual, emotional, and sensuous, must be taken into consideration and duly coördinated. We talked over the point as we returned to Ventnor, and several other observations occurred to me in the course of our rambles afterward; so I propose to set down in this paper the net result of our joint investigations. The starting-point of our exposition will seem at first sight sufficiently remote from any question, either of obelisks or of æsthetics, but I trust that as I proceed its relevancy to the main subject will become clearer.

A baby of my acquaintance, aged seven months, is very fond of hearing a spoon knocked against a finger-glass. One day the spoon was put into her hands, and, after a series of random efforts, she at last succeeded, half by accident, in striking the glass and producing the musical note which pleases her. This performance gave her the most intense delight, as was evidenced by her smiles and chuckles. She continued her endeavors with varying success, and soon learned how to direct her muscles so as to bring about the desired effect. Every exercise of this power gives her acute pleasure, and is followed by a crow of excitement and a glance around which asks mutely for the sympathy or approbation of by-standers. Evidently, even at this early age, the gratification of power, the pleasure of successful effort, is a feeling within the range of her unfolding intelligence.

Another baby, half a year older, is in the habit of pursing her lips and blowing upon her papa, who thereupon pretends to be knocked down, and falls upon the carpet. In this case the gratification is even more evident, and the supposed effect is more conspicuous and striking. Other children, again, push down grown-up people with their hands, and are delighted at their resistless fall. The main element in all these pleasures is the production of a noticeable effect; and it is obviously desirable, both for the individual and the race, that such efficient action should be followed by pleasurable feeling. The power to produce great mechanical results and the will to initiate them are necessary factors of success in the struggle for life among the higher animals.

Boys a little more advanced in nervous and muscular development derive analogous pleasure

from somewhat similar exercises. They love to roll huge stones close to the edge of a hill, and then watch them tearing down its slopes, rooting up the plants or shrubs, and thundering into the valley beneath. At other times, they band together to fling a small boulder into a lake, and revel in the exhibition of power given by its splash and roar. And this enjoyment is probably not confined to human beings; for our congeners, the monkeys, delight in similar displays; and those of them who are trained in the Malay peninsula to pick and fling down cocoanuts from the palms, chuckle and grin over each nut as it falls, with true boyish merriment.

But the most conspicuous manifestation of these feelings is to be seen when the constructive faculty comes into play. The first desire of children in their games is to build *something big*, a visible trophy of their architectural skill. On the sea-shore they pile up great mounds of sand, or dig a pit surrounded by a mimic rampart. If they can get at a heap of bricks or deal planks, they will arrange them in a pyramid, and will judge their success by the height which they can attain. In doors, their ambition finds vent in card-houses, or lofty edifices of wooden blocks. In winter, the big snowball forms a never-failing centre of attraction; while American and Canadian boys obtain a firm material in the frozen snow for neatly-built palaces, which sometimes outlast an entire week. But, above all, it is important in every case to notice that children invariably call the attention of older people to these great effects which their hands and arms have produced. The first element of the sublime is possibly to be sought in this sympathetic admiration for the big products of childish effort.

Among the earliest works of human art which are yet left to us from the sacrilegious hands of landlords and pashas, the same love for something big is still to be noticed. The chieftain's body lies beneath a big tumulus, or its resting-place is marked by a cromlech of big unhewn stones. The Gael crowns his mountain-top with a monstrous cairn; the Cymry pile the long avenues of Carnac; or perhaps a still earlier race lift into their places the huge rocks of Stonehenge. Italy and Greece still show us the Cyclopean masonry of Volaterræ and Tiryns; while farther east, the Pyramids, the Sphinx, the colossal Memnon, the endless colonnades of Karnak, bear witness to the self-same delight in bigness for its own sake, as a monument of power, personal or vicarious.

So here, almost without knowing it, we have

traced back our obelisk to the land of its birth, and seen the main reasons which gave it origin. All phallic speculations would obviously be out of place here; for even if we grant that the obelisk is in its first conception a phallus (which is far from certain), at any rate our present point will be gained if objectors allow us in return that it is a *very big* phallus. Beginning as a rough monolith, in all probability, the obelisk assumed in Egypt the form in which we know it best, a massive, tapering, sharply-pointed square column of polished granite. A few more words must be devoted to its historical growth before we pass on to its modern æsthetic value.

Egypt is the land of colossi. The notion of bigness seems to have held a closer grip over the despotic Egyptian mind than over any other psychological specimen with which we are acquainted. It does not need a journey up the Nile to show us their fondness for the immense; half an hour at the British Museum is quite sufficient. Now, *why* did the Egyptians so revel in enormous works of art? This question is usually answered by saying that their absolute rulers loved thus to show the vastness of their power; and doubtless the answer is very true as far as it goes, and quite falls in with our theory given above. But it does not *always* happen that despotic monarchs build pyramids or Memnons; and the further question suggests itself, What was there in the circumstances of Egypt which determined this special and exceptional display of architectural extravagance? As we cast about for an answer, an analogy strikes us at once. Taking the world as a whole, I think it will be seen that the greatest architectural achievements are to be found in the great plain countries; and that mountain districts are comparatively bare of large edifices. The plain of Lombardy, the plain of the Low Countries, the plain of Chartres, the Lower Rhine Valley, the eastern counties—these are the spots where our great European cathedrals are to be found; and, if we pass over to Asia, we shall similarly discover the country for pagodas, mosques, and temples, in the broad basins of the Euphrates, the Ganges, the Indus, the Hoang-ho, and the Yang-tse-kiang. No doubt castles and fortresses are to be found everywhere on heights for purposes of defense; but purely ornamental architecture is most flourishing in level expanses of land. Now, there is no level expanse in the world, habitable by man, so utterly unbroken and continuous as the valley of the Nile. Herein, doubtless, we have a clue to the special Egyptian love for colossal under-

takings of every sort. Let us proceed to apply it psychologically.

Children at play on the sands do not pile up their great mound in the midst of rocks and boulders. On the contrary, they choose a level space, where no neighboring object overpeers and casts into the shade their little colossus—not by premeditation and concert, of course, but by instinctive feeling that a big heap will look bigger just here. So with primitive man: he puts his tumulus not in the midst of natural elevations which mock his puny efforts, but in some wide plain where its size comes out by contrast with the small objects around. And, as civilization advances, it will naturally follow that man will most indulge his love for conspicuous displays of material power in those places where such displays produce the greatest effect. In mountain-countries, man's handiwork is apt to be dwarfed by the proximity of Nature's majestic piles, and his *amour propre* is not constantly stimulated to some greater and yet greater achievement; but in wide and level valleys the effects he can produce are so relatively striking, that every despot is urged on by an overwhelming desire to outdo the triumphs of his predecessors. From Timour's pyramid of skulls to the Arc de l'Étoile in Paris one sees the same spirit of boastfulness, allied with the same predatory instinct, running through the long line of columns, pillars, triumphal arches, and Nelson monuments.

A word must be added to prevent misconception. Undoubtedly some splendid architectural works are to be found in mountainous districts; but they are the exception, not the rule. And even so they are apt to be rather military than ornamental, owing their beauty more to incidental circumstances than to deliberate design. Beginning with the rude earthworks which cap most heights in the British Isles, we go on to the Hellenic Acropolis and the Italian Arx, the ruined castles of Rhineland, the fortress-crowned heights of Stirling and Dunbarton, the frowning battlements of Quebec and Gibraltar. When an ecclesiastical character has been given to such buildings, it seldom quite obscures their original warlike purpose. Most of the churches dedicated to St. Michael, the militant archangel who delights in airy pinnacles, are connected with adjoining fortresses; the cathedrals of Zion and Durham are fronted by the castles of the prince-bishop; and the Parthenon or the Capitol does not make us forget the real nature of the Acropolis and the Arx. Such cases are very different from those of Milan and Cologne, of the Memnonium and the

Táj-Mahál. Moreover, it is worth noticing that in mountainous or hilly regions the buildings usually crown the highest points, so that Nature aids art instead of obscuring it. If a tumulus *must* be placed in a hill-country, it is piled on the top of the most conspicuous elevation: and all landmarks, from cairns to Hardy monuments, are perched in similar situations. But this point is one which will come in further on.

Egypt, then, being the flattest of all flat countries, is the one where we might naturally expect the taste for bigness to reach the most portentous development. Aided by the existence of a simple autocracy and an overwhelming military spirit, it produced all those forms of colossi with which we are so familiar; and among them our present subject, the obelisk. But so far we have only considered its historical origin; we have now to inquire what are the points about it which give it æsthetic beauty in our eyes at the present day.

In a formal analysis it would be necessary to divide the elements of our feeling into various classes—the sensuous, the emotional, and the intellectual; but for our immediate purpose it will perhaps be better if we take the complex total in its *ensemble*, and notice its different factors in the order of their prominence. To do so properly, let us begin with the obelisk in itself, viewed absolutely, and apart from all considerations of locality, fitness, and association.

As we look up at our present specimen, the first point which strikes us is its *size*. It appeals to the emotion of the sublime in its simplest form, the admiration for the literally great in man's handiwork. We think instinctively: "What a huge mass of stone this is! How it towers up into the air! How many men it must have taken to raise it to that height!" In short, one's earliest feeling is summed up in a note of admiration. The Appuldurcombe Obelisk is formed of separate stones, each of immense size, and we see immediately how impossible it would be for our unaided efforts to roll over even a single one of them. But most other obelisks are monolithic, and in that case our direct affection of the sublime is far more vivid. We picture to ourselves the difficulty of hewing that immense, unbroken mass from the solid rock of its parent-quarry; the care that must have been taken to insure it against fracture or chipping; the mechanical power involved in raising it successfully to its final site, and planting it firmly on its pedestal. The most conspicuous element in our æsthetic pleasure on viewing an obelisk is clearly the sym-

pathetic reflex of that primitive Egyptian delight in something big.

The next element in order of conspicuousness is its *form*. This it is which on the one hand marks off the obelisk, as such, from any other massive monument, and on the other hand adds a further element of beauty when massiveness is wanting. Any obelisk, great or small, pleases us (irrespective of its surroundings) by its graceful, tapering shape. It is not like the pyramid, a squat heap of stones, placed in the position where the least possible mass is supported by the greatest possible base. On the contrary, while the stability of the shaft is sufficiently insured, its slender dimensions yield the notion of comparative slightness. Nor is it like the column, whose natural purpose is that of a support to some other body, and which always looks ridiculous when surmounted by a figure; an absurdity conspicuous enough in Trafalgar Square and the Place Vendôme, but reaching a culminating point in the meaningless colonnades of the Taylorian Institute at Oxford. The column has no natural termination, and so, when it is wrested from its original intention, it always disappoints us by its useless capital, which obviously implies a superincumbent mass; but the obelisk has no other object to serve save that of beauty, and its summit is planed off into the most graceful and appropriate form. Again, the simplicity of its outline pleases us. If the angles were cut down so as to make an octagonal plinth, we should feel that additional trouble had been taken with no additional effect. But, as it now stands, we see in its plain sides and rectangular corners a native grandeur which would be lost by more ambitious decoration. Carve its contour, ornament its simple summit, bevel its straight edges, and all its impressiveness is gone at once.

From these complex considerations of form, mainly composed of intellectual factors, we may pass on to those more elementary ones, the effect of which is rather directly sensuous. The obelisk is bounded by straight lines whose length is not excessive, and whose direction can be followed by the eye with ease and gratification. Its upward tapering form adapts itself admirably to the natural convergence of the lines of vision. Its four sides can be grasped at once without confusion, and its pointed top, leveled all round, gives an obvious and pleasing termination to the muscular sweep. Then, too, it is throughout symmetrical, and that in a manner which requires no effort for its comprehension. If one side bulged a little, if one angle were untrue, if one

line of slope at the summit did not "come square" with its neighbor, if anywhere there were a breach of symmetry, an indication of unworkmanlike carelessness, all our pleasure would be gone. But when we see that the artisan has exactly carried out his ideal, simple as that ideal is, we are pleased by the evidence of skill and care, and sensuously gratified by the simplification of our visual act in apprehending the form produced.

Closely allied to these sources of pleasure are those which depend upon the polish of a granite obelisk. Sensuously we derive two kinds of gratification from this property: the visual gloss gives an agreeable stimulus to the eye, while the tactual smoothness affords pleasure to the nervous terminals of the hand. Further, it is intellectually gratifying as another symbol of the care bestowed by the workman upon his work. And when in certain cases we add to the last-named idea the historical conception of the inadequate tools with which our Egyptian artist must have wrought this exquisite sheen, we raise our feeling at once to a far higher emotional level.

But we have not yet exhausted the elements of beauty and interest given by an obelisk, even apart from special circumstances of site and surroundings. Its surface may be deeply scored with hieroglyphics, and this, though in one sense a detriment to the general effect, yet gives a certain detailed interest of its own. We can notice, too, how this carving of the plane surfaces, which nowhere interferes with the typical outline, does not disfigure our obelisk in at all the same way as ornamentation of its edges or summit would disfigure it. The hieroglyphics leave it still essentially the same as ever; while a little floral decoration, a few scrolls or acanthus-leaves at its critical points, would make it something totally different and vastly inferior. Again, the mere color and texture of the stone may form partial elements in the total result. Red granite, closely dappled with points of crystalline transparency, or blue and gray limestone, shining with a dull and subdued glossiness, are in themselves striking components of the beauty which we notice in particular instances.

When we pass on from these immediate and general impressions to those more special ones which are given by historical and geographical association, a whole flood of feelings crowds upon our mind. Let us try to disentangle a few of the most prominent strands, again in the order of their conspicuousness.

Part of our pleasure in viewing such an erec-

tion is undoubtedly due to the recognition, "This is an obelisk." Every cognition, as Mr. Herbert Spencer tells us, is a recognition; and every recognition is in itself, apart from specialties, pleasurable. And, when an educated man recognizes an obelisk as such, he greets it as an old acquaintance, around which cling many interesting associations of time and place. In its origin it is, for our present purpose at least, Egyptian; and we see in it always a certain Egyptian massiveness, solidity, simplicity, grandeur. While to the merest child or boor it is beautiful for its form, its height, its size, its gloss, its texture; to the cultivated mind it is further beautiful for its suggestions of a dim past, a great empire, a forgotten language, a mighty race, now gone forever, but once the teachers and pioneers of humanity on its upward struggle to light. We cannot divorce from our recognition of its shape and name some dim recollection of its history and its birthplace. When we meet it in the cemeteries of Western America, or on the hill-sides of sub-tropical Australia, it carries us back, perhaps unconsciously, but none the less effectively, over a thousand miles and ten thousand years to the temple-courts of Meroe or the mired presence of Amenoph.

If we feel thus in the case of any obelisk, still more do we feel so in the case of an actual Egyptian obelisk. It makes a great difference in the impressiveness of each particular block of stone whether it was hewed a myriad of years ago in the quarries of Syene, or last year in the quarries of Aberdeen. The sublime in its most developed forms comes in to complicate our simple sense of beauty when we have to deal with long-past time and the relics of ancient empire. There is a great gulf between the child's admiration for that big pillar of polished rock and the cultivated man's half awe-struck gaze upon that sculptured monument of the earliest great civilization whose memory has come down to us across the abyss of ages.

More or less remotely present in some few minds will be the still earlier history of that smooth needle of serpentine. The fancy will run back to those primeval days when the action of seething subterranean waves melted together and fixed into solid crystal the intricate veins of green and russet whose mazes traverse its surface. But the eyes that so turn backward instinctively to the first beginnings of mundane things are as yet but very few, and we need hardly follow out their speculations further, rather satisfying ourselves with the passing observation that each such prolongation of our field of vision lays open before

us wider and yet wider expanses for the exercise of our æsthetic faculties in the regions of the highest and truest sublime.

Thus we have unraveled a few among the many tangled threads of semi-automatic consciousness which go to make up our idea of beauty in the case of an obelisk in itself, regarded without any reference to place or time. Let us now turn our attention awhile to the question of surrounding circumstances, and inquire how far the beauty of every particular obelisk depends upon its harmony with neighboring objects.

There is a Dissenting chapel in Oxford, the four corners of whose roof are decorated—as I suppose the architect fondly hoped—with four obelisks of painted stucco. I have often noticed in passing this chapel that each separate obelisk, regarded apart from its incongruous position, is capable of yielding considerable pleasure on the score of form alone, even in spite of the poor and flimsy material of which it is composed. Some faint odor of Egyptian solidity, some evanescent tinge of architectural grace, still clings individually about every one of these brick-and-plaster monstrosities. Shoddy though they are, they nevertheless suggest the notion of massive stone, which custom has associated with the shape in which they are cast. But when the eye turns from each isolated pillar to the whole of which they form a part, the utter incongruity of their position overwhelms one with its absurdity. Wherever else an obelisk ought to be set, it is clear that it should not be set at every angle of a roof.

On the other hand, as we look away from Appuldurcombe over to the monuments which mark and individualize every ridge in the distance, we see that an obelisk, placed on a commanding natural height, in a solitary conspicuous position, adds to the beauty of certain scenes instead of detracting from it. Certain scenes, I am careful to say; for there are some wild, rocky districts where such puny decorations only reveal a miserable cockney conceit. But in typical English undulating country—such a country as that which swells on every side of Appuldurcombe—with its gentle alternation of hill and dale, dotted with church-towers and stately mansions, a monument on every greater ridge is an unmitigated boon. It gives the eye a salient object on which to rest as it sweeps the horizon. It makes up in part for the want of jutting peaks or glacier-worn bosses. Above all, it harmonizes with the general evidences of cultivation

and painstaking human endeavor. In a Highland glen we look for unmixed Nature—purple heather, brown and naked rock, brawling stream, rugged hill-side, and lonely fir-trees beaten and distorted by the wind. But, in a graceful English scene like this, we are gratified by the triumph of man's art—level lawns, green or golden cornfields, lofty steeples, smooth parks shaded with majestic and evenly-grown oaks. So, in the first case, we are displeased by any obtrusion of would-be artistic handicraft, such as the eighteenth century officiously foisted upon the scenery it admired; while in the second case we find in these purely ornamental structures the final touch which finishes off an artificial landscape. In such circumstances the obelisk is a symbol of loving care, giving to the complex picture the one element which it lacks.

Whatever may have been the original purpose of the obelisk—and we can hardly doubt that it had once a religious signification—its modern use is the one thus indicated, as a mark or salient point to fix the eye upon a critical site, either in a close area or an extended prospect. When we employ it to decorate a town, we place it in some open and conspicuous situation, either in the centre of a square, or where roads diverge, or at the apex of a triangular green, or at the point of bisection in one side of a bilaterally symmetrical oblong. When we use it for rural decoration, we perch it on the summit of a rounded and sloping hill. It does not look well on an elevation which already possesses a natural peak or well-marked crest; but it serves admirably to fasten the eye on the otherwise doubtful crown of a long and sweeping ridge. Again, such a pillar would be absurd half-way up a hill, where it would hardly come out against the neighboring background of green; but it stands up with a pleasing boldness against the cold gray and somewhat monotonous sky-line of an English down. In short, an obelisk, viewed apart from its own individuality, and with reference to the whole scene in which it fills a place, is essentially a mark to call attention to the site on which it stands. Of course, a column often serves the same purpose; but, then, a column serves it badly, and an obelisk serves it well. It is just because it does so that it has survived to the present day.

If we look at a few such individual cases we shall find yet other elements in the complex feeling of beauty and fitness. There is the Luxor Obelisk in the Place de la Concorde. Here we have all the usual points which belong to the form as

such, to the massive and monolithic character, to the high polish and sombre coloring, to the quaint and suggestive hieroglyphics with which it is deeply scored; and we have also the additional points given by its central and symmetrical position in a noble square, marking, as it were, a node in the long vista which reaches to the Louvre on the one side and the Arc de Triomphe on the other; but, over and above all these factors in our complex emotional state, there is a strange sense of irony in the collocation of that mute memorial of a solid and patient primeval race beside the gilded dome of the Invalides, the brand-new architectural elegancies of the Haussmann order, and the frivolous modern through which pours ceaselessly past it up the Champs Élysées. I have seen that relic of the Pharaohs illuminated with gas-jets and colored lanterns in honor of the Fête Napoléon. And yet few will be disposed to deny that there is, by reason of this very contrast, a sort of odd fitness in the present position of the Luxor Obelisk.

Now, let us turn to a very different instance, the Speke memorial in Kensington Gardens. Here we have to deal with a perfectly modern specimen, lacking all the historical interest of the Colonne de Luxor. But we have still the graceful form, the hard and solid material, the glistering surface, the suggestion of antique workmanship. And here the obelisk stands at the end of a green vista; it is approached by a close-cut sward, and it forms a pleasant termination to a pretty, if strictly artificial, scene. Moreover, there is a solemn appropriateness in the choice of an old Egyptian form for the commemoration of a fearless and ill-fated Nile explorer; while the brevity and simplicity of the legend—the single word "Speke" engraved on its base—is in admirable keeping with the general characteristics of the obelisk. On the whole, it is probably the best-chosen and best-situated monument in London.

Another similar structure with which many of us are familiar may supply a passing illustration. It is a column this time, not an obelisk, but it will serve equally well to point the moral in hand. On the heights which bound the valley of the Niagara and overlook the sleepy waters of Lake Ontario stands a Corinthian column, surmounted by a statue, and known as Brock's monument. As one passes down the river, leaving behind the great cataract itself, and the pine-clad ravine through which the whirlpool rapids surge with ceaseless foam, a turn of the stream brings one suddenly in view of a level reach which forms

part of the monotonous Ontario basin. Brock's monument stands at the very edge of the higher lands before they dip into this low-lying plain. If it stood in Waterloo Place, the visitor would pass it by with the same carelessly contemptuous glance which he vouchsafes in passing to the Duke of York's Column. But on the banks of a great American stream the righteous indignation which man naturally feels toward a supporter with nothing to support is waived in favor of other associations. In the midst of a wide, half-tilled expanse, still dotted with stumps of trees and interspersed with shabby wooden villages, that tall shaft of sculptured stone, in memory of a British soldier, has an air of European solidity and ancient civilization that contrasts well with the shuffling modern appearance of everything else in the prospect. All other human additions to the neighborhood of Niagara—the big wooden hotels with their sham cupolas, the line of bazaars with their sham Indians, the paper-mills of Luna Island, with their intensely realistic appurtenances—are simply hideous. But that one touch of familiar European art, spurious as it is in itself, can hardly fail to raise a thrill of pleasurable surprise and grateful recognition in every visitor from the older lands across the Atlantic.

Perhaps it is this very consciousness of contrast which fills Greenwood and Mount Auburn with Ionic temples or Roman mausoleums. Bad as is generally the taste displayed in such structures and the choice of their position, an occasional success half redeems the many failures. A monument which struck me much in this respect is situated in the graveyard of a church in the mountain district of Jamaica. As you ride down from the Newcastle cantonment you pass through a narrow horse-path, almost choked with tropical ferns, wild brushwood, and spreading aloe-plants. But when you reach this little churchyard, neatly kept and planted with English-looking flowers, you see a plain obelisk of polished Aberdonian granite, whose simple gracefulness could not offend the most fastidious eye, while the evidence of care and comparative culture strikes the mind at once with a pleasant relief.

There are many other cases nearer home of similar erections which might be examined, did space permit, such as the Baxter monument near Kidderminster, the various London and Paris columns, the *Colonne de la Grande Armée* at Boulogne, and so forth. But the instances already given will suffice to mark the complexity which is introduced by consideration of surrounding

circumstances. It would be interesting, too, to compare them as regards their origin and purpose, their harmonies and contrasts, with the Highland cairn and the Welsh *maen-lir*, the white horses of Calne and Wantage, the arches of Titus and Severus, the pillars of Byzantium, the minarets of Delhi, the pagodas of Kew and Peking, the *campanili* of Italy, the steeples of our own village churches, and the Albert, Scott, Stewart, and Martyrs' memorials. But such a treatment of the subject would probably prove too exhaustive for even the most minutely conscientious student, and perhaps their relations are sufficiently hinted even in the brief list we have just strung together. Let us pass on to see the net results of our previous inquiry.

At first sight few æsthetic objects could seem simpler of explanation than an obelisk. Compared with an historical painting, or a lyric poem, or an operatic *aria*, or even a landscape, it is but a single element by the side of the many which go to compose those complex wholes. But when we proceeded to analyze this seemingly elementary factor in the whole scene which lay before us from Appuldurcombe, we saw that it is really itself made up of a thousand different threads of feeling, sensuous, intellectual, and emotional. While most theorists are ready to account for every manifestation of beauty by a single uniform principle, actual analysis revealed to us the fact that even the most apparently uncompounded perception depended for its pleasurable effect upon a whole mass of complicated causes. Some of these factors are immediate and universal, appealing to the senses of child and savage and cultivated man alike; others are mediate and special, being entirely relative to the knowledge and emotional constitution of the individual percipient. We will sum them up briefly under the different categories into which they would fall in a systematic scheme of our æsthetic nature.

Sensuously, the obelisk has tactual smoothness and visual gloss; a simple, graceful, and easily-apprehended form, and sometimes delicate or variegated coloring, as well as crystalline texture. In special cases it may also afford harmonious relief from neighboring tints, and may stand out with pleasing boldness against a monotonous horizon.

Emotionally, the obelisk appeals to the affection of the sublime, both directly, by its massive size and weight, and indirectly, by its suggestion of remote antiquity and despotic power. It arouses the sympathetic admiration of skill and honest workmanship, and in special cases it re-

calls historical or geographical associations, and brings back to the spectator familiar scenes in the midst of unfamiliar surroundings, besides yielding grateful evidence of human care and industry.

Intellectually, the obelisk accords with the natural love of symmetry, both in itself, owing to the even arrangement of its sides and angles, and with reference to its surroundings, in those cases where it occupies the central or nodal position in a regular inclosure. In a landscape, it yields us the pleasurable feeling of individuality and recognizability, aiding us in the determination of distant topographical details. In a city, it decorates and defines the noticeable sites. And in all cases alike it produces either the intellectual pleasure resulting from a sense of harmony with neighboring conditions, or the intellectual discomfort due to a consciousness of discord and incongruity.

Now, if any belisk, with all its apparent simplicity, really involves so immense a number of

feelings for its proper perception, we may perhaps form some dim idea of the infinite plexus of feelings which are concerned in the proper perception of a great work of art. We may thus be led, by an easy example, to hesitate before we accept those current æsthetic dogmas which attribute the sense of beauty to any one faculty, intellectual or emotional. And we may conclude that every separate thrill of that developed emotion which we call the consciousness of beauty is ultimately analyzable into an immense number of factors, the main and original members of which are purely sensuous, while its minor and derivative members are more or less distinctly ideal. To the child and the savage a beautiful object is chiefly one which gives immediate and pleasurable stimulation to the eye or the ear: to the cultivated man, a beautiful object is still the same in essence, with the superadded gratifications of the highly-evolved intelligence and moral nature.—

Cornhill Magazine.

BOOKS AND CRITICS.¹

By MARK PATTISON.

BEFORE advancing any statements which may appear to you doubtful, I will bespeak your favorable attention by saying something which cannot be contradicted.

A man should not talk about what he does not know. That is a proposition which must be granted me. I will go on to say further—it is not the same thing—a man should speak of what he knows. When it was proposed to me to say something to you this evening, I wished that what I said should be about something I knew.

I think I do know something about the *use* of books. Not the contents of books, but the value and use of them. All men have read some books. Many have read much. There are many men who have read more books than I have. Few in this busy, energetic island in which we live can say, what I have to confess of myself, that my whole life has been passed in handling books.

The books of which we are going to speak to-night are the books of our day—modern literature, or what are commonly called “new books.”

So various are the contents of the many-colored volumes which solicit our attention month after month for at least nine months of the year

that it may seem an impossible thing to render any account of so many-sided a phenomenon in the short space of one lecture. But I am not proposing to pass in review book by book, or writer by writer—that would be endless. I am not proposing to you to speak of individuals at all; I want you to take a comprehensive point of view, to consider our books *en masse*, as a collective phenomenon—say from such a point of view as is indicated by the questions, “Who write them? Who read them? Why do they write or read them? What is the educational or social value of the labor so expended in reading or writing?”

Literature is a commodity, and as such it is subject to economic law. Books, like any other commodity, can only be produced by the combination of labor and capital—the labor of the author, the capital of the publisher. They would not be written unless the author labored to write them. They could not be printed unless there was somebody ready to advance money for the paper and the work of the printing-press. The publisher, the capitalist, risks his money on a book because he expects to turn it over with a trade-profit—say twelve per cent.—on it. On

¹ A lecture delivered October 29, 1877.

the capitalist side the production is purely a commercial transaction; but, on the labor side—i. e., on the part of the author—it is not equally easy to state the case as one of labor motivated by wages. Certainly authorship is a profession. There are authors who are authors and nothing more—men who live by their pen, as a counsel lives by giving opinions, or a physician by prescribing for patients. But this is only partially the case with our literature. A large part of it is not paid for; the author's labor is not set in motion by wages. Many other motives come in, inducing men to address the public in print besides the motive of wages. Disinterested enthusiasm; youthful ardor of conviction; egotism in some one of its many forms of ambition; vanity, the desire to teach, to preach, to be listened to; mere restlessness of temperament; even the having nothing else to do—these things will make a man write a book quite irrespective of being paid for doing so. Did you ever hear of Catherinot? No! Well, Catherinot was a French antiquary of the seventeenth century—a very learned one, if learning means to have read many books without understanding. Catherinot printed, whether at his own cost or another's I cannot say, a vast number of dissertations on matters of antiquity. David Clément, the curious bibliographer, has collected the titles of one hundred and eighty-two of those dissertations, and adds there were more of them which he had not been able to find. Nobody wanted these dissertations of Catherinot. He wrote them and printed them for his own gratification. As the public would not take his *papirasses*, as Valesius called them, he had recourse to a device to force a circulation for them. There was then no penny-post, so he could not, like Herman Heinfetter, post his lucubrations to all likely addresses, but he used to go round the *quais* in Paris, where the old book-stalls are, and, while pretending to be looking over the books, slip some of his dissertations between the volumes of the *boutiquier*. In this way the one hundred and eighty-two or more have come down to us. Catherinot is a by-word, the typical case of scribbleomania—of the *insanabile scribendi eucathes*—but the malady is not unknown to our time, and accounts for some of our many reams of print. And, even if pure scribbleomania is not a common complaint, there are very many other motives to writing besides the avowed and legitimate motive of earning an income by the pen. Why do men make speeches to public meetings, or give lectures in public institutions? It is a great deal of trouble to do

so. The motives of the labor are very various. Whatever they are, the same variety of motives urges men to write books.

Notwithstanding these exceptions, the number and importance of which must not be lost sight of in our inquiry, the general rule will still hold that books, being a commodity, are subject to the same economic laws as all commodities. That one which is of importance for us is the law of demand and supply; the law which says that demand creates supply, and prescribes its quantity and quality. You see at once how vital to literature must be the establishment of this commercial principle as its regulator, and how radical must have been the revolution in the relation between writer and reader which was brought about when it was established. In the times when the writer was the exponent of universally-received first principles, what he said might be true or might be false, might be ill or well received, but at all events he delivered his message; he spoke as one having authority, and did not shape his thoughts so as to offer what should be acceptable to his auditory. Authorship was not a trade; books were not a commodity; demand did not dictate the quality of the article supplied. In England, at the beginning of the eighteenth century, the transformation of the writer from the prophet into the trading author was pretty well complete. As we trace back our civilization to the cave-man, so it is worth while casting a glance at the ancestral authorape from whom is descended the accomplished and highly-paid leader-writer of 1877, who sits for a county, and the "honor of whose company" dukes solicit. The professional author of Queen Anne's time has been delineated to us, by the master-hand of Pope, as a disreputable being, starving in a garret "high in Drury Lane," on an occasional five guineas thrown to him by the grudging charity of one of the wealthy publishers, Tonson or Lintot, or more likely Curll, "turning a Persian tale for half a crown," that he might not go to bed supperless and swearing. He was a brainless dunce without education, a sneaking scoundrel without a conscience. But you will notice that in this his mean estate, now become a hireling scribbler, he continued for long to keep up the fiction that the author was a gentleman who wrote because it pleased him so to do. When he had finished his pamphlet in defense of the present administration, a pamphlet for which he was to get Sir Robert's shabby pay, he pretended, in his preface, that he had taken up his pen for the amusement of his leisure hours. When he had

turned into rhyme Ovid's "De Arte Amandi" "for Curl's chaste press," he said he was going to oblige the town with a poetical trifle. You all remember Pope's couplet—

"Rhymes ere he wakes, and prints before term ends,
Obliged by hunger and request of friends."

The second line ought to be read thus :

"Obliged by hunger and—request of friends,"

hunger being the real cause of the hurried publication; "request of friends" the cause assigned, suppose on the title-page. The transformation of the teacher into the paid author was complete; but the professional author, though compelled to supply the article which was in demand, still gave himself the airs of an independent gentleman, and affected to be controlling taste instead of ministering to it.

In our own day, notwithstanding the exceptions to which I have alluded, it is now the rule that the character of general literature is determined by the taste of the reading public. It is true that any man may write what he likes, and may print it. But if he cannot get the public to buy it, his book can hardly be said to be published. At any rate, books that are not read count for nothing in that literature of the day which is the subject before us.

Let us first inquire what literature is as to its mass, before we look into its composition. And here it will simplify our subject if we divide books into two classes—literature strictly so called, and the books which are not literature.

Literature does *not* mean all printed matter. Blue-books and acts of Parliament, Mrs. Beeton's "Household Management," Timbs's "Year-book of Facts," Fresenius's "Chemical Analysis," these are not literature. The word is not applicable to all the books in our libraries. Most books are didactic—i. e., they are intended to convey information on special subjects. Treatises on agriculture, astronomy, a dictionary of commerce, are not literary works. They are books—useful, necessary for those who are studying agriculture, astronomy, commerce—but they do not come under the head of literature. There are books which the publishers are pleased to advertise as "gift-books," the object of whose existence is that they may be "given"—no doubt they answer their purpose, they are "given"—and there is an end of them. I have seen an American advertising column headed "swift-selling books," the object of which books, I presume, was that they might be "sold," like Peter Pindar's razors. When we have excluded all books which teach

special subjects, all gift-books, all swift-selling books, all religious books, history and politics, those which remain are "literature."

I am unable to give a definition of literature. I have not met with a satisfactory one. Mr. Stopford Brooke, in a little book which I can cordially recommend to beginners—it is called "A Primer of English Literature"—has felt this difficulty at the outset. He says in his first page, "By literature we mean the written thoughts and feelings of intelligent men and women arranged in a way which will give pleasure to the reader." It would be easy to show the defects of this definition; but, till I am prepared to propose a better, we may let this pass. Of what books the class literature consists may be better understood by setting the class in opposition to special books than by a description. Catalogues of classified libraries use the term "*belles-lettres*" for this class of book.

When we have thus reduced the comprehension of the term "literature" to its narrowest limits, the mass of reading soliciting our notice is still enormous—overwhelming. First come the periodicals, and of periodicals first the dailies. The daily newspaper is political or commercial, mainly; but even the daily paper now, which pretends to any standing, must have its column of literature. The weekly papers are literary in a large proportion of their bulk. Our old friend the *Saturday Review* is literary as to a full half of its contents, and, having worked off the froth and frivolity of its froward youth, offers you for sixpence a coöperative store of literary opinion of a highly-instructive character, and always worth attention. There are the exclusively literary weeklies—the *Academy*, the *Athenæum*, the *Literary World*—all necessary to be looked at as being integral parts of current opinion. We come to the monthlies. It is characteristic of the eager haste of our modern Athenians to hear "some new thing," that we cannot now wait for quarter-day. Those venerable old wooden three-deckers, the *Edinburgh Review* and the *Quarterly Review*, still put out to sea under the command, I believe, of the Ancient Mariner, but the active warfare of opinion is conducted by the three new iron monitors, the *Fortnightly*, the *Contemporary*, and the *Nineteenth Century*. In these monthlies the best writers of the day vie with each other in soliciting our jaded appetites on every conceivable subject. Indeed, the monthly periodical seems destined to supersede books altogether. Books now are largely made up of republished review articles. Even when this is not the case,

the substance of the ideas expanded in the octavo volume will generally be found to have been first put out in the magazine article of thirty pages. Hence the monthlies cannot be disposed of by slightly looking into them; they form at this moment the most characteristic and pithy part of our literary produce. It has been calculated that the insect-life upon our globe, if piled in one mass, would exceed in magnitude the heap which would be made by bringing together all the beasts and birds. For though each insect be individually minute, their collective number is enormous. So a single number of a periodical seems little compared with a book; but then there are so many of them, and they are reproduced so fast! A newspaper seems less than it is on account of the spread of the sheet. One number of the *Times*, a double sheet containing 16 pages, or 96 columns, contains a quantity of printing equal to 384 pages 8vo, or an average-sized 8vo volume. Even a hard reader might find it difficult within thirty days to overtake the periodical output of the month; and then on the first he would have to begin all over again.

So much for periodicals; we come now to the books.

The total number of new books, not including new editions and reprints, published in Great Britain in 1876, was 2,920. In accordance with the construction I have put on the term literature, we must subtract from this total all religious, political, legal, commercial, medical, juvenile books, and all pamphlets. There will remain somewhere about 1,620 books of literature, taking the word in its widest extent. I may say, by-the-way, that these figures can only be regarded as approximative. Cataloguing in this country is disgracefully careless. Many books published are every year omitted from the London catalogue. For example, out of 267 works published in the two counties of Lancashire and Cheshire, only 31 are found entered in the last London catalogue. But I will take no account of omissions. I will even strike off the odd 120 from my total of 1,620, and say that English literature grows only at the rate of 1,500 works per annum. At this rate in ten years our literary product amounts to 15,000 books. Put the duration of man's reading life at forty years. If he had to read everything that came out, to keep pace with the teeming press, he would have had in his forty years 60,000 works of contemporary literature to wade through. This in books only, over and above his periodical work, which we calculated would require pretty well all his time.

But as yet we have got only Great Britain. But England is not all the world, as Mr. Matthew Arnold reminds us ("Essays," p. 43). By the very nature of things, much of the best that is known and thought in the world cannot be of English growth, must be foreign; in a survey of literature we cannot afford to ignore what is being said and written in the countries near us, any more than in politics we can afford to ignore what is being done by them. At present Germany and France are the two countries with whom we are most closely connected, and whose sayings are the most influential sayings in the world.

Germany is the country of books, and its output of books is enormous. The average annual number of books printed in that language is about 12,000. However, only a fraction of this total of German books deserves to rank as literature. Mere book-making is carried in Germany to a frightful pitch. The bad tobacco and the falsified wines of Mayence and Hamburg find their counterpart in the book-wares of Leipzig. The German language is one of the most powerful instruments for the expression of thought and feeling to which human invention has ever given birth. The average German literary style of the present day is a barbarous jargon, wrapping up an attenuated and cloudy sense in bales of high-sounding words. The fatigue which this style of utterance inflicts upon the mind is as great as that which their Gothic letter, a relic of the fifteenth century, inflicts upon the eye, blackening and smearing all the page. An examination of the boys in the Johanneum of Hamburg elicited the fact that sixty-one per cent. of the upper class were short-sighted. A large part of German books is not significant of anything—mere sound without meaning.

Putting aside, however, the meaningless, there remains not a little in German publication which requires the attention of one who makes it his business to know the thoughts of his age. The residuum of these 12,000 annual volumes has to be sifted out of the lumber of the book-shops, for it embodies the thoughts and the moral ideal of a great country and a great people. Poor as Germany is in literature, it is rich in *learning*. As compilers of dictionaries, as accumulators of facts, the German book-maker is unrivaled. The Germans are the hewers of wood and drawers of water for a literature which they have not got. All the rest of the European nations put together do not do so much for the illustration of the Greek and Latin classics as

the Germans alone do—classics by whose form and spirit they have profited so little. It is one of the paradoxes of literary history that in this very country—Germany—which is the world's schoolmaster in learning the Greek and Latin languages—so little of the style and beauty of those immortal models passes into its daily literature.

If style and form alone were what gave value to literature, the first literature now produced in the world would be the French. All that the Germans have not the French have. Form, method, measure, proportion, classical elegance, refinement, the cultivated taste, the stamp of good society—these traits belong not only to the first class of French books, but even to their second and third rate books. No writer in France of whatever calibre can hope for acceptance who violates good taste or is ignorant of polite address. German literature is not written by gentlemen—mind, I speak of literature, not of works of erudition—but by a touse-headed, unkempt, unwashed professional bookmaker, ignorant alike of manners and the world. In France a writer cannot gain a hearing unless he stands upon the platform of the man of the world, who lives in society, and accepts its prescription before he undertakes to instruct it. French books are written by men of the world for the world. This is the merit of the French. The weak point of French books is their deficiency of fact, their emptiness of information. The self-complacent ignorance of the French writer is astonishing. Their books are too often style and nothing more. The French language has been wrought up to be the perfect vehicle of wit and wisdom—the wisdom of the serpent—the incisive medium of the practical intelligence. But the French mind has polished the French language to this perfection at a great cost—at the cost of total ignorance of all that is not written in French. Few educated Frenchmen know any language but their own. They travel little, and, when they do travel, their ignorance of the speech of the country cuts them off from getting to know what the people are like. We must credit the French with knowing their own affairs; of the affairs even of their nearest neighbors in Europe they are as ignorant as a Chinese. Their newspapers are dependent for their foreign intelligence on the telegrams of the *Times*. Hence their foreign policy has been a series of blunders. Had the merits of the case been known to it, could republican France, in 1849, have sent out an expedition to Rome to set

up again the miserable ecclesiastical government which the Romans had thrown off? I was reading in the *Figaro* not long ago a paragraph giving an account of the visit of a French gentleman in England. On some occasion he had to make a speech; and he made it in English, acquitting himself very creditably. "M. Blanc," says the *Figaro*, "being a Breton, spoke English like a native Englishman, on account of the close affinity between the two languages, Breton and English." The *Figaro* is one of the most widely-circulated newspapers in France. England is a country with which the French are in close and constant communication, and yet they have not discovered that the English tongue does not belong to the Keltic family of languages. That Germany is as little known to them as England I might instance in the most popular tourist's book of the day. Victor Tissot's "*Voyage au Pays des Milliards*" has reached something approaching to fifty editions. It is nothing but a tissue of epigrams and witty exaggerations, a farce disguised as fact, and taken by the French nation as a serious description of German life.

It is an error to say, as is sometimes said, that French literature is a mere literature of style. This finished expression embalms much worldly wisdom, the life-experience of the most social of modern men and women; but it is an experience whose horizon is limited by the limits of France. It is a strictly national literature. It is, in this respect, the counterpart of the literature of ancient Athens. We, all the rest of us, are to the Frenchman barbarians in our speech and manners. He will not trouble himself about us. By this exclusiveness he gains something and loses much. He preserves the purity of his style. The clearness of his vision and the precision of his judgment, from his national point of view, are unimpaired. He loses the cosmopolitan breadth—the comparative standpoint. But the comparative standpoint is the great conquest of our century, which has revolutionized history and created social science and the science of language.

He who aims at comprehending modern literature must keep himself well acquainted with the contemporary course of French and German books, as well as of his own language; and these two are enough. A Spanish literature of to-day can hardly be said to exist, and the Italians are too much occupied at present in reproduction and imitation to have much that is original to contribute to the general stock of Europe.

English, French, German: the periodical and

the volume publication in these three languages, year by year: you will say the quantity is prodigious—overwhelming, if it were to be supposed that any reader must read it all. But this is not the case: what the publisher's table offers is a choice—something for all tastes: one reads one book, another another. As I divided books into two classes, books of special information and books of general literature, so readers must now be divided into two classes—the general public and the professional literary man: the author, or critic, let us call him. I am not proposing that the general public should read, or look at, all this mass of current literature. It would be preposterous to think of it. You must read by selection; but for your selection you will be guided—you are so in fact—by the opinion of those whom I must now speak of as a class, by the name of critics.

Criticism is a profession, and, as you will have gathered from what has been said, an arduous profession; the responsibility great, the labor heavy. Literature is not your profession—I speak to you as the general public—it is at most a solace of your leisure hours; but the critic, he who sits on the judgment-seat of letters, and has to acquit or condemn, to examine how each writer has executed his task, to guide the reading community by distinguishing the good and censuring the bad—he really holds an educational office which is above that of any professor or doctor, inasmuch as the doctor of laws or of divinity is authorized to speak to his own faculty, whereas the critic speaks to the whole republic of letters. What is recreation to you is business to the critic, and his business is to keep himself acquainted with the course of publication in at least these three languages. Looking, then, at the mass and volume of printed matter to be thus daily and hourly sifted, you cannot think that the profession of critic is a sinecure.

And before he can be qualified to take his seat on the bench and dispense the law, consider what a lengthened course of professional training must have been gone through by our critic or judicial reader. When he has once entered upon his functions, his whole time will be consumed, and his powers of attention strained to the utmost, in the effort to keep abreast of that contemporary literature which he is to watch and report upon. But no one can have any pretension to judge of the literature of the day who has not had a thorough training in the literature of the past. The critic must have been apprenticed to his profession.

It has been calculated that in a very advanced and ramified science, e. g., chemistry, fourteen years are required by the student to overtake knowledge as it now stands. That is to say, that to learn what is known, before you can proceed to institute new experiments, fourteen years are necessary—twice the time which the old law exacted of an apprentice bound to any trade. The fifth of Elizabeth, which used to be known as the statute of apprenticeship, enacted that no person should for the future exercise any trade, craft, or mystery, unless he had previously served to it an apprenticeship of seven years at least. This enactment of 1563 was but the legislative sanction of what had been for centuries the by-law of the trade-guilds. This by-law had ruled, not in England only, but over all the civilized countries of Europe. It was a by-law that had not been confined to trades. It had extended over the arts and over the liberal professions. University degrees are nothing more than the application of this by-law to the learned professions. It required study for twenty-eight academical terms, i. e., seven years, to qualify for the degree of M. A. in the universities. Rather, I would say, that the line was not then drawn between the mechanical and the liberal branches of human endeavor; both were alike designated "Arts;" and the term "universities," now restricted to the bodies which profess theoretical science, was then the common appellation of all corporations and trade-guilds, as well as the so-called Universities of Paris and Bologna.

Regarding literature as a separate art, we might ask, "How long would it require to go through the whole of it to become a master of this art?" Even taking the narrowest definition of literature, it seems a vast surface to travel over, from Homer down to our own day! I say the surface, because no one supposes it necessary to read every line of every book which can call itself literature. Remember that, in studying the literature of the past, other countries than France and Germany come in. I have dispensed our critic from occupying himself with the Italian and Spanish books of to-day. But with the books of the past it is different. Italy, in the fifteenth and sixteenth centuries, was the most civilized and literary country in Europe. And Spain has its classical writers. Their mere mass is prodigious. Life in Italy was rich and varied, and consequently so were the materials for that true narrative which is stranger than fiction. Villari has computed that the Italian republics of the middle ages enjoyed a total of 7,200 revolutions,

and recreated themselves with 700 grand massacres. The longest single poem, I believe, extant, is an Italian poem, the "Adone" of Marini, who lived in the time of our James I. It contains 45,000 lines. As for Spain, one single author of the seventeenth century, Lope de Vega, wrote 1,800 plays; his works altogether fill forty-seven quarto volumes. Alonso Tostado, a Spanish bishop of the fifteenth century, wrote nearly forty folios, having covered with print three times as many leaves as he had lived days. To come to England. Our William Pryne wrote 200 different works. Chalmers's collected edition of the English poets only comes down to Cowper, who died in 1800, and it fills twenty-one volumes royal 8vo, double columns, small type. The volumes average 700 pages. This gives a total of 14,700 pages, or 29,400 columns. Now it takes—I have made the experiment—four minutes to read a column with fair attention. Here is a good year's work in reading over, only once, a selection from the English poets. The amount of reading which a student can get through in a given time hardly admits of being measured by the ell. The rate of reading varies with the subject, the rapid glance with which we skim the columns of a newspaper being at one end of the scale, and the slow sap which is required for a page of, say, Kant's "Critique of Pure Reason" being at the other. Still, just to get something to go upon, make a calculation in this way: Suppose a man to be able to read eight hours a day. No one can really sustain receptive or critical attention to written matter for eight hours. But take eight hours as the outside possibility. Thirty pages 8vo is an average hour's read, taking one book with another. This would make 240 pages per day, 1,680 per week, and 87,360 pages in the year. Taking the average thickness of an 8vo volume as 400 pages only, the quantity of reading which a diligent student can get over in a year is no more than an amount equal to about 220 volumes 8vo. Of course, this is a merely mechanical computation, by which we cannot pretend to gauge mental processes. But it may be worth while knowing that the merely mechanical limit of study is some 220 volumes 8vo per annum.

It would be clearly impossible even for an industrious reader to read, even once, every line of the world's stock of poetry, much less every line of all that can be called literature. In no branch of study is mere mechanical application of much avail. In the study of literature, as in art, mechanical attention, the mere perusal of the printed page, is wholly useless. The student,

therefore, has to overcome the brute mass of the material on which he works by artificial expedients. Of these expedients the most helpful is that of selection. As he cannot look into every book, he must select the best. And selection must not be arbitrary. In the literary creations of the ideal world, as in the living organisms of the material world, natural selection has saved us the difficulty of choice. The best books are already found and determined for us by the verdict of time. Life of books is as life of nations. In the battle for existence the best survive, the weaker sink below the surface, and are heard of no more. In each generation since the invention of printing many thousand works have issued from the press. Out of all this mass of print a few hundred are read by the generation which succeeds; at the end of the century a score or so may be still in vogue. Every language has its classics, and it is by this process of natural selection that the classics of any given country are distinguished from the weltering mass of abandoned books.

It is a great assistance to the student that the classics of each language are already found for him by the hand of time. But our accomplished critic cannot confine his reading to the classics in each language; his education is not complete till he has in his mind a conception of the successive phases of thought and feeling from the beginning of letters. Though he need not read every book, he must have surveyed literature in its totality. Partial knowledge of literature is no knowledge. It is only by the comparative method that a founded judgment can be reached. And the comparative method implies a complete survey of the phenomena. It is recorded of Auguste Comte that, after he had acquired what he considered a sufficient stock of material, he abstained scrupulously from all reading, except two or three poets (of whom one was Dante) and the "Imitatio Christi" of Thomas à Kempis. This abstinence from reading Comte called his *hygiène cérébrale*, healthy treatment of his brain. The citizens of his Utopia are to be prohibited from reading any books but those which had happened to fall in Comte's way before he gave up reading. It is, I think, the case that our student has now to read more than is compatible with perfect equilibrium of faculty. On the other hand, the consequences of cutting off contact with the thoughts of others, as Comte resolutely did, may be seen in the unhealthy egotism and puerile self-complacency which deform his writings, his perpetual "mistake as to the relative value of his

own things and the things of others." (Arnold's "Essays.")

We require of our thoroughly furnished critic that he should have prepared himself for his profession by a comprehensive study of all that human thought, experience, and imagination, have stored up for us. When we have used all the short cuts to this goal which art and Nature have provided, how many years will such an apprenticeship require? The data are wanting on which to found a calculation. Can the work be got through in seven years, in twice seven, or in three times seven? I do not know. Archbishop Usher at twenty began to read the Fathers, Greek and Latin, with the resolution of reading them through. The task was achieved in nineteen years. Hammond, at Oxford, read thirteen hours a day (Life of Usher. Life of Hammond, by Fell). Milton's "industrious and select reading," in preparation for the great work to which he dedicated a whole life, long choosing, and late beginning, are as well known as the thirty years spent by Edward Gibbon in preparing for and in composing his history.

Of course in this, as in other trades, a man learns while he practises. Buffon told a friend that, after passing fifty years at his desk, he was every day learning to write. The critic's judgment matures by many failures. Without these three elements—time, industry, arduous endeavor—no man can attain to be a supreme judge of literary worth. Perhaps you have been accustomed to set before yourselves quite another ideal of the literary life. You have thought the business of reviewing a lazy profession, the resource of men who wanted industry or talent, who were, in short, fit for nothing better, a profession largely adopted by briefless barristers, by incompetent clerks, by green youths fresh from college examinations, and generally by men who shirk hard work—in fact, an easy-chair and slipper business. You have, perhaps, supposed that anybody can write a review, that essay-writing is as easy as talking, that it is only a matter of cheek and fluency. You have imagined that a quarterly or a weekly reviewer merely gets his knowledge of the subject in hand out of the book he has under review; that he, thereupon, dishonestly assumes to have known all about it, and with voluble impertinence goes on to retail this newly-acquired information as if it were his own, seasoning it with sneers and sarcasms at the author from whom he is stealing. I know these things are said. I have heard even respectable reviews and magazines accused of paying for this sort of thing by the column, i. e.,

giving a pecuniary inducement to fill out paper with words—to make copy, or padding, as it is called. I don't know if these things are done in practice. If they are, they are fraudulent, and must, I should think, come within the act against adulteration. What I have set before you in the above outline is the honest critic who gives to his calling the devotion of a life, prepares himself by antecedent study, and continues through the whole of his career to make daily new acquisitions and to cultivate his susceptibility to new impressions.

Such are the qualifications of the teacher, of the writer of books. I turn now from the author to the reader, from the producer to the consumer. You to whom I now speak are a portion of the public; you represent the consumer. And first, what is the mechanism by which the consumer is provided with his article? The English are not a book-storing people. Each family has not, as a rule, its own library. In great country-houses, it is true, there is always the library. Many treasures are in these old repositories—the accumulated store of half a dozen generations. They often go back to Queen Anne, the great book-diffusing period of our annals; sometimes, but more rarely, to the seventeenth century. The family history may be read in the successive strata, superimposed, like geological strata, one on the other. The learned literature of the seventeenth century, largely composed in Latin, its Elzevirs, and its Variorum classics, will often be found relegated to a garret. These books have come to be regarded as lumber. They are only not cleared out and dispatched to Sotheby's, because the cost of removal would exceed their produce at the auction. This, though hoisted up to the garret by an upheaval, is in point of time the earliest stratum. Upon this will be found a bed of theological pamphlets mostly in small quarto, in which lurk the ashes of passion, once fired by the Revolution of 1688, the non-juring pamphlets, the Dr. Sacheverell pamphlets, the Bangorian controversy. In the great library on the ground-floor we shall find the earliest stratum to consist of the splendid quartos, on thick paper with wide margin, of Queen Anne's time. The *Spectator*, the *Tatler*, Pope's Homer, a subscription copy; the folios of Carte and Echard, and so down the century over Junius and Chesterfield's "Letters" to the first editions of Sir Walter Scott's poems. The mere titles of such a collection, or accretion, form a history of literature. But it is only in our old country-houses that such

a treat is to be enjoyed, and the number of these diminishes in each generation. Cultivation and intellectual tastes seem to be dying out among the English aristocracy. It has been said ("New Republic") the fop of Charles II.'s time at least affected to be a wit and a scholar, the fop of our times aims at being a fool and a dunce.

In the house of a middle-class family you will also find a few books—chiefly religious books or specialty books—little literature, and that casual, showing no selection, no acquaintance with the movement of letters. There will be nothing that can be called a library. The intellectual barrenness of these middle-class homes is appalling. The dearth of books is only the outward and visible sign of the mental torpor which reigns in those destitute regions. Even in priest-ridden France, where the confessor has all the women and half the men under his thumb, there is more of that cultivation which desiderates the possession of books. In many a French family of no great means is a bookcase of some five hundred volumes, not presents, but chosen, and in which the *chefs-d'œuvre* of French literature will be included. They will be in half morocco, with gilt edges; binding not sumptuous, but elegant, and perfectly clean, neither thumbed nor grease-stained, nor gas-shriveled—a sign, you will say, that they are not much used. Not so. A Frenchman cannot endure a dirty book. It is an error to suppose that the dirt on the cover and pages of a book is a sign of its studious employment. Those who use books to most purpose handle them with loving care. The dirt on English books is a sign of neglect, not of work. It is disrespectful and ignorant handling. If you have a select cabinet of books, with which you live habitually as friends and companions, you would not choose to have them repulsive in dress and outward appearance.

How insignificant an item of household expenditure is the bookseller's bill in a middle-class family! A man who is making £1,000 a year will not think of spending one pound a week on books. If you descend to a lower grade of income, the purchase of a book at all is an exceptional occurrence, and then it will rarely be a book of pure literature. The total population of the United Kingdom is more than 33,000,000. The aggregate wealth of this population is manifold more than it was one hundred and fifty years ago, but the circle of book-buyers, of the lovers of literature, is certainly not larger, if it be not absolutely smaller.

One reason which may be assigned for the book

dearth among families of small means is want of space. Room in this country is now become very costly. A family of £1,000 a year in a town probably pays out £100 a year as rent. A heavy tax! And what do you get for it? A hutch in which you can scarcely put up your family or breathe yourself. You have literally no room for books. This, I grant, is a too true description of the town dwelling. But it is not altogether an account of why you are without a library. A set of shelves, thirteen feet by ten feet, and six inches deep, placed against a wall, will accommodate nearly one thousand volumes 8vo. Cheap as books now are, a well-selected library of English classics could be compressed into less room than this, was the companionship of books felt by you to be among the necessities of life.

If narrow income and cramped premises will not let us have a private library, we may meet our wants in some measure by public libraries. The coöperative store, as applied to groceries, is a discovery of our generation. But the principle of coöperation was applied to libraries long before. The book-club is an old institution which flourished in the last century, but is nearly extinct now. There were some twelve hundred of these clubs scattered over England, and their disappearance has had a marked effect on the character of our book-market. Each country club naturally fell under the control of the one or two best-informed men of the neighborhood. The books ordered were thus of a superior class, and publishers could venture upon publishing such books, because they knew they could look to the country clubs to absorb one edition. Now, the supply of new books has passed away from the local clubs, and into the hands of two great central houses. Smith and Mudie, of course, look only to what is most asked for. And, as even among readers the ignorant, the indolent, and the vulgar, are in a large majority, it is the ignorant, the indolent, and the vulgar, who now create that demand which the publisher has to meet. Universal suffrage in the choice of books has taken the place of a number of independent centres which the aristocracy of intellect could influence.

It may prove some compensation for the destruction of the country book-clubs, that the great towns are beginning to bestir themselves to look after their book-supply. The earliest common libraries were, as we should expect, in universities and colleges, often remote from populous centres, such as the Sharp Library in Bamburgh Castle. It is only quite recently that the trading

and manufacturing towns have begun to feel the want of books. And the desire is still feeble, and has spread but a little way. Some eighty or ninety cities and towns, I believe, in all Great Britain, have adopted, in whole or in part, Mr. Ewart's act. There is still a very large number of towns with a population over three thousand who have not yet felt the want of a public library. Your city, always forward where enterprise can go, and where educational matters are in question, stands first, or only second to Manchester, in apprehending the public importance of a complete outfit of books.

So much on the book-supply. I go on to the question, What is the stimulus which makes men ask for books? Why do English men and women of the present day read?

There are people, I believe, who read books that they may be able to talk about them. Reading from *any* motive is better than satisfied ignorance; but, surely *this* motive is both morally and intellectually unsound. Morally, it is an ostentation, an affectation of an interest you do not feel. Intellectually, it is on a par with cram; it is no more knowledge than what is got up for the purpose of an examination is knowledge. What is read for the sake of reproducing in talk has neither gone to the head nor the heart. When any one says to me in company, "Have you read so-and-so?" I always feel an inclination to answer, "No, I never read anything," for I know the next question will be, "Did you like it?" and there an end. Those who most read books don't want to talk about them. The conversation of the man who reads to any purpose will be flavored by his reading; but it will not be about his reading. The people who read in order to talk about it, are people who read the books of the season because they are the fashion—books which come in with the season and go out with it. "When a new book comes out I read an old one," said the poet Rogers. And Lord Dudley—the great Lord Dudley, not the present possessor of the title—writes to the Bishop of Llandaff: "I read new publications unwillingly. In literature I am fond of confining myself to the best company, which consists chiefly of my old acquaintance with whom I am desirous of becoming more intimate. I suspect that nine times out of ten it is more profitable, if not more agreeable, to read an old book over again than to read a new one for the first time. . . . Is it not better to try to elevate and endow one's mind by the constant study and contemplation of the great models, than merely to know of one's own knowledge that such

a book a'n't worth reading?"—"Lord Dudley's Letters.") We wear clothes of a particular cut because other people are wearing them. That is so. For to differ markedly in dress and behavior from other people is a sign of a desire to attract attention to yourself, and is bad taste. Dress is social, but intellect is individual: it has special wants at special moments. The tendency of education through books is to sharpen individuality, and to cultivate independence of mind, to make a man cease to be "the contented servant of the things that perish."

Dr. Halley used to recommend reading on medical grounds. He said close study prolonged life by keeping a man out of harm's way. But I never met with any one who acted upon Dr. Halley's advice, and chose to read hard that he might live long. And is there not truth in the opposite doctrine, which Mortimer Collins ("Secret of Long Life," page 136) inculcates, that "the laziest men live longest?"

I have not, remember, raised the question, Why *should* we read? This is the most important question of all those which can be raised about books. But I am not to-night presuming to advise you as to what you *should* do. I am only observing our ways with books—recording facts, not exhorting to repentance. Why *do* men read? What is the motive power which causes the flow of that constant supply of new books which flows over at those literary drinking-fountains, Smith's book-stalls?

Making exception of the specialty books—those which we get in order to learn some special subject—there is one, and one only, motive of all this reading—the desire of entertainment. Books are in our day the resource of our leisure; we turn to them in default of better amusement. Of course, you will think immediately of the many exceptions which there are to this general statement. But, as I said before, the character of the books offered in the book-market is determined by the nature of the *general* demand. And it is the character of the general literature of the day which fixes our attention at this moment.

In taking the Smith and Mudie counter as the standard of the literature consumed by the English public, I do so because the class of book they supply is the best average class of book going—of "new book." I do not forget how small a fraction, after all, of the 34,000,000 Britons the consumers of books of this class are. We sometimes speak of the readers of this class of book as "the reading public." But I do not forget that there exists a wider "reading

public," which is below the Smith and Mudie level. Enter a book-shop in a small town in a remote province, and you will find on its counter and shelves a class of literature of a grade so mean that a Smith's book-stall instantly rises fifty per cent. in your imagination. Ask for Thackeray's "Vanity Fair." The well-dressed young person who attends to the shop never heard of Thackeray. The few books she can offer are mostly children's books—grown people don't seem to read in country places—or they are books of a denominational cast, books which perhaps are called religious, but which are, strictly speaking, about nothing at all, and made up of strings of conventional phraseology. Some of these books, unknown as they are to the reviews, have a circulation which far surpasses anything ever reached by one of our "new books" which has been ushered into the world by complimentary notices in all the papers. In estimating the intellectual pabulum most relished by my countrymen, I do not forget that "Zadkiel's Almanac" had a circulation of 200,000. Commander Morrison, R. N., who only died as lately as 1874, was perhaps the most successful author of the day, and a great authority on astrology. He wrote, among other books, one entitled "The Solar System as it is, and not as it is represented by the Newtonians." He brought an action against Sir Edward Belcher, who had called him in print an impostor. It was tried before Chief-Justice Cockburn, and Commander Morrison, who retained Sergeant Ballantine, obtained damages. The Court of Queen's Bench decided that Zadkiel was not an impostor. The tastes of this widest circle of readers—the 200,000 *abonnés* of Zadkiel—are not now under our consideration. We are speaking of the "reading public" in the narrower sense, and of what are called new books. And I was saying that this public reads for amusement, and that this fact decides the character of the books which are written for us.

As amusement I do not think reading can rank very high. When the brain has been strained by some hours' attention to business some form of open-air recreation is what would be hygienically best for it. An interesting game which can be played in the fresh air is the healthiest restorative of the jaded senses. It is a national misfortune that as our great towns have grown up in England there has been no reserve of ground in the public interest. The rich have their fox-hunting and their shooting, their deer-forests and their salmon-rivers. But these are only for the wealthy. Besides, they are pastimes

turned into pursuits. What is wanted, in the interest of the humbler classes, is public places of considerable extent, easily accessible, where recreation for an hour or two can be always at hand. After manual labor rest and a book, after desk-work active exercise and a game, are what Nature and reason prescribe. As every village should have its village green, so every town should have its one or more recreation-grounds, where cricket, fives, tennis, croquet, bowls, can be got at a moment's notice in a wholesome atmosphere, not impregnated by gas, not poisoned by chemical fumes. Our towns are sadly behind in the supply of pleasant places of public resort. The co-operative principle has yet to be applied to open-air amusements. It is surely bad economy of life that in one of our wealth-producing centres a game of fives should be almost as difficult to get as a salmon-river.

Still, even if these things were to be had, instead of being as they are unprocurable, in the long winter of our northern climate there are many months in the year during which our amusement must be sought in-doors. Here come in the social amusements—theatres, concerts, dances, dinners, and the varied forms of social gathering.

It is when all these fail us, and because they do so often fail us, that we have recourse to the final resource of all—reading. Of in-door entertainment the truest and most human is that of conversation. But this social amusement is not, in all circumstances, to be got, and when it is to be had we are not always fit for it. The art of conversation is so little cultivated among us, the tongue is so little refined, the play of wit and the flow of fancy so little encouraged or esteemed, that our social gatherings are terribly stupid and wearisome. Count Pozzo di Borgo, miserable amid the luxurious appliances of an English country-house—it is Lord Houghton tells the story ("Monographs," page 212)—"drew some newly-arrived foreigner into a corner with the eager request, '*Vins donc causer, je n'ai pas causé pour quinze jours.*' Neither our language nor our temperament favors that sympathetic intercourse, where the feature and the gesture are as active as the voice, and in which the pleasure does not so much consist in the thing communicated as in the act of communication, and still less are we inclined to cultivate that true art of conversation, that rapid counterplay and vivid exercise of combined intelligences, which presupposes long and due preparation of the imagination and the intellect."

Instead of stimulating, we bore each other to

the death. It is that we may escape from the terrible *ennui* of society that we have recourse to a book. We go to read not from craving for excitement, but as a refuge from the *tedium vite*, the irksomeness of herding with uninteresting fellow-mortals. The man who is engaged all the morning, and has his faculties stimulated, his intellect edged to keenness by the details of business, cannot, on his return to his fireside, subside into vacuity. He must have something to whittle at. He reads his newspaper as long as he can, and, when the newspaper at last gives out, he falls back upon a book. The native of a southern climate who has no business, and whose mind is never roused to exertion, has no such craving. The Italian noble does without books. He passes his day in listless indolence, content without ideas. There is no vacuity, and therefore no supply of books to fill it.

Here is the key to the character of the literature of our age. Books are a response to a demand. And the demand is a demand for recreation by minds roused to intelligence but not to intellectual activity. The mind of the English reader is not, as in the southern man, torpid, non-existent; it is alive and restless. But it is not animated by a curiosity to inquire, it is not awake to the charm of ideas, it is only passively recipient of images. An idea is an excitant, comes from mind, and calls forth mind. An image is a sedative.

The books, then, which are produced have to meet this mental condition of the reader. They have to occupy his attention without making any call upon his vigilance. There must be no reflex mental action. Meditation is pain. Fresh images must flow as a continuous douche of tepid water over the mind of the reader, which must remain pleased but passive. Books must be so contrived as to produce and sustain this beatific self-forgetfulness. That is called by publishers a successful book which just hits this mental level. To express all I have tried to say in one epithet—a book must be readable. If a book has this quality, it does not much matter what it is about. Any subject will answer the purpose if the treatment be agreeable. The book must be so written that it can be read without any force being put upon the attention. It must not require thought or memory. Nor must there be any learned rubbish about. A Latin quotation may be ventured only by an established favorite. Ouida did once hazard "*facilis descensus Avernus*," but it was ill-taken by the critics.

Under these conditions of the public demand,

it is not surprising that the species of composition which is most in favor should be prose fiction. In every other style of literary art, prose or poetical, our age looks back to by-gone ages for models which it is ever endeavoring to approach, but dare not hope to surpass. In the novel, our age, but especially our own country, may justly boast to have attained a development of inventive power unequaled in the annals of all literature. It is not only that this is the most prolific species of book, more than one novel per working-day being given to the world every year, but it is that the most accomplished talent which is at work for the book-market is devoted to this class of production. If, as I laid down at the commencement of this lecture, supply is governed by demand, it is clear that this result must be so. Entertainment without mental effort being our requirement, we must have our politics, our history, our travels, presented in an entertaining way. But fiction, if taken from every-day life, and not calling upon us for that effort of imagination which is necessary to enable us to realize a past age, is entertainment pure, without admixture of mental strain or hitch of any kind.

For our modern reader it is as necessary that the book should be new as that it should be bound in colored cloth. Your confirmed novel-reader has a holy horror of second perusals, and would rather read any trash for the first time than "*Pendennis*" or "*Pride and Prejudice*" for the second. The book must be written in the dialect and grammar of to-day. No word, no construction, no phrase, which is not current in the newspaper, must be used. A racy and idiomatic style, fed by the habitual reading of our old English literature, would choke the young man who does the literature for the *Daily Telegraph*, and he would issue in "the largest circulation in the world" a complaint that Mr. — seems to write strange English! Our modern reader requires his author's book, as he does his newspaper leader or his clergyman's sermon, to be the echo of his own sentiments. If Lady Flora were to ask me to recommend her a book to read, and I were to suggest Johnson's "*Lives of the Poets*," do you think she would ever ask my advice again? Or, if I were to mention Trevelyan's "*Life of Lord Macaulay*," the best biography written since Lockhart's "*Life of Scott*," she would say, "We had that long ago" (it came out in 1876); "I mean a *new* book."

To a veteran like myself, who have watched the books of forty seasons, there is nothing so old as a new book. An astonishing sameness

and want of individuality pervades modern books. You would think they were all written by the same man. The ideas they contain do not seem to have passed through the mind of the writer. They have not even that originality—the only originality which John Mill in his modesty would claim for himself—"which every thoughtful mind gives to its own mode of conceiving and expressing truths which are common property"—("Autobiography," p. 119). When you are in London step into the reading-room of the British Museum. There is the great manufactory out of which we turn the books of the season. We are all there at work for Smith and Mudie. It was so before there was any British Museum. It was so in Chaucer's time:

"For out of the olde fieldes, as men saythe,
Cometh all this newe corn fro yere to yere,
And out of olde bookes in good faith
Cometh all this newe science that men lere."

It continued to be so in Cervantes's day. "There are," says Cervantes in "Don Quixote" (32), "men who will make you books and turn them loose in

the world with as much dispatch as they would do a dish of fritters."

It is not, then, any wonder that De Quincey should account it ("Life of De Quincey," i., 385) "one of the misfortunes of life that one must read thousands of books only to discover that one need not have read them," or that Mrs. Browning should say: "The *ne plus ultra* of intellectual indolence is this reading of books. It comes next to what the Americans call whittling." And I cannot doubt that Bishop Butler had observed the same phenomenon which has been my subject to-night when he wrote, in 1729, a century and a half ago ("Preface to Sermons," p. 4): "The great number of books of amusement which daily come in one's way, have in part occasioned this idle way of considering things. By this means time, even in solitude, is happily got rid of without the pain of attention; neither is any part of it more put to the account of idleness, one can scarce forbear saying is spent with less thought, than great part of that which is spent in reading."—*Fortnightly Review*.

A MIGHTY SEA-WAVE.

ON May 10th last a tremendous wave swept the Pacific Ocean from Peru northward, westward, and southward, traveling at a rate many times greater than that of the swiftest express-train. For reasons best known to themselves, writers in the newspapers have by almost common consent called this phenomenon a tidal wave. But the tides have had nothing to do with it. Unquestionably the wave resulted from the upheaval of the bed of the ocean in some part of that angle of the Pacific Ocean which is bounded by the shores of Peru and Chili. This region has long been celebrated for tremendous submarine and subterranean upheavals. The opinions of geologists and geographers have been divided as to the real origin of the disturbances by which at one time the land, at another time the sea, and at yet other times (often in fact than either of the others) both land and sea, have been shaken as by some mighty imprisoned giant, struggling, like Prometheus, to cast from his limbs the mountain-masses which hold them down. Some consider that the seat of the Vulcanian forces lies deep below that part of the chain of the Andes which lies at the apex of

the angle just mentioned, and that the direction of their action varies according to the varying conditions under which the imprisoned gases find vent. Others consider that there are two if not several seats of subterranean activity. Yet others suppose that the real seat of disturbance lies beneath the ocean itself, a view which seems to find support in several phenomena of recent Peruvian earthquakes.

Although we have not as yet full information concerning the great wave which in May last swept across the Pacific, and northward and southward along the shores of the two Americas, it may be interesting to consider some of the more striking features of this great disturbance of the so-called peaceful ocean, and to compare them with those which have characterized former disturbances of a similar kind. We may thus, perhaps, find some evidence by which an opinion may be formed as to the real seat of subterranean activity in this region.

It may seem strange, in dealing with the case of a wave which apparently had its origin in or near Peru on May 9th, to consider the behavior of a volcano, distant 5,000 miles from this region,

a week before the disturbance took place. But, although the coincidence may possibly have been accidental, yet, in endeavoring to ascertain the true seat of disturbance, we must overlook no evidence, however seemingly remote, which may throw light on that point; and as the sea-wave generated by the disturbance reached very quickly the distant region referred to, it is by no means unlikely that the subterranean excitement which the disturbance relieved may have manifested its effects beforehand at the same remote volcanic region. Be this as it may, it is certain that on May 1st the great crater of Kilauea, in the island of Hawaii, became active, and on the 4th severe shocks of earthquake were felt at the Volcano House. At three in the afternoon a jet of lava was thrown up to a height of about 100 feet, and afterward some fifty jets came into action. Subsequently jets of steam issued along the line formed by a fissure four miles in length down the mountain-side. The disturbance lessened considerably on the 5th, and an observing-party examined the crater. They found that a rounded hill, 700 feet in height, and 1,400 feet in diameter, had been thrown up on the plain which forms the floor of the crater. Fire and scoria were spouted up in various places.

Before rejecting utterly the belief that the activity thus exhibited in the Hawaii volcano had its origin in the same subterrene or submarine region as the Peruvian earthquake, we should remember that other regions scarcely less remote have been regarded as forming part of this great Vulcanian district. The violent earthquakes which occurred at New Madrid, in Missouri, in 1812, took place at the same time as the earthquake of Caraccas, the West Indian volcanoes being simultaneously active; and earthquakes had been felt in South Carolina for several months before the destruction of Caraccas and La Guayra. Now we have abundant evidence to show that the West Indian volcanoes are connected with the Peruvian and Chilian regions of Vulcanian energy, and the Chilian region is about as far from New Madrid as Arica in Peru from the Sandwich Isle.

It was not, however, until about half-past eight on the evening of May 9th that the Peruvian earthquake began. A severe shock, lasting from four to five minutes, was felt along the entire southern coast, even reaching Autofagasta. The shock was so severe that it was impossible, in many places, to stand upright. It was succeeded by several others of less intensity.

While the land was thus disturbed, the sea

was observed to be gradually receding, a movement which former experiences have taught the Peruvians to regard with even more terror than the disturbance of the earth itself. The waters which had thus withdrawn, as if concentrating their energies to leap more fiercely on their prey, presently returned in a mighty wave, which swept past Callao, traveling southward with fearful velocity, while in its train followed wave after wave, until no less than eight had taken their part in the work of destruction. At Mollendo the railway was torn up by the sea for a distance of 300 feet. A violent hurricane which set in afterward from the south prevented all vessels from approaching, and unroofed most of the houses in the town. At Arica the people were busily engaged in preparing temporary fortifications to repel a threatened assault of the rebel ram Huiscar, at the moment when the roar of the earthquake was heard. The shocks here were very numerous, and caused immense damage in the town, the people flying to the Morro for safety. The sea was suddenly perceived to recede from the beach, and a wave from ten feet to fifteen feet in height rolled in upon the shore, carrying before it all that it met. Eight times was this assault of the ocean repeated. The earthquake had leveled to the ground a portion of the custom-house, the railway-station, the submarine-cable office, the hotel, the British consulate, the steamship-agency, and many private dwellings. Owing to the early hour of the evening, and the excitement attendant on the proposed attack of the Huiscar, every one was out and stirring; but the only loss of life which was reported is that of three little children who were overtaken by the water. The progress of the wave was only stopped at the foot of the hill on which the church stands, which point is farther inland than that reached in August, 1868. Four miles of the embankment of the railway were swept away like sand before the wind. Locomotives, cars, and rails, were hurled about by the sea like so many playthings, and left in a tumbled mass of rubbish.

The account proceeds to say that the United States steamer *Waters*, stranded by the bore of 1868, was lifted up bodily by the wave at Arica, and floated two miles north of her former position. The reference is, no doubt, to the double-ender *Waterce*, not stranded by a bore (a term utterly inapplicable to any kind of sea-wave at Arica, where there is no large river), but carried in by the great wave which followed the earthquake of August 13th. The description of the

wave at Arica on that occasion should be compared with that of the wave last May. About twenty minutes after the first earth-shock the sea was seen to retire, as if about to leave the shores wholly dry; but presently its waters returned with tremendous force. A mighty wave, whose length seemed immeasurable, was seen advancing like a dark wall upon the unfortunate town, a large part of which was overwhelmed by it. Two ships, the Peruvian corvette *America*, and the American double-ender *Wateree*, were carried nearly half a mile to the north of Arica, beyond the railroad which runs to Tacna, and there left stranded high and dry. As the English vice-consul at Arica estimated the height of this enormous wave at fully fifty feet, it would not seem that the account of the wave of last May has been exaggerated, for a much less height is, as we have seen, attributed to it, though, as it carried the *Wateree* still farther inland, it must have been higher. The small loss of life can be easily understood, when we consider that the earthquake was not followed instantly by the sea-wave. Warned by the experience of the earthquake of 1868, which most of them must have remembered, the inhabitants sought safety on the higher grounds until the great wave and its successors had flowed in. We read that the damage done was greater than that caused by the previous calamity, the new buildings erected since 1868 being of a more costly and substantial class. Merchandise from the custom-house and stores was carried by the water to a point on the beach five miles distant.

At Iquique, in 1868, the great wave was estimated at fifty feet in height. We are told that it was black with the mud and slime of the sea-bottom. "Those who witnessed its progress from the upper balconies of their houses, and presently saw its black mass rushing close beneath their feet, looked on their safety as a miracle. Many buildings were, indeed, washed away, and in the low-lying parts of the town there was a terrible loss of life." Last May the greatest mischief at Iquique would seem to have been caused by the earthquake, not by the sea-wave, though this, also, was destructive in its own way. "Iquique," we are told, "is in ruins. The movement was experienced there at the same time and with the same force" (as at Arica). "Its duration was exactly four minutes and a third. It proceeded from the southeast, exactly from the direction of *Ilaga*." The houses built of wood and cane tumbled down at the first attack, lamps were broken, and the burning oil spread over and set fire to

the ruins. Three companies of firemen, German, Italian, and Peruvian, were instantly at their posts, although it was difficult to maintain an upright position, shock following shock with dreadful rapidity. Nearly 400,000 quintals of nitrate in the stores at Iquique and the adjacent ports of Molle and Pisagua were destroyed. The British bark *Caprera* and a German bark sank, and all the coasting-craft and small boats in the harbor were broken to pieces, and drifted about in every direction.

At Chanavaya, a small town at the guano-loading deposit known as Pabellon de Pica, only two houses were left standing out of four hundred. Here the earthquake-shock was specially severe. In some places the earth opened in crevices seventeen yards deep, and the whole surface of the ground was changed. The shipping along the Peruvian and Bolivian coast suffered terribly. The list of vessels lost or badly injured at Pabellon de Pica alone reads like the list of a fleet.

We have been particular in thus describing the effects produced by the earthquake and sea-wave on the shores of South America, in order that the reader may recognize in the disturbance produced there the real origin of the great wave which a few hours later reached the Sandwich Isles, 5,000 miles away. Doubt has been entertained respecting the possibility of a wave, other than the tidal wave, being transmitted right across the Pacific. Although in August, 1868, the course of the great wave which swept from some region near Peru, not only to the Sandwich Isles, but in all directions over the entire ocean, could be clearly traced, there were some who considered the connection between the oceanic phenomena and the Peruvian earthquake a mere coincidence. It is on this account, perhaps, chiefly, that the evidence obtained last May is most important. It is interesting, indeed, as showing how tremendous was the disturbance which the earth's frame must then have undergone. It would have been possible, however, had we no other evidence, for some to have maintained that the wave which came in upon the shores of the Sandwich Isles a few hours after the earthquake and sea-disturbance in South America was, in reality, an entirely independent phenomenon. But when we compare the events which happened last May with those of August, 1868, and perceive their exact similarity, we can no longer reasonably entertain any doubt of the really stupendous fact that *the throes of the earth in and near Peru are of sufficient energy to send an oceanic wave right across the Pacific*, and of

such enormous height at starting, that, after traveling with necessarily diminishing height the whole way to Hawaii, it still rises and falls through thirty-six feet. The real significance of this amazing oceanic disturbance is exemplified by the wave-circles which spread around the spot where a stone has fallen into a smooth lake. We know how, as the circle widens, the height of the wave grows less and less, until, at no great distance from the centre of disturbance, the wave can no longer be discerned, so slight is the slope of its advancing and following faces. How tremendous, then, must have been the upheaval of the bed of ocean by which wave-circles were sent across the Pacific, retaining, after traveling 5,000 miles from the centre of disturbance, the height of a two-storied house! In 1868, indeed, we know (now even more certainly than then) that the wave traveled very much farther, reaching the shores of Japan, of New Zealand, and of Australia, even if it did not make its way through the East Indian Archipelago to the Indian Ocean, as some observations seem to show. Doubtless we shall hear, in the course of the next few months, of the corresponding effects of the spread of last May's mighty wave athwart the Pacific, though the dimensions of the wave of last May, when it reached the Sandwich Isles, fell far short of those of the great wave of August 13-14, 1868.

It will be well to make a direct comparison between the waves of May last and August, 1868, in this respect, as also with regard to the rate at which they would seem to have traversed the distance between Peru and Hawaii. On this last point, however, it must be noted that we cannot form an exact opinion until we have ascertained the real region of Vulcanian disturbance on each occasion. It is possible that a careful examination of times, and of the direction in which the wave-front advanced upon different shores, might serve to show where this region lay. We should not be greatly surprised to learn that it was far from the continent of South America.

The great wave reached the Sandwich Isles between four and five on the morning of May 10th, corresponding to about five hours later of Peruvian time. An oscillation only was first observed at Hilo, on the east coast of the great southern island of Hawaii, the wave itself not reaching the village till about a quarter before five. The greatest difference between the crest and trough of the wave was found to be thirty-six feet here; but at the opposite side of the island, in Kealakekua Bay (where Captain Cook died), amounted only to thirty feet. In other

places the difference was much less, being in some only three feet, a circumstance doubtless due to interference, waves which had reached the same spot, along different courses, chancing so to arrive that the crest of one corresponded with the trough of the other, so that the resulting wave was only the difference of the two. We must explain, however, in the same way, the highest waves of thirty-six to forty feet, which were doubtless due to similar interference, crest agreeing with crest, and trough with trough, so that the resulting wave was the sum of the two which had been divided, and had reached the same spot along different courses. It would follow that the higher of the two waves was about twenty-one feet high, the lower about eighteen feet high; but as some height would be lost in the encounter with the shore-line, wherever it lay, on which the waves divided, we may fairly assume that in the open ocean, before reaching the Sandwich group, the wave had a height of nearly thirty feet from trough to crest. We read, in accordance with this explanation, that "the regurgitations of the sea were violent and complex, and continued through the day."

The wave, regarded as a whole, seems to have reached all the islands at the same time. If this is confirmed by later accounts, we shall be compelled to conclude that the wave reached the group with its front parallel to the length of the group, so that it must have come (arriving as it did from the side toward which Hilo lies) from the northeast. It was then not the direct wave from Peru, but the wave reflected from the shores of California, which produced the most marked effects. We can understand well, this being so, that the regurgitations of the sea were complex. Any one who has watched the inflow of waves on a beach so lying within an angle of the shore, that while one set of waves comes straight in from the sea, another thwart set comes from the shore forming the other side of the angle, will understand how such waves differ from a set of ordinary rollers. The crests of the two sets form a sort of network, ever changing as each set rolls on; and considering any one of the four-cornered meshes of this wave-net, the observer will notice that, while the middle of the raised sides rises little above the surrounding level, because here the crests of one set cross the troughs of the other, the corners of each quadrangle are higher than they would be in either set taken separately, while the middle of the four-cornered space is correspondingly depressed. The reason is, that at the corners of the wave-net crests join with

crests to raise the water-surface, while in the middle of the net (not the middle of the sides, but the middle of the space inclosed by the four sides) trough joins with trough to depress the water-surface.¹

We must take into account the circumstance that the wave which reached Hawaii last May was probably reflected from the California coast, when we endeavor to determine the rate at which the sea-disturbance was propagated across the Atlantic. The direct wave would have come sooner, and may have escaped notice because arriving in the night-time, as it would necessarily have done if a wave which traveled to California, and thence, after reflection, to the Sandwich group, arrived there at a quarter before five in the morning following the Peruvian earthquake. We shall be better able to form an opinion on this point after considering what happened in August, 1868.

The earth-throe on that occasion was felt in Peru about five minutes past five on the evening of August 13th. Twelve hours later, or shortly before midnight, August 13th, Sandwich Island time (corresponding to 5 A. M., August 14th, Peruvian time), the sea round the group of the Sandwich Isles rose in a surprising manner, "inasmuch that many thought the islands were sinking, and would shortly subside altogether beneath the waves. Some of the smaller islands were for a time completely submerged. Before long, however, the sea fell again, and as it did so the observers found it impossible to resist the impression that the islands were rising bodily out of the water. For no less than three days this strange oscillation of the sea continued to be experienced, the most remarkable ebbs and floods being noticed at Honolulu, on the island of Oahu."

The distance between Honolulu and Arica is about 6,300 statute miles; so that, if the wave traveled directly from the shores of Peru to the Sandwich Isles, it must have advanced at an average rate of about 525 miles an hour (about 450 knots an hour). This is nearly half the rate at which the earth's surface near the equator is car-

ried round by the earth's rotation, or is about the rate at which parts in latitudes 62° or 63° north are carried round by rotation; so that the motion of the great wave in 1868 was fairly comparable with one of the movements which we are accustomed to regard as cosmical. We shall presently have something more to say on this point.

Now, last May, as we have seen, the wave reached Hawaii at about a quarter to five in the morning, corresponding to about ten, Peruvian time. Since, then, the earthquake was felt in Peru at half-past eight on the previous evening, it follows that the wave, if it traveled directly from Peru, must have taken about thirteen and a half hours, or an hour and a half longer, in traveling from Peru to the Sandwich Isles, than it took in August, 1868. This is unlikely, because ocean-waves travel nearly at the same rate in the same parts of the ocean, whatever their dimensions, so only that they are large. We have, then, in the difference of time occupied by the wave in May last and in August, 1868, in reaching Hawaii, some corroboration of the result to which we were led by the arrival of the wave simultaneously at all the islands of the Sandwich group—the inference, namely, that the observed wave had reached these islands after reflection from the California shore-line. As the hour when the direct wave probably reached Hawaii was about a quarter-past three in the morning, when not only was it night-time, but also a time when few would be awake to notice the rise and fall of the sea, it seems not at all improbable that the direct wave escaped notice, and that the wave actually observed was the reflected wave from California. The direction, also, in which the oscillation was first observed corresponds well with this explanation.

It is clear that the wave which traversed the Pacific last May was somewhat inferior in size to that of August, 1868, which, therefore, still deserves to be called (as then by the present writer) the greatest sea-wave ever known. The earthquake, indeed, which preceded the oceanic disturbance of 1868 was far more destructive than that of May last, and the waves which came in upon the Peruvian and Bolivian shores were larger. Nevertheless, the wave of last May was not so far inferior to that of August, 1868, but that we may expect to hear of its course being traced athwart the entire extent of the Pacific Ocean.

When we consider the characteristic features of the Peruvian and Chilian earthquakes, and especially when we note how wide is the extent

¹ The phenomena here described are well worth observing on their own account as affording a very instructive and, at the same time, very beautiful illustration of wave-motions. They can be well seen at many of our watering-places. The same laws of wave-motion can be readily illustrated, also, by throwing two stones into a large, smooth pool at points a few yards apart. The crossing of the two sets of circular waves produces a wave-net, the meshes of which vary in shape according to their position.

of the region over which their action is felt in one way or another, it can scarcely be doubted that the earth's Vulcanian energies are at present more actively at work throughout that region than in any other. There is nothing so remarkable, one may even say so stupendous, in the history of subterranean disturbance as the alternation of mighty earth-throes, by which, at one time, the whole of the Chilian Andes seem disturbed, and anon the whole of the Peruvian Andes. In Chili scarcely a year ever passes without earthquakes, and the same may be said of Peru; but, so far as great earthquakes are concerned, the activity of the Peruvian region seems to synchronize with the comparative quiescence of the Chilian region, and *vice versa*. Thus, in 1797, the terrible earthquake occurred known as the earthquake of Riobamba, which affected the entire Peruvian earthquake region. Thirty years later a series of tremendous throes shook the whole of Chili, permanently elevating the whole line of coast to the height of several feet. During the last ten years the Peruvian region has in turn been disturbed by great earthquakes. It should be added that between Chili and Peru there is a region about 500 miles in length in which scarcely any volcanic action has been observed. And, singularly enough, "this very portion of the Andes, to which one would imagine that the Peruvians and Chilians would fly as to a region of safety, is the part most thinly inhabited—inasmuch that, as Von Buch observes, it is in some places entirely deserted."

One can readily understand that this enormous double region of earthquakes, whose oscillations on either side of the central region of comparative rest may be compared to the swaying of a mighty seesaw on either side of its point of support, should be capable of giving birth to throes propelling sea-waves across the Pacific Ocean. The throes actually experienced at any given place is relatively but an insignificant phenomenon; it is the disturbance of the entire region over which the throes is felt which must be considered in attempting to estimate the energy of the disturbing cause. The region shaken by the earthquake of 1868, for instance, was equal to at least a fourth of Europe, and probably to fully one-half. From Quito southward as far as Iquique—or along a full third part of the length of the South American Andes—the shock produced destructive effects. It was also distinctly felt far to the north of Quito, far to the south of Iquique, and inland to enormous distances. The disturbing force which

thus shook 1,000,000 square miles of the earth's surface must have been one of almost inconceivable energy. If directed entirely to the upheaval of a land-region no larger than England, those forces would have sufficed to have destroyed utterly every city, town, and village, within such a region; if directed entirely to the upheaval of an oceanic region, they would have been capable of raising a wave which would have been felt on every shore-line of the whole earth. Divided even between the ocean on the one side and a land-region larger than Russia in Europe on the other, those Vulcanian forces shook the whole of the land-region, and sent athwart the largest of our earth's oceans a wave which ran in upon shores 10,000 miles from the centre of disturbance with a crest thirty feet high. Forces such as these may fairly be regarded as cosmical; they show unmistakably that the earth has by no means settled down into that condition of repose in which some geologists still believe. We may ask with the late Sir Charles Lyell whether, after contemplating the tremendous energy thus displayed by the earth, any geologist will continue to assert that the changes of relative level of land and sea, so common in former ages of the world, have now ceased? and agree with him that if, in the face of such evidence, a geologist persists in maintaining this favorite dogma, it would be vain to hope, by accumulating proofs of similar convulsions during a series of ages, to shake the tenacity of his conviction—

"Si fractus illabatur orbis,
Impavidum ferient ruine."

But there is one aspect in which such mighty sea-waves as in 1868, and again last May, have swept over the surface of our terrestrial oceans, remains yet to be considered.

The oceans and continents of our earth must be clearly discernible from her nearer neighbors among the planets—from Venus and Mercury on the inner side of her path around the sun, and from Mars (though under less favorable conditions) from the outer side. When we consider, indeed, that the lands and seas of Mars can be clearly discerned with telescopic aid from our earth at a distance of 40,000,000 miles, we perceive that our earth, seen from Venus at little more than half this distance, must present a very interesting appearance. Enlarged, owing to greater proximity, nearly fourfold, having a diameter nearly twice as great as that of Mars, so that at the same distance her disk would seem more than three times as large, more brightly illuminated by the sun in the proportion of about five to tw

she would shine with a lustre exceeding that of Mars when in full brightness in the midnight sky about thirty times, and all her features would, of course, be seen with correspondingly-increased distinctness. Moreover, the oceans of our earth are so much larger in relative extent than those of Mars, covering nearly three-fourths instead of barely one-half of the surface of the world they belong to, that they would appear as far more marked and characteristic features than the seas and lakes of Mars. When the Pacific Ocean, indeed, occupies centrally the disk of the earth which at the moment is turned toward any planet, nearly the whole of that disk must appear to be covered by the ocean. Under such circumstances the passage of a wide-spreading series of waves over the Pacific, at the rate of about 500 miles an hour, is a phenomenon which could scarcely fail to be discernible from Venus or Mercury, if either planet chanced to be favorably placed for the observation of the earth—always supposing there were observers in Mercury or Venus, and that these observers were provided with powerful telescopes. •

It must be remembered that the waves which spread over the Pacific on August 13-14, 1868, and again on May 9th-10th last, were not only of enormous range in length (measured along crest or trough), but also of enormous breadth (measured from crest to crest, or from trough to trough). Were it otherwise, indeed, the progress of a wave forty or fifty feet high (at starting, and thirty-five feet high after traveling 6,000 miles), at the rate of 500 miles per hour, must have proved destructive to ships in the open ocean as well as along the shore-line. Suppose, for instance, the breadth of the wave from crest to crest one mile, then, in passing under a ship at the rate of 500 miles per hour, the wave would raise the ship from trough to crest—that is, through a height of forty feet—in one-thousandth part of an hour (for the distance from trough to crest is but half the breadth of the wave), or in less than four seconds, lowering it again in the same short interval of time, lifting and lowering it at the same rate several successive times. The velocity with which the ship would travel upward and downward would be greatest when she was midway in her ascent and descent, and would then be equal to about the velocity with which a body strikes the ground after falling from a height of four yards. It is hardly necessary to say that small vessels subjected to such tossing as this would inevitably be swamped. On even the largest ships the effect of such motion would

be most unpleasantly obvious. Now, as a matter of fact, the passage of the great sea-wave in 1868 was not noticed at all on board ships in open sea. Even within sight of the shore of Peru, where the oscillation of the sea was most marked, the motion was such that its effects were referred to the shore. We are told that observers on the deck of a United States war-steamer distinctly saw the "peaks of the mountains in the chain of the Cordilleras wave to and fro like reeds in a storm;" the fact really being that the deck on which they stood was swayed to and fro. This, too, was in a part of the sea where the great wave had not attained its open-sea form, but was a rolling wave, because of the shallowness of the water. In the open sea, we read that the passage of the great sea-wave was no more noticed than is the passage of the tidal wave itself. "Among the hundreds of ships which were sailing upon the Pacific when its length and breadth were traversed by the great sea-wave, there was not one in which any unusual motion was perceived." The inference is clear that the slope of the advancing and following faces of the great wave was very much less than in the case above imagined; in other words, that the breadth of the wave greatly exceeded one mile—amounting, in fact, to many miles.

Where the interval between the passage of successive wave-crests was noted, we can tell the actual breadth of the wave. Thus, at the Samoan Isles, in 1868, the crests succeeded each other at intervals of sixteen minutes, corresponding to eight minutes between crest and trough. As we have seen that, if the waves were one mile in breadth, the corresponding interval would be only four seconds, or only 120th part of eight minutes, it would follow that the breadth of the great wave, where it reached the Samoan Isles in 1868, was about 120 miles.

Now, a wave extending right athwart the Pacific Ocean, and having a cross-breadth of more than 100 miles, would be discernible as a marked feature of the disk of our earth, seen, under the conditions described above, either from Mercury or Venus. It is true that the slope of the wave's advancing and following surfaces would be but slight, yet the difference of illumination under the sun's rays would be recognizable. Then, also, it is to be remembered that there was not merely a single wave, but a succession of many waves. These traveled also with enormous velocity; and though at the distance of even the nearest planet the apparent motion of the great wave, swift though it was in reality, would be so far reduced

that it would have to be estimated rather than actually seen, yet there would be no difficulty in thus perceiving it with the mind's eye. The rate of motion, indeed, would almost be exactly the same as that of the equatorial part of the surface of Mars, in consequence of the planet's rotation; and this (as is well known to telescopists), though not discernible, directly produces, even in a few minutes, changes which a good eye can clearly recognize. We can scarcely doubt, then, that if our earth were so situated at any time when one of the great waves generated by Peruvian earthquakes is traversing the Pacific that the hemisphere containing this ocean were turned fully illuminated toward Venus (favorably placed for observing her), the disturbance of the Pacific could be observed and measured by telescopists on that planet.

Unfortunately, there is little chance that terrestrial observers will ever be able to watch the progress of great waves athwart the oceans of Mars, and still less that any disturbance of the frame of Venus should become discernible to us by its effects. We can scarcely even be assured that there are lands and seas on Venus, so far as direct observation is concerned, so unfavorably is she always placed for observation; and though we see Mars under much more favorable conditions, his seas are too small and would seem to be too shallow (compared with our own) for great waves to traverse them such as could be discerned from the earth.

Yet it may be well to remember the possibility that changes may at times take place in the nearer planets—the terrestrial planets, as they are commonly called, Mars, Venus, and Mercury—such as telescopic observation under favorable conditions might detect. Telescopists have, indeed, described apparent changes, lasting only for a short time, in the appearance of one of these planets, Mars, which may fairly be attributed to disturbances affecting its surface in no greater degree than the great Peruvian earthquakes have affected for a time the surface of our earth. For

instance, the American astronomer Mitchel says that, on the night of July 12, 1845, the bright polar snows of Mars exhibited an appearance never noticed at any preceding or succeeding observation. In the very centre of the white surface appeared a dark spot, which retained its position during several hours. On the following evening not a trace of the spot could be seen. Again, the same observer says that, on the evening of August 30, 1845, he observed for the first time a small bright spot, nearly or quite round, projecting out of the lower side of the polar spot. "In the early part of the evening," he says, "the small bright spot seemed to be partly buried in the large one. After the lapse of an hour or more my attention was again directed to the planet, when I was astonished to find a manifest change in the position of the small bright spot. It had apparently separated from the large spot, and the edges alone of the two were now in contact, whereas when first seen they overlapped by an amount quite equal to one-third of the diameter of the small one. This, however, was merely an optical phenomenon, for on the next evening the spots went through the same apparent changes, as the planet went through the corresponding part of its rotation. But it showed the spots to be real ice-masses. The strange part of the story is, that in the course of a few days the smaller spot, which must have been a mass of snow and ice as large as Nova Zembla, gradually disappeared." Probably some great shock had separated an enormous field of ice from the polar snows, and it had eventually been broken up and its fragments carried away from the arctic regions by currents in the Martian oceans. It appears to us that the study of our own earth, and of the changes and occasional convulsions which affect its surface, gives to the observation of such phenomena as we have just described a new interest. Or rather, perhaps, it is not too much to say that telescopic observations of the planets derive their only real interest from such considerations.—*Cornhill Magazine.*

THEOLOGY AND SCIENCE TWO HUNDRED YEARS AGO.¹

By CARUS STERNE.

IT is interesting to observe the scientific treatment two or three hundred years ago of such questions as the origin of species and the migration of the human race. I do not mean the purely theological treatment of these subjects, for belief in the letter has ever been ready with its solutions of such difficult problems, but I mean the honest striving and mental effort of candid men to establish a harmony between Revelation, Reason, and Discovery. In this respect, it appears to me that a book by Abraham Milius, on the "Origin of Animals and the Migration of Peoples,"² published in the third quarter of the seventeenth century, at Salzburg, under the high approbation of the archbishop of that see, is worthy of a pretty thorough examination. This work shows, better than any other I know of, what a botch is made of our theories of the universe when Reason and Revelation exchange compliments and make compromises with each other. It also shows what a powerful influence the discovery of America and Australia, with their wealth of unknown animals and plants, exercised upon the traditional theories of the universe—theories that were undisturbed even by the discoveries of Copernicus and Kepler.

I would remark that this work, originally written in Latin, was accessible to me only in the German translation of the Austrian *Kreisphysikus*, Christoph Bitterkraut,³ a work of 400 pages; and, in view of the free and even arbitrary dealing of the translator with the original, it may be that for many a contradiction in the text the translator alone is answerable. Of the life and rank of the author, or the date of publication of the original, unfortunately, I have no information. It is an agreeable surprise to find in a work published in the seventeenth century by permission of the church authorities a far freer exposition of the Scriptures than would be likely to be permitted in the same circles nowadays. The author promisingly sets out with a eulogy on human reason, which, as he says, can neither be driven nor tied, but which unerringly pursues its

object of "bringing to light what is hidden, and exploring the unknown." Of those persons who make no use of "this so precious prerogative above other animals bestowed upon them, and indeed, as it were, inherited by them," it is said that they "voluntarily confine themselves within the narrowness of the inebecility and ignorance of irrational brute beasts, from which they differ little if at all." Among the subjects the investigation of which suggests itself to man's reason, one of the most important is declared to be this: "How did not only man but all other animals also originally come into existence, and then how did they spread over the whole world and all its parts, there to dwell and to take up their abode?" "Be it," says the author in another place, "that such questions are rather over-curious, still they appear to be not altogether without reason." In the words above quoted it strikes us as something unusual, in the author's day, that he speaks of "man and other animals," thus reckoning man among animals, for a sharp line of demarkation was made between the two, in view of the question of creation.

We readily incline to the supposition that the view held by a Linné, a Cuvier, an Agassiz, according to which the Creator with his own hands fashioned every living thing, whether plant, or animal, or man, was the original doctrine of the Church. But this is entirely erroneous. The Christian Church has, ever since the origin of dogmatic theology, reserved exclusively to man the privilege of having sprung directly from the hands of the Creator, and has characterized as false and contradictory of the Scriptures the supposition that plants and animals had a like origin. St. Ambrose and St. Basil, in their observations on the "work of the six days" (hexameron), held that the words "Let the earth bring forth grass, the herb," etc., and "Let the waters bring forth abundantly the moving creature that hath life," are to be so understood that water and land have been endowed with the property of bearing all sorts of animals and plants and that this power remains, so that new plants, and animals may still come into existence without any parents. In fact it was even held that the work of the sixth day is as yet by no means completed, and that in particular insects and all

¹ Translated from the German by J. Fitzgerald, A.M.

² "De Origine Animalium et Migratione Populorum."

³ "Merkwürdiger Diskursz von dem Ursprung der Thier und Aufzug der Völker," 1670.

smaller animals produced from "sweat, transpiration, and putrefaction," only came into being at a far later period. Cornelius à Lapide reckoned even the mouse among these *epigoni* of the creation.

With such outward agreement as this between Christian and heathen philosophy, we are not to be surprised if in the work named above we find arguments in favor of this continued creation. We are informed how from a sod moistened with May-dew one may produce eels to stock his pond, and how from crabs' claws one may produce scorpions, to say nothing of the swarms of insects which spring from bodies in the state of decomposition. The Church was in full accord with this doctrine; indeed, such was her position with regard to the hypothesis of spontaneous generation that when, in 1743, the English priest John Turberville Needham observed the development of the "wheat-eels" so called, she raised no objection to his quoting the Bible in favor of his doctrine. According to Needham, Adam was produced in the same way from the creative earth, and Eve sprung from Adam's body like the bud of a polyp. Nay, when about the year 1674, in Florence, Francisco Redi expressed doubts as to the spontaneous generation of maggots in decomposing flesh, having observed that they entered it in the form of eggs, the clergy raised the cry of "Heresy!" because in the book of Judges there is mention of a swarm of bees springing from the carcass of a lion. Thus do men change their positions!

Our author appears to have agreed fully with St. Basil in the doctrine that plants and animals not only were produced in the first instance by the power implanted in the earth, but that "even at the present day, and in the same manner, they do still take their rise from the earth." He believed that he must apply his reason even to propositions of faith, and he was deeply concerned as to how this orthodox doctrine of the spontaneous generation of animals was to be harmonized with the story of Noah's deluge. "If wild animals and tame animals also are produced by the innate and implanted force of the earth, the Almighty God would never have ordered Noah to take the animals with him into the ark." There the well-founded scruples of our author's conscience found expression.

It is highly instructive to observe the distinction drawn between literal belief and reason, in the middle of the seventeenth century, by a staunch Christian believer, who thinks it worth while to enter on a profound investigation of the

question in what season of the year the world was created, and who adjudges this privilege to the spring-time. He unconsciously rejects faith and elings to reason. One cannot believe, he says, in substance, that Noah and his family concerned themselves about all manner of vermin to save them from the flood, so that they might still plague himself and all other men. Nor must we omit to consider how, during the long continuance of the deluge, he contrived to feed the rapacious animals and to restrain them from rending the tame and the useful animals. True, Origen came to the conclusion that the wild beasts were nicely separated; and St. Augustine said that their wildness was during this time in abeyance; but, as the author thinks, this could not have come to pass without a further miracle, for wild animals must have sustenance. "This is very questionable. If the case were so, there would not have been pair and pair of the unclean, and seven and seven of the clean animals, as the sacred text says, taken into the ark, but a great multitude;" so, therefore, he adds in substance, to quiet consciences, we will suppose that they learned by a miracle to do without food. His own opinion he expresses more than once, that "the devout Noah took with him into the ark only his domestic, tame animals," so that the pains of domestication might not be lost, and the damage from the flood made greater; "but the noxious and rapacious animals were produced anew from the earth."

That animals can be created anew, the author concludes from the fact that there are many animals that, of a certainty, never were created by God, and nevertheless possess a special form and life, namely, hybrids, as the mule, the lynx, and the leopard. But these animals, because they were not created by God, cannot fulfill the divine command, "Be fruitful and increase!" As is known, the lynx was at that time held to be a hybrid between the wild-cat and the wolf, and the leopard a hybrid between the lion and the panther. The author looks on the phenomenon of hybrids as so strong a proof that creation cannot have taken place *immediatè*, that he investigates the question as to who first raised a mule, coming to the conclusion that it was Ana, son of Sibon, an Idumæan, who lived in the days of Jacob and Esau.

The chief objection of our independent Bible expounder against the story of Noah arose out of the impossibility of Noah "bringing all animals from the uttermost bounds and places of America, and taking them into the ark, seeing that

their species and genera were in former times never to be seen either in Asia or Armenia or other continerous countries." This consideration further leads our worshiper of reason to entertain doubts as to the myth which locates paradise in the centre of creation, and which represents Adam as there bestowing upon all animals the names they were thenceforth to bear. A multitude of strange plants and animals had then been introduced from America, awakening serious doubts in the minds of believers in the Bible. Every one could not be so complaisant as the painters, who straightway introduced the turkey and the sunflower into Adam's garden of paradise, as though they had been there from the first. The deep impression made by this enriching of the "Garden of Paradise" (the name then given to zoölogical and botanic gardens) can be judged from the following passage: "My God, with what wonder do we view these strange animals from so remote countries! How intently we consider all their lineaments, their forms, their colors, their whole bodies! Have they fallen down from heaven? What else are we to think when we see so many diversified plants, trees, roots, and seeds?"

Strong believers took the matter easy, as usual. Without more ado they declared the Canadian arbor-vitæ to be the long-sought tree of life of paradise; and in the guaiacum-tree of Brazil was found the tree from whose sacred wood was fashioned the cross of Christ. The passion-flower, which is limited to South America, originally bloomed on Golgotha, and so on. Of fishes and birds, as also of the seeds of plants, it was said that they had been carried by the winds or by the waves from the Old World to the New. "But gently, gently," cries the cautious critic to these orthodox Hotspurs; "consider the matter a little more, and do not be over-hasty. Are there not to be found, beloved, among birds, many whose feathers are coarse, thick, hard, and heavy, and many that are very slow and tardy in flight? Nay, are there not many that dread water, so that they will not venture to fly across a brook twelve paces wide, or at all events across a stream that is even a short quarter of a mile in width? I say nothing at present of those which cannot fly at all, as ostriches, bustards, and the like. How, then, could such birds cross seas, streams, and rivers?"

The author admits that marine fishes might wander to a great distance, but here he notes another difficulty: "Fishes, like all other animals, do not willingly quit their own place or their

usual waters where they have their abode, and being, and sustenance. Each species likes best to remain in its own waters, in its own brook. And as commonly each stream, nay, every little brooklet, has its own peculiar fishes, and as the latter thrive best therein, so, on the contrary, do they soon perish when transferred. Then," he adds, "there are many animals on the earth that will not venture to swim at all. Perhaps some one will object, and say that such quadruped animals might have been carried in ships from our countries to the West Indies; but this is absurd, and hard to believe, for who could ever be so reckless, nay, so crazy, as to tolerate the company of lions, bears, tigers, panthers, and other such ferocious beasts—to trust their cruel nature, and to take such animals on board ship? This, in truth, would be the same thing as taking to one's bosom venomous snakes and vipers."

This circumspect critic, who clearly deserved the outlines of animal and plant geography, then tells us that this experiment, were it to be made, would probably end in failure. He calls attention to the negative results following the attempt to carry "over sea to New France, otherwise called Canada, different species of domesticated animals." Of these animals, some were unable to endure the sea-voyage, while others could not accommodate themselves to the strange climate; and thus the experiment failed even with domestic animals, though these are far more cosmopolitan than wild animals.

"But," continues the author, "let us dismiss these vain ideas, and simply put this question to the learned: Are there not to be found in these Western Indies many and varied species, not only of wild and ferocious, but also of tame animals, that have never been seen or described either in Asia, in Europe, or in Africa, whereof it is said '*Africa semper aliquid novi*'—Africa is ever presenting something new?" And the same is true of the birds, fishes, and plants, of those countries: "Besides, there also exist in America, Mexico, Peru, and Magellanica, species of birds that were never seen either in Asia or in Europe until they were brought hither in ships.

"But here, again, some one might ask and say: 'If, then, from Asia, as the first nurse, no less of mankind than of all the other animals and plants, nothing was carried into the other portions of the world, as Africa, Europe, and America, why then do those regions possess so great an abundance of all these things?' My reply, which perhaps will to some appear singular, is that even He who created all animals and vegetation, of every kind,

and planted the region round about Eden, in Asia, did the same in America; and there, by the self-same power, created all kinds of vegetables, flowers, trees, seeds, roots, and animals, endowing them with the same blessing, and bidding them to increase and multiply."

Thus does our independent expounder of the Mosaic tradition declare in favor of many central points of creation. Nor does the express statement of the Bible that all the animals were brought to Adam, so that he might name each, shake his conviction that the animals of America are native to American soil, and that the inhabitants of the oceanic islands are at home on those "large and small isles of the sea." This conviction, he exclaims, in the language of Virgil, is as immovable—

"Quam si dura silex aut stet Marpesia cautes."

From all this we see how deep was the impression made by the inexhaustible variety of the plant and animal kingdoms of the New World. The error of the earlier zoölogists and botanists in supposing plants and animals to be the same the world over, so that they sought on the Rhine and in Belgium for the plants described by Theophrastus and Dioscorides, was at last exploded, after it had given rise to a voluminous literature, and to no end of confusion in nomenclature.

As for the human inhabitants of America, Millius—just as science does in the present day—makes them an exception. He does not believe that they are, "as the ancient Egyptians and Athenians boasted themselves to be, autochthones and aborigines, sprung like mushrooms and grasshoppers from mud and ordure." Unfortunately, we cannot affirm that this keen-sighted man reached this conclusion by way of ethnological and anatomical argument. He rather bases his doctrine on curious theological premises, which quiet his scruples of conscience, and enable him to consider man as something apart "from all other animals." Like most scholars of his day, Millius could not imagine that to Moses and the other prophets of the Old and New Testament the existence of one-half of the world was all unknown. Accordingly, they sought in the Bible for passages that might have reference to the New World, and they found them in abundance, as is ever the case under like circumstances. But none of these references is anterior to the flood; and, therefore, it was supposed that, prior to that event, the Old World was not so over-populated as to necessitate a migration to the New. But now, since before the flood there were no human

beings in America and the islands of the sea, it of course follows that there were no sinners there. "Hence we must firmly hold that the deluge did not extend to all places on the globe; and, in particular, that it did not extend to America, Magellanica, and certain other islands." This conclusion is also reached from the consideration that the fauna and flora of those countries, differing as they do essentially from the fauna and flora of the Old World, could, in case the deluge extended thither, never have been renewed, inasmuch as the Creator has rested ever since the end of the sixth day. This argument is so contradictory of the views previously expressed by Millius regarding the origin of plants and animals, that we are inclined to think that here we have an interpolation by the translator.

It is not uninteresting to notice that even in those times men thought of the route to America *via* Japan—a route that must still be esteemed the most probable one, though ever since 1728 it has been known, thanks to Behring's discovery, that Asia and America are separated by a pretty wide strait, whereas earlier it was supposed that they were united. Even Joseph à Costa, one of the earliest historians of America, gave free play to his imagination in tracking the migration by this route. According to this writer, the first human inhabitants of America emigrated from the Indus and the Ganges, passing by way of China and Japan, and so reaching the shores of the Western Continent. On reaching land they traveled southward as far as the Andes, and there first rested from their weary journeyings. "Montanus," says Millius, "affirms that there still exists in Peru, near the mountains called by the Spaniards the Andes, a very ancient city, Jucktam, so called after Jucktam or Jecktam, third son of Eber, whose descendants settled in Peru, and there built the first city."

Of Eber, great-grandson of Noah, we read in the Bible (Genesis x. 25-30): "Unto Eber were born two sons; the name of one was Peleg; for in his days was the earth divided; and his brother's name was Joktan. . . . And their" (the sons of Joktan's) "dwelling was from Mesha, as thou goest unto Sephar, a mount of the east." Further geographical determination being disregarded, it was concluded that by the "mount of the east" the Andes alone could be understood, for that range alone, on account of its height and extent, is worthy of being called *par excellence* the "mount of the east." And the inhabitants of Babylon, from which the migration set out, might well call America the Land

of the East. This sagacious hypothesis of Montanus's is adopted not only by Joseph à Costa and George Horn, author of a work published in 1652, on "The Origin of the Americans" (*De Originibus Americanis*), but by all those who were concerned about reconciling with the Bible the discovery of America. Indeed, the problem was worthy of the assiduous study of the theologians. As we know, the Bible makes Shem, Ham, and Japhet, the ancestors of the Asiatics, the Africans, and the Europeans—America was overlooked; but now we have in Joktan an ancestor for the people of that continent.

The discovery of America must have been highly unpleasant news to the orthodox Church. St. Augustine, that Christian sophist and rhetorician who has always been over-estimated, says of the disputed point of the existence of antipodes: "It is impossible that the opposite side of the earth should have inhabitants, for, among the descendants of Adam, Holy Scripture mentions no such progeny." Words fail Lactantius to characterize properly the foolishness of the mathematicians and astronomers of his time (third century), who regarded the existence of antipodes as an open question, and a possibility, nay, even as a probability. "Is it possible," he exclaims, "for men to be so silly as to believe that on the other side of the earth the trees are turned downward, and that the feet of the inhabitants are higher than their heads? If we ask for the proofs of the monstrous opinion that objects on the other side do not fall downward, we get the reply that it is a physical property that heavy bodies, like the spokes of a wheel, tend toward the centre; while light bodies, as, for instance, clouds, smoke, fire, tend from the centre toward the heavenly spaces. Truly, I know not how I shall express myself about men who, walking in the wrong path, still obstinately pursue it, and labor to strengthen one foolish assumption with another still more foolish."

Nothing shows more plainly how severe was the blow suffered by the mystical view of creation, in the discovery of America, than does the studious diligence with which men strove to find America in the Bible. As formerly it used to be shown from the Scripture that the Western Hemisphere could not be inhabited, so men strove now to prove that this quarter of the world had been well known to the Jews; nay, that the Jews had from immemorial time been in commercial relations with the people of America. The name

of the country from which Solomon derived his treasures of gold, the Ophir of the ancients, was simply an anagram of Peru, the land of gold: Phiro = Peru, a very simple matter. Suddenly a light broke upon Mercurius, Postellus, Goropius, Becanus, Montanus, and other scholars of the sixteenth and seventeenth centuries, and they vied with one another in belittling the services of Columbus, who had played them so scurvy a trick. They said that Solomon and all the peoples of antiquity had sent their ships to Ophir—the present Peru—and there was no new discovery at all.

The worthy Milius even sympathizes with these depreciations of Columbus's services, expressing himself as follows about the American Ophir: "We may conjecture, nay, even with certainty conclude, that the golden land of Ophir, from which, besides the best and finest gold, Solomon also derived a great quantity of valuable wood, ivory, apes, peacocks, and parrots, is this very Peruvian province. At the present time we, too, derive from this same country a multitude of the same wonderful animals, precious woods of every kind, as ebony, paradise-wood, red, yellow, and white Brazil-wood; also the holy wood called guaiacum, sassafras, and many others. From the Red Sea, whence Solomon, that wisest of kings, used to fit out and dispatch his fleets, it has been found that the voyage can be conveniently made to America. From all this it very clearly appears that Solomon's Ophir is the American country, Peru. This conclusion is further confirmed by the Bible text which says that the voyage to and fro took three years, whence it appears that the land of Ophir must have been very distant. But who could suppose that the voyage from the Arabian coast to the islands of Japan and Malacca, or to any other part of the East Indies, would take three years?" The author regards it as very probable that the voyage, then as yet unattempted, "from the Red Sea and its world-renowned port of Thir to Peru" and back again, would have taken three years, and thence draws the gratifying conclusion that the wise Solomon must have enjoyed no contracted geographical outlook.

Surely, free research was almost nipped in the bud by the necessity imposed upon the student of taking account of traditional beliefs. Only after long struggling has it been able to reach that atmosphere of liberty in which alone it can live and thrive.—*Kosmos*.

ANIMAL DEPRAVITY.

"IT is of no use to talk about reason," said a friend with whom we had been discussing the subject. "If you wish to establish man's kinship with brutes, you must prove that they, too, are capable of vice, his imagined prerogative." We could not deny that this was sound counsel. In sermons and platform orations, and in leading articles, man declaims, indeed, in favor of "virtue." But listen to him in his more confidential moments, when he flings aside his disguises. You will find that he then pronounces such of his own species as make some apparent approach to this official standard "ninecompoos or hypocrites." The faint praise with which he damns goodness but half hides the underlying sneer. Scarcely can you, in the German language, speak of a man in terms which convey a lower estimate of his abilities or his energies than when you call him "eine gute Haut," or "eine gute Seele." On the contrary, "ein böser Kerl" is always understood to be clever and plucky. Even the virtuous English, senior wranglers in the school of hypocrisy, have similar idioms. "A good boy," "a moral young man," "a very good sort of fellow," "a man with no harm in him," are terms used by no means in a complimentary sense. Of all the literary diseases of the day "goody-goodyism" is the one most despised by cultivated men of the world. On the other hand, when a woman is particularly well pleased with her lover does she not always call him a "naughty man?" Do all these phrases spring from a secret conviction that human vices are restrained less by conscience and high principle than by weakness or cowardice? Does the world suspect that the good man has often merely "nothing in him?"

But when we attempt to treat of the morals of brutes in order to find whether in that region lies the much-talked-of but evanescent boundary-line—when we seek to show that vice is, after all, not man's exclusive attribute, we are met at once with the objection—"Animals have, and can have, no moral life, as has man. They have no perception of right and wrong, but simply follow their propensities, and obey the laws of their being, from which, indeed, they have no power to depart.¹ This is, I think, a tolerably fair

specimen of the language which *demi-savants* habitually use when treating of the lower animals. "The kingdoms of freedom and of Nature" is an antithesis common in their mouths—the "kingdom of freedom," forsooth, signifying mankind! It is, of course, exceedingly convenient to have some imaginary *a priori* reason which renders any appeal to facts superfluous, or rather altogether impertinent. Being neither lunatics, metaphysicians, Calvinists, nor fallen angels,¹ we shall not enlarge upon "freedom;" we will merely declare that if men's vaunted freedom relates to *action* it is shared by the gorilla. He is perfectly free to rise up or sit down, to come or go, to crack a nut, or to crush the skull of a "man and a brother," just as he may think proper. That he is "free" to love or to hate,² to fear or hope, to believe or disbelieve, or in short to experience any emotion, passion, feeling, sentiment, or frame of mind, we deny, just as we deny it of man. Now to the more immediate question.

In the first place we must judge every animal from what may be called its own point of view, not with reference to man and his notions of advantage or convenience. He calls the wolf and the tiger cruel, the viper malignant, and the spider treacherous. This is idle talk. The wolf can only subsist upon animal food, and is no more to be censured for devouring the lamb—for which he may further plead man's conduct in precedent—than is the lamb for devouring grass. Why, moreover, should the vegetarian—brute or human—presume to denounce the flesh-eater as cruel? Have plants no rights? Are we sure that, if they could be consulted, they would consent to be plucked and eaten? They have, it is true, no demonstrable nervous system. But in view of the manifold ways by which in creation we see one and the same end accomplished—in view, too, of the facts on vegetal sensitiveness now ascertained—can we accept this as conclusive evidence? A Society for the Emancipation of Vegetables should be formed at once, and begin soliciting subscriptions. Such a movement would not be more unreasonable than certain other phases of modern British humanitarianism.

¹ Milton most happily represents his devils discussing on free-will.

² "It lies not in our power to love or hate."—(Mallows.)

¹ "Animals, as a rule, do no more than follow their natural instincts."—(Rev. G. Henslow, "Theory of Evolution of Living Beings.")

It is a great mistake to suppose that herbivorous animals are necessarily milder than the carnivora. The contrary is often the case. The flesh-eater attacks and kills for food. The grass-eater, e. g., the Cape buffalo, and even the domestic bull, indulges in wanton outrages and "unprovoked assaults." His tendency to these peculiarly English offenses is, perhaps, the reason why he has been, under the name of John Bull, chosen as the type of the nation.

The true question is, Does a brute, like man, ever violate "the laws of its own nature?" If it is found incapable of departing, whether to the right hand or the left, from one fixed line, we must then pronounce it, according to the commonly-received notion, alike incapable of vice and of virtue, void indeed of moral life, in as far as this is deemed to be dependent upon choice.¹ But if it can deviate more or less from the norm of its existence, and especially if by such transgression it entails suffering upon itself and others, we are then, we submit, warranted in regarding its actions as morally good or evil—good in as far as it conforms to the laws of its being; evil when it goes astray.

We may then judge it, just as man judges his own actions and those of his fellows; the full likeness of the cases justifying us in drawing like conclusions. It will be admitted that "brutes" have wills of their own which vary in intensity among individuals of any given species in the same manner as in man, if not to the same extent. Among domestic animals there are some which, in spite of kicks and cuffs, and general maltreatment, persevere in their own way. Such creatures man, taking as usual, himself for the law of the universe, pronounces "vicious." There are others, again, which, under all circumstances, unhesitatingly submit their will to his, and these he praises.

The same method of judging, by-the-way, is applied to dependents and children. A child deficient in vital power implicitly obeys his parents and "betters" from want of energy to dispute their commands. He is, accordingly, held up to general admiration; his early death is pronounced a "mysterious dispensation of Providence," and his virtues and precocity are duly chronicled in a tract. On the contrary, the healthy and vigorous child, full of life and action, is apt to rebel against authority. It is, therefore, set down as a tiny incarnation of evil,

and if it finds its way at all into a pretty story-book, is made to serve as an awful warning for the rising generation. There is wonderful virtue in listlessness, and in impotence lies an inconceivable amount of purity. Perhaps if we take the latter term in its modern cant sense the two may be regarded as practically synonymous.

The existence of a will, capable of acting at times in defiance of circumstances, is as clearly manifest in the horse, the ass, and the pig, as in man himself, though in the three former it is little appreciated. Strange that what in animals is branded as stupidity should in man be deemed almost divine.

Were brutes devoid of freedom, unable to choose between two lines of conduct, we should find them in all cases simply obedient to their propensities, and intent only upon immediate gratification without any regard to ulterior consequences. Were such the case, for man to train them would be an impossibility. Yet we know that dogs, cats, hawks, etc., are trained to conduct quite different from their natural inclinations. A cat, though one of the most self-willed of animals, can be taught to abstain from molesting chickens, pigeons, and cage-birds, or from stealing, scratching furniture, etc. A dog can be brought to point to a covey of partridges instead of obeying his natural impulse to rush forward and endeavor to seize them. The following case is very significant: "A fine terrier in the possession of a surgeon at Whitehaven about three weeks ago exhibited its sagacity in a rather amusing manner. It came into the kitchen and began plucking the servant by the gown, and in spite of repeated rebuffs, it perseveringly continued in its purpose. The mistress of the house, hearing the noise, came down to inquire the cause, when the animal treated her in a similar manner. Being struck with the concern evinced by the creature, she quietly followed it up-stairs into a bedroom whither it led her; there it commenced barking, looking under the bed and then up in her face. Upon examination a cat was discovered there quietly demolishing a beefsteak, which it had feloniously obtained. The most curious feature is that the cat had been introduced into the house only a short time before, and that bitter enmity prevailed between her and her canine companion."¹

This is a capital case. "Instinct" might undeniably have led the terrier to attack the cat and attempt to deprive her of her booty. But we find this natural impulse here completely re-

¹ If there were no evil, would there be also no good? If all matter were absolutely transparent and incapable of throwing a shadow, would light cease to exist?

¹ *Zoologist*, p. 2131.

strained for the attainment of a definite end. The terrier must have drawn the conclusion that his enemy, if detected in theft, would probably suffer severe punishment—perhaps even death—and he therefore laid an information against her, calculating thus to get rid of her without compromising himself. This incident plainly proves that brutes are capable of self-control—that they do not always blindly and necessarily follow their physical appetites, but can, like man, forego a present indulgence for what appears to them a greater good in prospect. It is as clear a case of self-determination—of appetite and passion governed by the will—as any which human biography can show.

It will possibly be objected that we give no instance of self-control except in species which have been brought under human influence. The reply is obvious: if a free-will or a power of self-determination has been created in such animals by man's intervention, its presence or absence is obviously a matter of small moment and quite inadequate to establish a "great gulf" between man and "brute." But if the will has *not* been thus created, it is probable, or rather certain, that were man better acquainted with the habits of wild animals he would find in their conduct also cases of self-control.

It will further be objected that in the vast majority of cases animals merely act in accordance with the dictates of their ruling propensities. We grant this, and we ask whether this does not hold good to an almost equal extent with man? Analyze the actions of N'Kyzntzgm, the blue-nosed baboon, and you will admittedly find little save the manifestations of ruling propensity. Sift in like manner the conduct of John Nokes, collier, of Hanley, and you will come to the same result. Surely, then, we can regard it as proved that in the matter of self-determination, in the supremacy of will over propensity, there is no difference of kind between man and brute.

Were animals really what vulgar human opinion supposes—did they simply and in all cases follow their propensities in the machine-like manner so commonly attributed to them—it is difficult to see how any individuality of character could exist. All the members of one species would have the same mental abilities and the same dispositions. But this is precisely what is not the case. Among a dozen animals of the same species and even of the same breed differences of character are found as decided as occur among a similar number of men. Any breeder or trainer

of horses, cattle, dogs, or poultry, would greet with laughter—loud, if not Olympian—the theorist who should assert that these animals display anything like identity of disposition. There are the obstinate and the docile, the timid and bold, the open and the treacherous, the placable and the revengeful. In fact, to find two horses or two dogs precisely alike in every point of character that man can distinguish would be as difficult as to find two human beings similarly identical. How much greater, then, would be the range of character visible if we could see them with the eyes of their own species!

Perhaps the usual evasion may be attempted that such various development of temper and disposition is to be found among tame animals alone. The objection is baseless. Capture a number of wild elephants, hawks, ravens, parrots, and try to tame them. You will find still the same variety as you would among animals born in a state of tameness. The differences are found by man, not created.

We will next endeavor to show—what, indeed, follows as a corollary from the foregoing considerations—that animals are capable of vice, hoping that this circumstance may lead man to recognize them as brothers.

To eat more than hunger demands merely for the sake of the sensuous enjoyment thus obtainable, has been always, in man, branded as a serious vice, and has indeed been classed among the "seven deadly sins" of mediæval tradition.¹ This transgression has been found to impair human health, and to blunt mental action. How is it in this respect with brutes? Do they never eat more than they can digest and assimilate? Do they never suffer consequently in their health? Most assuredly. Cows have been known to gorge themselves with clover till they have died from repletion. Ducks often suffer from their own greediness. Similar cases of gluttony are, of course, more rare among wild animals, who neither find food in such abundance nor are so undisturbed in its enjoyment. Yet even they, in homely phrase, at times eat more than does them good. Here, then, we see that brutes have a certain liberty of action. They can be either temperate or gluttonous. In the former case they

¹ It is a remarkable fact that the discharge of any voluntary physical function to which *no* pleasure is attached was never pronounced a vice, even if exercised in excess. But those whose importance the Creator has indicated by rendering them pleasant were branded as sinful not merely when discharged in excess, but even when kept within the bounds of moderation—and this in the exact ratio of their pleasurableness.

preserve their health; in the latter case they bring upon themselves disease or perhaps death. If the gluttonous animal gives unchecked play to its propensities, does not the temperate animal, like the temperate man, resist temptation, and exercise a certain amount of self-restraint? Is it not, for so doing, equally entitled to credit?

The Rev. G. Henslow, in his able and interesting work on the "Theory of Evolution of Living Beings," makes some remarks which must here be taken into consideration if only for their cool *naïveté* of assumption. Says this author: "In obeying those laws of self-preservation and propagation which have been impressed upon it, it is extremely probable that wild animals eat and drink not for the purpose of eating and drinking, but to maintain bodily life only. The laws of propagation are obeyed, but union is probably not resorted to for mere union's sake. Animals show no signs of distinguishing the object from the means. Man alone can see that eating is pleasant, and so often eats for the mere sake of eating, and similarly of other pleasures."

If animals eat only to maintain life it is somewhat strange that they are so extremely nice in the quality of their food. Birds and wasps, in their visits to our gardens, select fruit with a care surpassing that of any human epicure. They attack only the finest pears, peaches, etc., and of these they eat only the sunny side. Mr. Henslow confounds the *result* of an action with the *motive*. Man, at least in his adult state, and possibly the higher animals, know that the result of eating is the prolongation of life, and that abstinence would be ultimately fatal. But neither man nor animal, as a rule, eats from any other motive than to avoid the pains of hunger and to secure the pleasures of eating. We will even venture to say that the less ultimate results are held in view in the gratification of any physical appetite the more perfectly those very results are obtained. As regards the "laws of propagation," we can bring forward facts proving that among animals union is resorted to for mere union's sake. Into what absurdities men are led by their notions of what is "extremely probable!"

It may be urged that the moderation of an animal may spring, not from its greater power of self-control, but from its feebleness of appetites. We cannot deny that this is a possible explanation. But it may, with equal right, be extended to man also. Who knows that the temptation which the saint resists is really as strong as that to which the sinner succumbs? Are we not, in cases of reformation of character, frequently left in pain-

ful doubt whether the "convertite" is forsaking his vices or his vices forsaking him?

Alcoholic excitement is not one of the prevailing vices of brutes, from the satisfactory reason that they are under the operation of a natural Maine law.¹ Two cases of drunkenness, in a cow and a sow respectively, are on record. Both these occurred in Scotland. It is only fair to surmise that the offending animals, like some of their two-legged compatriots, thought fit, in the words of Hudibras, to—

"Compound for sins they were inclined to,
By damning those they had no mind to."

A later instance of undeniably "beastly" drunkenness is given in the *Greenock Advertiser*. Two rats got "that fou" in the shop of a spirit-merchant in the town by dint of consuming the dribblings from a barrel of strong ale, and were killed before they could stagger off to their holes.

It is generally known that most of the quadrupeds, when thrown among human society, learn very readily to like a glass of strong liquor—a fact which should go far to establish their title to a place on the right side of the "gulf." It is no less certain that some of the less reputable monkeys are captured by leaving near their haunts vessels filled with a kind of beer. They come, drink and become drunken, and in that state commit the very venial error of mistaking the negro, who comes to lead them into captivity, for one of their own species.

From alcoholism we are naturally led to the love of the narcotics, as tobacco, opium, Indian-hemp, coca, and the like. That man has a widely-spread craving for these so-called "keys of paradise," has been sufficiently shown. But apes, also, in captivity have been known to indulge in the "weed" with evident relish. Imitation, say you? Probably enough; but has imitation no part in the spread of these minor vices among mankind? Nine smokers out of ten first take to the pipe or the cigar from the tendency—common alike to man and brute—of doing what others do. A love for tobacco in the solid form, also, is not peculiar to man. At a tavern in Bradford there flourished some years ago a goat, whose exploits in tobacco-chewing were not unknown to fame throughout the "land of woolen." A frequenter of the house occasionally won money from strangers, by betting that "himself and another" would eat a pound of tobacco in ten minutes. If the wager was accepted he would

¹ This is not literally true. Alcohol, in small doses, is being detected in natural productions, in which man has had no part.

order in a pound of ordinary shag tobacco, put a modest pinch in his own mouth, and call in the goat, who soon disposed of the remainder. It is not on record that Billy suffered in his health or displayed any marks of penitence after these performances.

Turn we next to dishonesty in the widest sense of the word—the vice most in favor in this virtuous age. The lower animals labor under the disadvantage of having no stock-exchange and of not using bills-of-exchange. But they indulge to the best of their means and opportunities in deceit, affectation, and hypocrisy.

The Rev. J. G. Wood, in his recent interesting work, "Man and Beast," gives an instance of a terrier who, finding that a companion had anticipated him in getting possession of a snug seat, suddenly pricked up his ears, dashed into a corner of the room, and began scratching and barking furiously. The other dog, believing that this commotion indicated the presence of a rat, hastened to the spot, when the terrier at once ran back and secured the coveted cushion. Mr. Wood—we quote from memory—very justly brings forward this incident as a proof of intelligence in dogs. But it is equally a proof of dishonesty. It is a clear case of obtaining something desirable on false pretences.

Hypocrisy is almost as prominent among the *Felide* as among men. If a delicate morsel is thrown to a cat, she will, except very hungry, assume an air of utter unconcern. But all the while she knows its position to a hair's-breadth, and, when no one appears to be looking, it will be at once seized and swallowed. Or, if a bowl of cream is standing in an accessible position, pussy appears lost in the brownest of studies. Her eyes are closed, or, if open, are directed anywhere save toward the tempting object; yet all the time she is watching her opportunity. Whether in cats or in man this failing is invariably the "homage which vice pays to virtue," we leave an open question.

The following instance of deceit and hypocrisy in a terrier is given by Mr. G. J. Romanes, in *Nature* (May 27, 1875, page 66):

"He used to be very fond of catching flies upon the window-panes, and if ridiculed when unsuccessful, was very much annoyed. On one occasion, in order to see what he would do, I purposely laughed immoderately every time he failed. It so happened that he did so several times in succession—partly, I believe, in consequence of my laughing—and eventually he became so distressed that he positively *pretended* to catch the fly, going through all the appropriate actions with his lips

and tongue, and afterward rubbing the ground with his neck, as if to kill the victim; he then looked up at me with a triumphant air of success. So well was the whole process simulated, that I should have been quite deceived had I not seen that the fly was still upon the window. Accordingly, I drew his attention to this fact, as well as to the absence of anything upon the floor, and, when he saw that his hypocrisy had been detected, he slunk away under some furniture, evidently much ashamed of himself."

This last point is most significant, fully overturning the vulgar notion of the absence of moral life in brutes, and of their total want of conscience.

That animals steal is a familiar expression. But we must here distinguish two different cases: we speak of hares stealing our corn, and of blackbirds plundering our cherries; but in neither case have we any reason to conclude that the offenders can distinguish between the crops in cultivated lands and the spontaneous produce of woods and wastes. But not a few species, both of birds, quadrupeds, and insects, evidently recognize the idea of property. This is proved by the fact that they display far greater courage and pertinacity in defense of their nests, their haunts, and their accumulations, than under other circumstances. A dog that, when trespassing, is put to flight by a gesture or a shout, becomes a formidable opponent in his own yard. If, then, such animals know what property is, and yet at times make free with it, we may justly pronounce them conscious thieves. Rooks are apt to purloin sticks from each other's nests; but, if the offender is detected and cuffed by the rightful owner, conscience makes a coward of him, and he merely defends himself by flight. More than this, rooks have some rudiments of criminal law. Inveterate thieves are sometimes banished from the rookery, severely beaten, or even killed outright.¹ But law presupposes the notions of right and wrong, and could never, therefore, have arisen among beings incapable of making this distinction.

As another vice, we may take quarrelsomeness—a term which we need surely not define. This attribute is highly conspicuous in the human species, nowhere perhaps more strikingly than in that part of the English nation who inhabit the borders of Yorkshire and Lancashire. But certain dogs show the very same disposition, and, without the smallest provocation, take every op-

¹ A most interesting account of the habits of rooks was given by Mr. Ashley, of Sheffield, in a lecture delivered before the Mechanics' Institute of that town about twenty years ago.

portunity of attacking horses, cows, sheep, and human beings. There is a well-authenticated instance of a terrier who, in picking a quarrel, contrived, as skillfully as if trained in the Kanzlei of Prince Bismarck, to place himself technically in the right. He would time his movements so that some passenger should stumble over him, and would then fasten on the calf of his leg. With a most statesmanlike aptitude, he selected the aged, the infirm, and the ill-dressed, as the objects of his cunningly-planned attacks. Lord Lytton tells us that the dog is a gentlemanly animal!

Closely connected with quarrelsomeness is the most fiendish of all man's failings—overlooked, as it is, by world-betterers and vice-suppressers—his disposition to give pain, bodily or mental, for mere amusement. There are few human beings, of the male sex at least, who do not delight in tormenting other creatures, whether of their own or of some different species.¹ Yet even this kind of malignity is not unshared by man's poor relations. Fall among wolves, and they will kill you for the straightforward purpose of eating you. Fall among blue-nosed baboons, and they will torment you to death "just for the fun of the thing." Could a red Indian, or even a normal English schoolboy, greatly improve upon this?

With the exception of a few genuine—not professional—philanthropists, man is remarkable for persecuting such of his own species as are unfortunate. This diabolical propensity shows itself in a variety of forms. "Hit him again, he has no friends," is scarcely a parody on the avowed opinions of the less hypocritical of the species. Those who lay claim to higher culture express their sorrow for the calamities of a neighbor by eschewing his society, or perhaps even by asking him whether he does not recognize in his sufferings a well-merited divine chastisement?

Odious as is this trait of human character, man has no monopoly thereof. The wounded wolf is at once devoured by his comrades.

Cattle, both wild and tame, have been observed to gore and trample to death a sick or lame member of the herd. A rook, accidentally entangled in the twigs of a tree, is pecked and buffeted by its fellow-citizens. This, of course, has been pronounced "instinctive." Animals, we are gravely told, put an end to sufferings which they are powerless to alleviate. They do not wish that the herd should be incumbered with a sickly or

wounded member. Taking these explanations for what they are worth, we still ask whether man's ill-treatment of his unfortunate fellows is not the ultimate transformation of the very same instinct.

But, further, the alleged instinct is not common to all gregarious animals. Monkeys and baboons cherish and defend the young, the helpless, and the wounded, of their own species. Ants will take great pains to rescue a member of their community who is in distress.

Looking in a different direction, we must acknowledge that among viviparous animals and birds, the females are, as a general rule, no less careful of their young than are human mothers. In thus acting they are undoubtedly obeying one of the "laws" of their nature. But they can also transgress such law, just as we occasionally find a woman who will neglect, ill-treat, or even kill her child. So is it with female brutes. Sometimes, though rarely, they will abandon or destroy their young. This is a fact well known to the breeders of tame animals. The seller of a mare, a cow, or a sow, is often asked by an intending purchaser, "Is she a good mother?" It must be remarked that neglect of family is by no means the invariable result of want of food, or of danger and annoyance. Birds will, as is well known, sometimes forsake their nests from fear. But a hen has been known to leave her chickens to the mercy of accidents without any conceivable motive save caprice, or the want of ordinary natural affection. Cats, though ordinarily very affectionate mothers, and sows, sometimes devour their young. Here, therefore, we find, again, that the lower animals are not bound down by absolute necessity to one unvarying line of conduct. Like man, they have the power to deviate from what is for them natural, normal, or right. Occasionally they make use of such power. What may be the causes of, or the motives for, such transgression, is not here the question. Enough for us that it exists.

We now come to a part of the subject which, though essential to our argument, we cannot enter into at any length. Do brutes invariably obey the "law of their being" as regards the mutual relations of the sexes? Far from it. The nearer brutes approach to man, the more they are inclined to sin against what, in modern cantology, is exclusively styled "morality." With animals which pair conjugal fidelity is, indeed, more general than with mankind. A petty negro chief laughed at the notion of keeping to one wife, "like the monkeys." Still it is far from being

¹ When an Englishman talks about amusement, it may be inferred as a general rule that he means killing something.

universal, and nowhere are exceptions more frequently found than among pigeons, which, with a rare depth of wicked satire, have been selected as types of matrimonial faith.

The existence of hybrids shows a departure from what Nature should enjoin. Such beings have been produced respectively, not alone between the horse and the ass, but between the horse and the quagga, the horse and the zebra, the ass and the zebra, the lion and the tiger, the hare and the rabbit (*leporides*), and between a great variety of birds of the poultry, pleasant, grouse, duck, and finch groups. To the dismay and indignation of certain theorists, some of these hybrids are capable of reproduction.

It has been objected that these instances occur only through human intervention. This is by no means the fact. Hybrids between distinct species of grouse have been met with in a wild state.

Instances of hybridism are likewise said to have occurred between animals much more widely remote in their respective natures. Such cases are doubtful, and are certainly not essential to our argument. But intercourse not unfrequently takes place between animals of different species where no offspring has been positively proved to result.

Many more instances of brute frailty might be given were it needful or desirable.

It has been asserted that "mere brutes" never commit suicide. This is a wanton, it might be said an impudent, assumption. If a negro, sold into slavery, refuses food and starves himself to death, as sometimes happened in the palmy days of the "black ivory trade," men say that he has committed suicide rather than live in bondage; but if an animal, bird, or reptile, taken away from its native haunts and shut up in a cage, persistently refuses food and dies in consequence, why should not the same name be applied to conduct precisely similar? Yet cases of this kind, in which the love of liberty and independence asserts itself in flat defiance of the strongest of all instincts, are by no means rare. There is great difficulty in inducing some animals to eat in captivity, even if supplied with the very kind of food which they select when at large. As an example, we may mention the common viper, which generally starves itself to death in captivity, regardless of the offer of the choicest mice. But there are many instances among domestic animals, proving that life-weariness and the determination to end miseries in a sudden manner are not confined to the human race.

"*Suicide by a Dog.*—A day or two since a fine dog, belonging to Mr. George Hone, of Frindsbury, near Rochester, committed a deliberate act of suicide by drowning in the Medway, at Upnor, Chatham. The dog had been suspected of having given indications of approaching hydrophobia, and was accordingly shunned and kept as much as possible from the house. This treatment appeared to cause him much annoyance, and for some days he was observed to be moody and morose. On Thursday morning he proceeded to an intimate acquaintance of his master's at Upnor, on reaching the residence of whom, he set up a piteous cry on finding that he could not obtain admittance. After waiting at the house some little time, he was seen to go toward the river close by, when he deliberately walked down the bank, and after turning round and giving a kind of farewell howl, walked into the stream, where he kept his head under water, and in a minute or two rolled over dead. This extraordinary act of suicide was witnessed by several persons. The manner of the death proved pretty clearly that the animal was not suffering from hydrophobia."—(*Daily News*.)

"*Suicide of a Horse.*—A correspondent writes: 'A few nights ago a poor creature, worn to skin and bone, put an end to his existence in a very extraordinary manner. His pedigree is unknown, as he was quite a stranger. A very worthy gentleman here met him in a public market, and thinking that he could find an employment for him, put him to work, but it was soon discovered that work was not his forte; in fact, he would do anything save work and go errands. His great delight was to roam about the fields and do mischief. People passing him used to ejaculate, "Ugh, you ugly brute" when they saw the seowl which was continually on his face. His master tried to win him by kindness. The kindness was lost upon him. He next tried the whip, then the cudgel, but all in vain. Work he would not. And as a last resort the punishment of Nebuchadnezzar of old was tried. He was turned out, "but house or hauld," to eat grass with the oxen. With hungry belly and broken heart he wended his lonely way down by the Moor's Shore, passed Luckyscaup, turned the Moor's Point, and still held on his lonely way, regardless of the wondering gaze of the Pool fishermen. At length he arrived at a point opposite the wreck of the Dalhousie, where he stood still; and while the curiosity of the fishermen was wound to the highest pitch as to what was to follow, he, neighing loudly and tossing his old tail, rushed madly

into the briny deep, got beyond his depth, held his head under the water, and soon ceased to be. The fishermen conveyed the true, although strange and startling, tidings to the respected owner, that his horse had committed suicide.'"—(*Dundee Advertiser*.)

There are several other authenticated cases on record where dogs have committed suicide by drowning. It is important, as showing intention, that dogs are perfectly aware of the results of prolonged immersion in water, as evinced by their so frequently rescuing children when in danger of drowning. Were dead brutes honored with a searching investigation, we might perhaps find such instances far more frequent than we suspect. They have, however, scantier facilities for self-murder than man, and possibly slighter temptations, as being, doubtless, upon the whole, less miserable.

The various actions above mentioned are all departures from the normal or natural conduct of the species concerned, and of course lead us again to the conclusion that brutes *can* do wrong, and if wrong, that they are consequently able also to do right.

Perhaps it may be argued by the captious that though gluttony, neglect of offspring, suicide, and the like, are wrong in themselves, and are hurtful to the offending animal and its species, yet that brutes have no conscience, and neither feel any satisfaction in "obeying the laws" of their nature, nor any remorse upon transgression. To this we may in the first place reply with a *tu quoque*—a retort for once satisfactory, as it withdraws the pretended distinc-

tion. Man does not appear to have any inborn and infallible knowledge of right and wrong. His vaunted conscience, when it is more than a mere figure of speech, is a creature of conventions and traditions. There is no vice, no crime even, how horrible soever, which at some time or in some part of the world man has not practised without a shadow of self-reproach. He has suffered, indeed, from his errors, but no more than the brutes does he, generally speaking, trace his sufferings to their true causes. Sir J. Lubbock states in his "Origin of Civilization" that, after inspecting nearly all existing records of savage life, he was unable to find any case of a savage having evinced remorse after the commission of any crime.

But, on the other hand, does man really *know* that brutes are void of all trace of conscience—that they feel no joy when they have acted aright, and no sorrow when they have done amiss? He has no proof—merely wanton assumption. Facts prove that certain animals do feel shame, sorrow, or remorse, when they have departed from what to them is the standard of right; and what more can reasonably or fairly be demanded?

We have thus, we submit, established that the lower animals have a moral life, that they can do right or do wrong, and that, like man, they avail themselves of their power to do the latter. Surely henceforth a fellow-feeling ought to make him wondrous kind to them all. Community in vice, or even in peccadillos, has always been a wonderful leveler of distinctions.—*Quarterly Journal of Science*.

BRIEF NOTES.

Funeral Ceremonies at the Nicobar Islands.—We take from the *Geographical Magazine* the following interesting extract from a letter by F. E. Tuson: "Last night I went over to Malacca, and found that one of the old men had died suddenly, and been buried just before I got there. A raft of long trunks of trees, with a house on it made of cocoanut-leaves, and with one large leaf placed upright to act as a sail, was lying opposite the dead man's hut, to convey away his 'iwi,' or spirit, when the *maulooennas*, or medicine-men, had caught it. They are awfully afraid of these 'iwis,' and all the inhabitants were sitting in their houses, afraid to move out. They attribute

all fever, and sickness, and calamity, to their 'iwis.' I found the *maulooennas* placing all the property of the deceased round about his tomb, and hanging up his hats, clothes, etc., on a post placed at his head. Everything a man or woman possesses is placed on his or her tomb, and never used again; the poultry and pigs are killed. The widow was in a house near, which was full of all the women in the place. She has to sit three days in a dark corner, with a cloth over her, and to see and speak to no one during that time. The 'iwi,' it seemed, would not come till night-time, when everything was quiet, so I was unable to see the operation of catching it, but I found out

the mode of procedure. The first thing was to eat up all the food in the village, with the exception of a little rice and bread-fruit, etc. The latter was placed in little pottles, like those used at home for strawberries, of a conical shape, about two feet long and eight inches in diameter. These were hung about the dead man's hut and tomb. At night the 'iwi' was supposed to come and enter one of the pottles, to eat the food in it. The *maulooennas* would then steal up, and close the mouth suddenly and tie it up. It is then carried with great care to the raft, which is towed out to sea and let go. I saw the pottles all ready, neatly made of cocoanut-leaves plaited together. I was told that the 'iwi' was invisible to all but the *maulooennas*, an idea started, of course, by the latter. The natives all seem to believe in their powers; but whether they do so themselves, I do not know. It does not seem necessary to pack the 'iwi' off the same day the man dies; for the other day the sister of 'London,' the head-man of Malacca, died, and her 'iwi' was not sent to sea till three months afterward. The *maulooennas* appoint the day. Three months hence they will have a great feast, paint their faces red, and all get drunk and dance for two or three days. At the end of a year the body is dug up, and the skull thoroughly cleaned and reburied. I have not ascertained the reason for this last ceremony. These people are a most interesting race, and very little is known about them."

The Iguana.—Mr. P. L. Simmonds, in a recently-published work on "Animal Products," says of the *Iguana delicatissima*, the large tree-lizard of Central and South America, that, while certainly not attractive in appearance, yet by most persons in tropical countries its flesh is highly esteemed. The eggs of the iguana, which are somewhat smaller than those of the domestic pigeon, are pronounced by Sir Robert Schomburgk and others to be delicious. One of the lizards will sometimes contain as many as eighty eggs, which, when boiled, are like marrow. The incessant destruction of the iguanas for the sake of their flesh has made them very scarce, if not altogether extinct, in localities where they were once abundant. They were formerly so common at the Bahamas as to furnish a great part of the subsistence of the inhabitants. In Costa Rica the large iguanas attain the size of small crocodiles. The usual native mode of cooking is to boil them, taking out the fat, which is melted and clarified and put into a dish, into which they dip the flesh of the iguana as they eat it. It was

long before the Spaniards in America could conquer their repugnance to iguana-flesh, but, having once tasted of it, they pronounced it to be the most exquisite of all delicacies. Peter Martyr is made to say, in the old English translation of his work, "De Rebus Oceanicis et Orbe Novo:" "These serpentes are lyke unto crocodiles, saving in bygness; the call them guanas. Unto that day none of owre men durst adventure to taste them, by reason of theyre horrible deformitie and lothsomnes. Yet the Adelantado, being entysed by the pleasantnes of the King's sister, Anacaona, determined to taste the serpentes. But, then, he felte the flesh thereof to be so delycate to his tongue, and to amayze without al feare. The which theyre companions perceiving, were not behynde hym in greedynesse; insomuche that they had now none other talke than of the sweetness of these serpentes, which they affirm to be of more pleasant taste than eyther our phesantes or partriches."

In a series of experiments lately made in England to determine the comparative strength of iron and steel plates, the metal was subjected in each case to the percussive force of a charge of $1\frac{1}{2}$ pound of gun-cotton. The steel plates measured $\frac{3}{4}$ of an inch thick and the iron $\frac{7}{8}$ thick, and the quality ranged from ordinary boiler-iron to the best classes of steel. The plates, thirty in number, were one by one placed on a concave anvil and the charge was fixed about nine inches above. The ordinary boiler-iron was indented to the fullest extent of the cavity of the anvil and fractured. The indentation on a plate of mild Bessemer steel tempered in oil was only $1\frac{1}{4}$ inch, and there was no fracture. A plate of mild steel (Siemens's), not tempered in oil, was indented $1\frac{1}{2}$ inch, and another, tempered, $1\frac{3}{4}$ inch. The results appear to show that steel is incomparably superior to iron for boilers, locomotive-tires, rails, and similar purposes.

A HIGHLY-INGENIOUS instrument for taking soundings at sea while the ship is in motion has been invented by Sir William Thomson. This instrument consists of a copper tube attached to the lower end of the sounding-wire, and inclosing a slender glass tube and a small quantity of sulphate of iron. As the tube descends the pressure of the water forces the sulphate into the glass tube. It leaves a stain on the glass, and according to the height of the stain is the depth of the sea at that point. The instrument has been tested with entirely satisfactory results.

THE NINETY YEARS' AGONY OF FRANCE.

BY PROF. GOLDWIN SMITH.

FOR ninety years, since the time when Calonne called together his Assembly of Notables, and when the voice of the Revolution was first heard announcing a reign of hope, love, freedom, and universal peace—for ninety years has France struggled to attain a settled form of constitutional government; and apparently she is farther from it now than she was in 1787—apparently, but not, we will hope, in reality. In this last crisis the mass of her people have exhibited not only a steadiness of purpose for which we were little prepared, but a self-control which is full of the highest promise. In spite of everything that the conspirators who had seized the government could do to provoke the nation to violence which might have afforded a pretext for using the public force against the public liberties, the nation has conquered by calmness. Conspiracy and illegality have passed from the side of the people to that of the reactionary government. This shows that considerable way has been made since the days of the Faubourg St.-Antoine.

Real progress is to be measured, not by change of institutions, but by change of character. The Revolution made a vast change in French institutions: it could not change French character, which remained as servile under the despotism of Robespierre as it had been under that of Louis XIV. Character seems now, after ninety years of desperate effort and terrible experience, to be coming up to the level of institutions. Perhaps France has reason to be grateful to De Broglie and his Marshal for giving her assurance of that fact, though their names will be infamous forever.

The reasons of the political failure of 1789 are manifest enough; we need not seek them in any mysterious incapacity of the Celtic race in general, or of the French branch of it in particular, for constitutional government. These mysterious capabilities and incapacities of races in truth are questionable things, and generally tend, upon closer inspection, to resolve themselves into the influence of circumstance perpetuated and accumulated through many generations. England, guarded by the sea, has had comparatively little need of standing armies, and she has thus escaped military despotism, since fleets cannot interfere with politics; yet even she might have fallen

under a military despotism, and foreign critics might now be moralizing on the inherent incapacity of her people for any government but that of force, if, when the army of James II. was encamped on Hounslow Heath, there had not been a William of Orange to come over to our rescue. France has had frontiers; therefore she has had standing armies, and her rulers have been masters of legions. She was exposed to foreign invasion for a whole century, from the time of Edward III. to that of Henry VI.; and again, at the crisis of her destiny in 1791, she was assailed by the arms of the coalesced powers of Reaction. On each occasion her people, to secure national independence, were compelled to renounce liberty, and the Government was inevitably invested with a military dictatorship of defense, which, once acquired, was perpetuated in political despotism. It would be difficult to prove that, under more auspicious circumstances, the States-General, which, at one period in the fourteenth century, entered on a course of reform as bold and comprehensive as anything done by the framers of the Great Charter or the Parliaments of Henry III., might not have developed into a British House of Commons.

The political crisis of 1789 was in itself one of the most tremendous kind; it was nothing less than the collapse, amid bankruptcy and general ruin, of the hereditary principle of government, the only principle which France or the greater part of Europe up to that time had known. But it was desperately complicated by its connection with a social and a religious crisis equally tremendous. It came upon a people totally untrained to political action, without political instruction, without a political press, without even the common information which a newspaper gives about passing events; without the means of judiciously choosing its political leaders, or even political leaders among whom a judicious choice could be made; without any good political writers, except Montesquieu, whose authority, as we shall presently see, was practically misleading. At the same time this people had, in common with all intellectual Europe, been excited by visions of boundless and universal happiness, of new heavens and a new earth, to be attained by a change of the social system and of

the form of government. Amid such disadvantages, and in face of a reaction at once political, social, and religious, the desperate reaction of privilege, both social and ecclesiastical, fighting for its existence, and not scrupling, in its transports of rage and terror at the appearance of liberty and equality, to combine with Robespierre in order to defeat Lafayette, success would have been almost a miracle. But then, to extinguish the last hope, came the coalition of the kings, hounded on by the too eloquent ravings of Burke, whose total failure to understand the difficulties under which the French reformers labored was discreditable to him as a political philosopher, while his frantic invocations of war, and, in his own hideous phrase, of "a long war," were disgraceful to him not only as a political philosopher but as a man.

The Republican Constitution formed after the overthrow of the Terrorists was not a good one. The institution of two Chambers was a mistake, arising from an illusion of which we shall presently have to speak; a sufficient control over the Executive Directory was not secured to the representatives of the nation; the judiciary was not placed on a proper footing. Still it is probable that the Constitution would in time have worked and given to France law and order under a Republic, had it been administered by tolerably honest hands, and had it not been exposed to military violence. But a revolution, especially an abortive revolution, leaves behind it a fearful legacy, not only of disappointment, lassitude, mistrust among the people, but of depravity among the chiefs. It gives birth to a race of intriguers, utterly selfish, utterly unprincipled, trained to political infidelity in the school of fortunate apostasy, steeped in perfidy by the violation of unnumbered oaths, and at the same time familiar with the revolutionary use of violence. Such was the offspring of the revolutionary periods of ancient history both in Greece and Rome. Thucydides saw and painted them; they impressed their character on Roman politics after the civil wars of Marius and Sylla. Such again was the offspring of the English Revolution; the Lauderdale and Shaftesburys, the scoundrels who formed the governments and led the factions of the Restoration, who carried on religious persecutions while themselves were infidels, shut up the exchequer, made the treaty of Dover, got up the Popish Plot, seized the municipal charters, judicially murdered Russell and Sydney. But never was there such a generation of these men as that which emerged from the wreck of the dreams of

Rousseau, and from the deadly struggle of factions which ended with the fall of Robespierre—Tallien, Fréron, Barère, Barras, Rewbell, Talleyrand, Merlin, Fouché, and their crew. Political corruption was aggravated by the corruption of morals, caused by the outburst of sensualism which naturally ensued after the dreadful repression and the savage Spartanism of the Terror. To this general depravity was added the volcanic fury, still unabated, of party passions raging in the breasts of factions which but yesterday had been alternately reveling in the blood of each other. It was by military violence, however, that the Constitution was at last overthrown, and its fall was the beginning of that supremacy of the army which unhappily has been from that hour, and still is, the fundamental fact of French politics. The hand which, at the bidding of traitors in the Directory, dealt the first blow, was that of Angereau, but the hand which planned it and dealt the final blow was that of Bonaparte. In estimating the result of the first experiment in Republican government, this must always be borne in mind.

The appearance of Bonaparte upon the scene with his character and his abilities may be truly called the most calamitous accident in history. An accident it was, for Bonaparte was not a Frenchman; he was made a French soldier by the chance which had annexed his country to France, without which he would have been a Corsican brigand, instead of being the scourge of the world. Little did Choiseul think that the rapacity which added to France Corsica would be the cause a century afterward of her losing Alsace-Lorraine. As to the greatness of the calamity, few doubt it, except the train of mercenary adventurers whose existence in France, as a standing and most dangerous conspiracy against her liberties, is itself the fatal proof of the fact which they would deny. What may have been the extent of Napoleon's genius, political or military, is a question still under debate, and one of a kind which it is difficult to settle, because, to take the measure of a force, whether mechanical or intellectual, we must know the strength of the resistance overcome. The Revolution had swept the ground clear for his ambition, and had left him in his career of aggrandizement almost as free from the usual obstacles without as he was from any restraints of conscience or humanity within. Death removed the only three men who were likely to make a stand, Hoche, Marceau, and Kleber, from his path. He disposed absolutely of an army full of burning

enthusiasm, and which, before he took the command, though it had recently met with some reverses, had already hurled back the hosts of the Coalition. In Europe, when he set out on his career, there was nothing to oppose him but governments estranged from their nations, and armies without national spirit, mere military machines, rusty for the most part, and commanded by privileged incompetence. England was the only exception, and by England he was always beaten. The national resistance which his tyranny ultimately provoked, and by which, when he had provoked it, he was everywhere defeated, in Russia, in Germany, even in decrepit Spain, was called into existence by his own folly. He ended, not like Louis XIV., merely in reverses and humiliations, but in utter and redoubled ruin, which he and his country owed to his want of good sense and of self-control, and to this alone, for he was blindly served, and fortune can never be said to have betrayed him, unless he had a right to reckon upon finding no winter in Russia. Before he led his army to destruction, he had destroyed its enthusiastic spirit by a process visible enough to common eyes, though invisible to his. Nor was he more successful as a founder of political institutions. He, in fact, founded nothing but a government of the sword, which lasted just so long as he was victorious and present. The instability of his political structure was shown in a lurid light by the conspiracy of Malet. Of its effect on political character it is needless to speak; a baser brood of sycophants was never gathered round any Eastern throne. At the touch of military disaster, the first Empire, like the second, sank down in ignominious ruin, leaving behind it not a single great public man, nothing above the level of Talleyrand. The Code survived; but the Code was the work of the jurists of the Revolution. With no great legal principle was Bonaparte personally identified, except the truly Corsican principle of confiscation, to which he always clung. The genius of the moral reformer is to be measured by the moral effect which he produces, though his own end may be the cup of hemlock. The genius of the adventurer must be measured by his success; and his success is questionable when his career, however meteoric, ends in total disaster. This is not the less manifest to reflecting minds because the pernicious brightness of the meteor still dazzles and misleads the crowd. But the greater Napoleon's genius was, the worse was it for France and mankind. All his powers were employed in the service of the most utterly selfish and evil ambition

that ever dwelt in human breast. It has been justly remarked that his freedom from every sort of moral restraint and compunction lent a unity to his aims and actions which gave him a great advantage over less perfectly wicked men. As to religion, he was atheist enough to use it without scruple as a political engine, and to regret that the time was past when he might, like Alexander, have given himself out as the son of a god. His selfishness is to be measured not merely by the unparalleled sacrifices of human blood and suffering which he offered to it; not merely by the unutterable scenes of horror which he witnessed without emotion, and repeated without a pang; but by the strength of the appeal which was made to his better nature, had he possessed one, and the splendor of the reward which was held out to him, if he would have kept his allegiance to the interests of his country and of humanity. What happiness and what glory would have been his if, after Marengo, he had given the world a lasting peace, and with it the fulfillment, so far as fulfillment was possible, of the social and political aspirations for which such immense and heroic efforts, such vast sacrifices, had been made! Never, in all history, has such a part been offered to man. Instead of accepting this part, Napoleon gave the reins to an ambition most vulgar as well as most noxious in its objects, and to the savage lust of war, which seems after all to have been the predominating element in this Corsican's character, and which gleamed in his evil eye when the cord was touched by those who visited him at Elba. The results were the devastation of Europe, the portentous development of the military system under which the world now groans, the proportionate depression of industry and of all pacific interests, the resurrection in a worse form of the despotisms around which the nations were fain to rally for protection against a foreign oppressor, and the new era of convulsions and revolutions which the resurrection of the despotisms inevitably entailed.

Of all the effects of Napoleon's career, the worst perhaps was the revelation of the weakness and meanness of human nature. What hope is there for a race which will grovel at the feet of sheer wickedness because the crime is on an enormous scale, and the criminal is the scourge, not only of one nation, but of his kind? Next in the order of evil were the ascendancy given to the military spirit and the example of military usurpation. The military spirit it was that, excited by the flagitious writings of Thiers, and weakly flattered by the house of Orleans, overturned

constitutional government in 1832. The example of military usurpation was followed by Napoleon's reputed nephew, who in his turn was driven by the discontent of the army, combined with the influence of his priest-ridden wife, into the war which overthrew his Empire, at the same time bringing the invader for the third time into Paris. The blow which military passion and the spirit of aggrandizement received in that defeat was to France a blessing in disguise. To it she owes the recovery, however precarious, of free institutions, of which there would otherwise scarcely have been a hope. But, even now, France, after all her efforts and revolutions, is to a fearful extent at the mercy of a stupid and self-willed soldier, a third-rate master even of his own trade, totally devoid of political knowledge and of sympathy with political aspirations, but at the head of the army, and, as his language to the soldiery on the eve of the elections proved, sufficiently wanting in the true sense of honor to admit into his mind the thought of using the public force with which he is intrusted for the overthrow of public liberty. No institutions, however sound and stable in themselves, can afford to a nation security for legal order while there is a constant danger of military usurpation. Nor is it easy to see how the danger can be removed, so long as an army strong enough to overpower all national resistance, and blindly obedient to command, is at the disposal of the executive for the time being.

Two years hence, if not before, there will be another crisis; and it is idle to conceal the unhappy and ignominious fact, that the decision will rest ultimately with the army and with those whom the army obeys.

Whether, under the new system of universal military service, with such influences as that of the Erckmann-Chatrian novels, the soldier has become more of a citizen and the army less of a knife, ready, in any hand by which it may for the moment be grasped, to cut the throat of public liberty, the event will show. The French peasant, if left to himself, is not fond of war; he hates the conscription, and has done so from the time of Cæsar; the fatal ascendancy of the military spirit is due, not to him, but to a series of ambitious rulers. This is true, but it does not save France from being, as a matter of fact, to a lamentable extent a stratiocracy. How the army can be placed in safe hands is a problem of which it is almost impossible to suggest a complete and permanent solution. The reduction of its numbers by the definite adoption

of a pacific policy is the only real security for the continuance of political liberty. In France the peril is greatest, and its manifestations have been most calamitous, but it extends more or less to all the European nations. Everywhere in Europe public liberty and human progress are to a fearful extent at the mercy of the vast standing armies which are maintained by the mutual jealousies of nations, assiduously stimulated by courts and aristocracies in the interest of moral and political reaction. He who said that science could not be better employed than in devising means of destroying prætorians gave utterance, in a cynical form, to a melancholy truth. It would be a happier way of escape from the danger if soldiers could possibly be made to understand their real duty to their country.

By the Restoration of the Stuarts, and the temporary recovery of its ascendancy by a defeated and vindictive party, England was thrown back into political discord, violence, and intermittent civil law for three-quarters of a century. The same calamity befell France, though in her case the restoration was the work of foreign hands; and the same or even greater allowance for the disturbing influence must be made. As no institutions can be proof against military treason, so none can be proof against passions which go beyond political antagonism, beyond even the utmost violence of party, and are, in fact, the passions of civil war. The factions which encountered each other in the legislative assemblies of the Restoration were the same which not long before had encountered each other on the battle-fields of La Vendée. Their hostility, scarcely diminished since they met in arms, was incompatible with that common allegiance to the Constitution and its objects, in spite of divergences on special questions, which is the first condition of constitutional government. Both extremes in the assemblies of Louis XVIII. and Charles X. were striving, not to give effect to their respective policies by constitutional means, but to overthrow the Constitution itself, one extreme in the interest of absolutism, the other in that of democracy. It was then as it is now, when the monarchical and aristocratic party is manifestly using the Marshalate and the Senate, not to modify legislation in a conservative sense, but to overthrow the Republic, as, if it had been successful in controlling the elections, it would unquestionably have done. In such a case institutions can do no more than prolong for themselves a precarious existence by being so ordered as to prevent rather than facilitate a pitched bat-

tle between parties which, when it once occurs, causes an outbreak of violence, and leads back to civil war.

Napoleon, besides restoring superstition for his political ends, restored aristocracy, though the fear of limiting his despotism made him dislike creating an hereditary House of Peers. This also has been a hostile and disturbing force, against which the Republic, founded on equality, has always had and still has to contend. The set of upstarts whom Bonaparte bedizened with tinsel dukedoms of course gave themselves greater airs than the old nobility of France. Such a fellow as Cambacères was very particular about being called Monseigneur; but a certain union of interest, if not a social union, has by this time been brought about between old privilege and new; and the attack on the Republic under De Broglie has been at least as much an aristocratic conspiracy as anything else. So manifest is this as to found a hope that the army, which is tolerably loyal to equality, if not to liberty, might recoil from supporting what it must see to be an aristocratic reaction. An aristocracy, while it exists, will never cease to intrigue against institutions based upon equality; and the total prohibition of hereditary titles was justly felt by the framers of the American Constitution to be essential to the security of their Republic.

Another adverse force against which free institutions have to contend in France, too often noted to need more than recognition in its place, is the tendency, derived from the old *régime*, but handed on in an intensified form by the Bonapartes, to administrative centralization, which, notwithstanding the improvement of local institutions, still decidedly preponderates over local self-government. The influence exercised by De Broglie and his accomplices over the elections, through prefects of their appointment, is a fatal proof of the fact. From the same inveterate spirit of encroachment on one side, and submission on the other, arises the want of independence in the judiciary which has been so disgracefully displayed in the late political trials. The resistance made by the constituencies to the prefects shows that improvement is going on; but a century of effort is not too much to throw off maladies so deeply seated as these.

The special influence, however, to which we wish here to point as having interfered with the success of elective government, and as still imperiling its existence in European countries generally, but notably in France, is the ignorant and fallacious imitation of the British Constitution.

We wish we could hope that the few words we have to say on this point would meet the eye of any French statesman, and direct his attention to the subject.

Burke denounced the political architects of 1789 for constructing their edifice according to theoretic principles instead of building it on old foundations, and he contrasted their folly with the wisdom of the old Whigs. Considering that the old Whigs were aristocrats who had inherited the territorial plunder of the courtiers of Henry VIII., and who desired to preserve that inheritance, and, with it, the power of an aristocracy, their economy in innovation was as natural as it was wise. But it would have tasked the sagacity of Burke to discover what old foundations for constitutional government there were in the France of 1789. France had then been, for at least a century and a half, a despotism with a strictly centralized administration. The semblance of provincial government survived, but it masked without really tempering the action of the satraps of the monarchy; and feudalism, crushed since Richelieu, had left behind no genuine remnant of local liberty, but only the antiquated machinery of social oppression, which Richelieu had done almost nothing to reform. Yet the political architects of 1789 did build on old foundations, the only old foundations which anywhere presented themselves—the foundations of the English Constitution. And it may confidently be said that, compared with that renowned, time-honored, and much-lauded model, the newest creation of the brain of Sieyès would have been a safe and practical guide. The clock-work constitutions of Sieyès displayed a fatal ignorance of the real forces; but at all events they involved no incurable self-contradiction. It was not absolutely impossible to make them work. But it was absolutely impossible, and had been actually proved to be so by English experience, to make the British Constitution work, as the British Constitution was understood by Frenchmen and by Englishmen themselves.

The received version of the British Constitution was that given by Montesquieu, in perfect accordance with the forms of British constitutional law. Montesquieu, a great genius in his day, while he explained the forms with philosophic eloquence, failed to pierce through them to the real political forces. In this respect he is like De Tocqueville, whose work, admirable in many respects, is still an account of the forms, not of the real forces, and, consequently, is of little value as a practical guide to American politics,

and is seldom quoted by American politicians. The legislative power is the sovereign power. But Montesquieu believed that the sovereign power, in the case of the British Constitution, was really divided among king, Lords, and Commons. He also believed that the legislative, executive, and judiciary powers were not only distinct, but independent of each other, and that the mutual independence of those powers was the palladium of constitutional government.

The British Constitution is a single elective assembly, in which the whole of the legislative, and therefore the whole of the sovereign power is really vested. This assembly virtually appoints the members of the executive, who are the leaders of its majority, and through the executive the ministers of justice. Round it still cling, as it were, the wrecks of an old feudal monarchy and of an old feudal House of Peers, but from both of them the power has long passed away, to centre in the Commons, though, strange to say, not only foreign observers, but English statesmen, long remained unconscious of the fact.

Whether the sovereign power, which could not be divided, should be vested in the crown or in the representatives of the people, was the question which, after vain attempts to settle it by debate, was fought out with arms between the Parliament and the Stuarts. It was decided, after a century of conflict and several vicissitudes of fortune, in favor of the representatives of the people, who finally triumphed in 1688. From that time the monarchy has been *fainéant*, interfering with the government only by means of back-stairs influence, or by forming for itself, underhand, a party in the House of Commons, as it did during part of the reign of George III. William III., being the head and the general of a European coalition, kept for his life the Foreign Office and the War-Office in his own hands; but after a slight resistance, ending with his attempt to veto the Triennial Act, he was obliged to relinquish every other kind of power; and, in the reign of his successor, the transfer of the sovereignty to Parliament was complete. As to the House of Lords, it has no power left in itself but that of obstruction on minor questions; on great questions it merely registers the vote of the majority of the House of Commons. This was settled in 1832, in the case of the Reform Bill, and again in 1846, in the case of the Corn Laws. On both those occasions the measures would notoriously have been rejected by an overwhelming majority, had the House of Lords been an independent assembly. The result showed that it was nothing

of the kind. King, Lords, and Commons work together harmoniously in England, not because each of them exercises its share of the sovereign power temperately, and with due respect for the rights of the others, which is the common and the orthodox belief, but because two of them are politically non-existent. Restore real sovereignty to the crown, and you will have the Stuarts and the Long Parliament over again.

Following, however, as they thought, the successful example of England, the framers of the French Constitution of 1789 attempted to divide the sovereign power, leaving a portion of it in the king, and vesting the remainder in the representatives of the people. The result, the inevitable result, was collision, and soon a conflict which, though neither party knew it, was essentially internecine. The weaker, that is to say, the monarchy, fell; but, in the desperate efforts necessary to get rid of the opposing force and to vindicate the sovereignty to itself, foreign intervention adding to the fury of the conflict and to the general difficulties of the crisis, the nation fell into convulsions, into the reign of violence, into the Terror, and after the Terror into military dictatorship and despotism. The same fatal situation was reproduced under the restored monarchy; again an attempt was made to divide the sovereign power between the king and the Assembly which represented the nation. In which of the two that power should rest, was the issue once more really debated through all those fierce sessions of the Restoration Legislature, while the ground heaved with conspiracy, and ever and anon the mutterings of civil war were heard in the streets. At last Charles X. made a desperate effort to cut the knot and render himself sovereign; by his failure and fall the question of sovereignty was decided for the time in favor of the representatives of the people. What power Louis Philippe retained was retained not of right (for he subscribed to the doctrine that he was to be guided by constitutional advisers assigned him by the majority in the Chambers), but by personal influence and corruption. It was in corruption, in fact, that monarchical power made clandestinely its last stand. Louis Philippe's fall, as we have already said, was due not so much to political causes, in the proper sense of the term, as to Chauvinism conspiring against a *bourgeois* king, whose policy was peace, though he yielded too much to the fancied necessity of sacrificing, by military display and menace, to the idol of war. At the same time the fresh impulse given to the revolutionary movement in Europe by the strug-

gles of oppressed nationalities caused an insurrection in France against the surviving forms of monarchy and the influences by which they were upheld. Chauvinism and the fear of anarchy together gave birth to the second Empire, under which the sovereign power reverted from the representatives of the nation to the monarch, who was in all but form a despot, as before the Legislature had been, in all but form and saving illicit influence, the king. The second Empire went to the grave of the first by the same road, the military aggressiveness which was the condition of its existence leading it on at last to ruinous defeat. Now, again, comes a nominal republic; but, unfortunately, there is still a king, and the hopeless problem of carrying on government with a divided sovereignty presents itself afresh. The marshal, having the command of the army, and being supported by those who desire a return to monarchy, struggles for the sovereign power; and the question at the late election was, whether that power should belong to him and the ministers of his personal choice, or to the nation. From 1798 onward there has been a chronic though intermittent struggle for the sovereign power several times; that power has been transferred and retransferred; there have been periods in which it was doubtful where it resided; but it has never been divided, nor is a division possible in the nature of things. The attempt can only lead to a conflict which will probably end, as it did in England, in civil war.

Those who found an elective government must not fancy that they can at the same time preserve monarchy. They must be logical, because they will find that in this case not to be logical is to plunge into practical confusion. They must vest the sovereignty absolutely and beyond question in the nation. Their first care must be to establish on an immovable foundation the principles that the nation alone makes and alone can alter the constitution; that to the nation alone all allegiance is due, and against it alone can treason be committed; that all other authority, however high, is merely derivative, responsible, and bounded by the written law; that the sovereignty of the nation is exercised through its representatives duly elected; and that to these representatives the obedience of all executive officers must be paid. This done, they may afford to make any conservative regulations with regard to the election of the National Assembly and the mode of its proceeding that they please; and, where freedom is young, they will find careful regulations of this kind needful. It is the

game of the Bonapartists, first to assert the sovereignty of the nation, and then to make the nation permanently divest itself of its sovereignty by a *plébiscite* in favor of the Bonaparte family and the brood of adventurers whose instruments the Bonapartes are. Of course, no legislation can prevent a national suicide; but clear declarations of principle are not barren because they are not endowed with force to defend themselves against treachery or violence; and it would be important to declare that the national sovereignty is inherent as well as entire, and that no single generation can by its act divest future generations of their right.

So long as there is a single head to the state there will always be some danger of a revival of monarchical pretensions, and of a dispute as to the seat of the sovereign power—at least in any country where monarchy has long existed and monarchical ideas have taken root. America is republican soil, on which hardly any but democratic ideas can grow; the sovereignty of the nation is firmly established, not only in documents, but in the minds of the people; the President is elected for a short term, his powers are clearly bounded by the written law, he has hardly any military force at his command; yet Jackson showed a tendency to encroachment, and the jobbers who plundered the community under Grant betrayed their desire not only of increasing but of perpetuating his power. A single head of the state is a fancied necessity; the Swiss Constitution, which, instead of a single man, has a council with a president whose function is only to preside, presents great advantages in this respect, and is the safest model for adoption. It, moreover, gets rid of that which is the scourge even of America, but far more of any country where the questions that divide parties are so fundamental and party hostility is so deadly as in France—a presidential election, which periodically stirs up from their depths all the most violent passions, excites the most turbulent ambitions, and brings all questions to a dangerous head. The framers of the American Constitution were in some degree misled, like the framers of the French Constitution, by their British model, which they reproduced in a republican form; they imagined that it was necessary to have something in place of the king, and the elective presidency with all its evils is the result.

Another signal and calamitous instance of mistaken imitation of the British Constitution is the power of dissolution, which the other

day, in the hands of a disloyal President and Senate, was so nearly the means of overturning the Republic. In the days in which the power of legislation, with the other attributes of sovereignty, resided in the crown, and Parliaments were merely consultative, or at most instruments for supplying by the grant of subsidies the occasional necessities of the crown, it was a matter of course that they should be summoned only when the crown needed their presence, and dismissed as soon as their advice had been given and they had voted their supplies. Our modern power of dissolution is a survival of this original state of things. But with us it is no longer practically in the hands of the king, or of any authority outside Parliament; it has passed, with the other attributes of the sovereign power, to the Parliament itself. It is exercised by a parliamentary minister, by whose advice the crown is bound on this as on all other questions to be guided, for the purpose of testing the relative position of parties in the country; and its exercise is limited to that object by restrictions which, though tacit and to be found in no book on constitutional law, are perfectly understood and observed by both parties as the rules of the game. It is in fact the mode by which the House of Commons adjusts itself to the public opinion which is the basis of its power. This has not been seen by those who, thinking to reproduce the British Constitution, have vested in an authority really external to the Parliament, such as the French Marshalate, a power of dissolution, which is in fact a power of extinguishing for the time, and may in disloyal hands be used as a power of extinguishing forever, the organ of the national sovereignty, and the national sovereignty itself. We know well that, in the case of France, the fault does not lie with the friends of the Republic; but it is not in France alone that the error respecting the power of dissolution has prevailed.

Dissolutions and general elections are alike obsolete bequests of old feudal politics; and, though by the practical temperament and the political experience of the English they have been tacitly accommodated, like other parts of the historic system, to the requirements of the present day, they are alike in themselves evil as well as obsolete. The existence of the Assembly, which is the organ of the national sovereignty, and without which the nation is practically powerless, ought never to be suspended for an hour; from its suspension in any country in which elective institutions have still a disputed title, and are threat-

ened by hostile machinations, the most serious dangers may arise. General elections are evil, because they bring on those violent conflicts of opinion, and pitched battles between parties, which, when the differences of sentiment are so extreme as they are between the Ultramontanists and the Liberals, the Legitimists and the Radicals, in France, are in the highest degree perilous, and, as the recent crisis has plainly indicated, might, in a very inflamed state of feeling, lead at once to an outbreak of violence and civil war. To avert such conflicts, to avoid pitched battles of opinion, to make the stream of political progress glide within its banks, and with as few cataracts as possible, ought to be the aim of all framers of elective constitutions. An elective assembly renewed, not all at once, but by installments, and at regular periods fixed by law, independent of the will of any functionary, will fulfill the condition of uninterrupted life, without which usurping governments, like that of De Broglie, may always be tempted to suspend its existence or get rid of it altogether; and it will conform steadily, yet promptly enough, to the changes of public opinion, without those violent revolutions which general elections are apt to produce, and without giving the excessive predominance which they are apt to give to the question or the cry of the day. The necessity under which party leaders find themselves of providing a question and a cry for a general election has had a bad effect even on English legislation.

Another illusion which has led to strange consequences in France, and in all other countries where the building of constitutions has been going on, including the British colonies, is the notion that the House of Lords is a Senate moderating by its mature wisdom the action of the more popular House. As we have had occasion to say elsewhere, the House of Lords is not a Senate; it is an old feudal estate of the realm: its action has been, not that of ripe wisdom moderating popular impulse, but simply that of privilege combating, so far as it dared, all change, in the interest of the privileged order. Whether its influence is really conservative may be doubted: in the first place, because its resistance to change, being unreasoning and anti-national, is very apt, as the history of the first Reform Bill shows, to provoke the revolutionary spirit rather than to allay it; and, in the second place, because it operates as a practical ostracism of the great land-owners, who, under the circumstances of English society, would otherwise certainly find seats in the House of Commons. The real stronghold of English

conservatism is the preponderance of the aristocratic, or rather plutocratic, element in the House of Commons. But at all events the House of Lords furnishes no model to any country which has not an hereditary and territorial aristocracy, or a privileged order of some kind, having its base, and presenting a fulcrum of resistance, outside the body of the nation. If both assemblies emanate from the nation, whatever diversities there may be in the mode of their election, and even if the Senate be not directly elected, but nominated by a government itself the offspring of election, the attempt to make the national sovereignty check and restrain itself by acting through two organs instead of one, and confronting its own impulses with its own cooler wisdom, must ultimately fail. So long as the same party has a majority in both assemblies, the double machinery will work smoothly, but at the same time it will be ineffective. But when the party which is in a majority in the popular assembly is in a minority in the Senate, as soon as an important question arises there will be a collision between the two Houses, and the result will be a dead-lock, which will last till the nation compels one of the two assemblies to give way, declaring thereby in effect that the national sovereignty is delegated to the other. Nor is there any real advantage in the delay which the dead-lock causes, sufficient to compensate for the violence of the struggle, and the dangerous excitation of turbulent and revolutionary passions. Such is the experience of the British colonies in Australia, while in Canada the Senate is a cipher, and its debates are not even reported. In Italy the same party was at first in the majority in both Chambers; but the other day a change took place in the popular Chamber, and at once there were symptoms of collision. In France, the Senate at each great crisis of the constitution has proved impotent or useless, as the historian of parliamentary government in France admits; but it is now showing a tendency, as might have been expected, to become the citadel of a party, or rather a group of parties, bent on overturning the Republic in the interest of some form of government more favorable to aristocracy; and in this way it threatens to prove not a nullity, but a danger of the first magnitude, and an instrument of attempts, such as the attempt of De Broglie, which may plunge the country again into civil war. If the example of the American Senate is cited in favor of a second Chamber, it must be remembered that the American Senate represents the Federal principle as opposed to the principle of population, and

that its authority and usefulness, whatever they may be, thus depend on its connection with a Federation.

Besides, of what special elements do you wish your Senate to consist? What is to be the special character of its members compared with those who sit in the Lower House? Till this is distinctly settled, all devices for particular modes of election or appointment are devices without an object; they are machines for producing something which itself is not determined. Do you wish your Senate to consist of old men, in accordance with the literal meaning of the name, and with the habit of primitive nations? It will represent the infirmities of old age. Do you wish it to consist of the rich? It will be the organ of a class interest, odious and the object of suspicion to all the rest of the nation. Or do you wish it to consist of the best and most trustworthy of your public men? If you succeed in putting these men into the Senate, you will deprive the popular Chamber of its guides and of those most able to control its impulses and passions, and in a manner ostracize your legislative wisdom. Something like this happened to Cromwell when he thought to temper the fractiousness of the House of Commons by restoring the Upper House: to supply materials for his Upper House he had to take his best men from the Lower; the lead in the Commons was broken up; the two Houses fell foul of each other; and the Parliament was dissolved in a storm.

Instead of attempting to divide the sovereignty, which is really indivisible, and to make the nation perform the chimerical operation of producing by election a check upon itself, attention should, we venture to think, be directed, more carefully and systematically than it has ever yet been, to the constitution of the representative assembly, to the mode and rate of its renewal, to the securities for its deliberate action and for the exclusion from it of mere passion and impulse, to such questions as that between direct election and election through local councils or other intermediate bodies, to the qualifications for the franchise in the way of property, age, education, or performance of national duties. It is singular, for instance, that, amid all the discussions about vetoes, absolute or suspensive, to be reposed in kings or presidents, no one has thought of requiring an absolute majority of the whole House for the passage of an opposed measure, or of giving to a minority, if it amounts to a certain proportion of the House, a limited power of delay.

But, of all the things borrowed by France and

other nations from the British Constitution, the most palpably absurd and calamitous, in its general application, is the system of party, which sets up the great offices of state as the prizes of a perpetual conflict between two organized parties, and relies upon the perpetual existence of these two parties and the ceaseless continuance of their conflict as the only available means of carrying on constitutional government. It is strange that any one should have fallen into such a trap who had studied the parliamentary history of England. In this country there have throughout been two parliamentary parties, and two only; while the objects sought by both have been so definite and of such importance as at once to insure cohesion, and to justify, in some degree at least, allegiance to the party standard. The conflict of parties has, in fact, been the means of carrying on and regulating a series of organic changes and reforms in a democratic, or at least in a popular, direction. The adherents of each party have been able to say, with truth, that they were contending for the ascendancy of certain definite principles in government and legislation. At the same time there have been certain principles common to both parties, which, with the remarkable aptitude of the nation, and the retention of the leadership on both sides by a section of the aristocracy, have always, in modern times, kept the contest within bounds. Even so, party has often shown that it is but a fine name for faction; and in the pauses of progress, when there was no great question before the country, the generous emulation of party leaders has sunk into a personal struggle for place with all its rancor and all its meanness. Such, however, as it is, the ground for the existence of the party system is peculiar to England, and has its explanation in her political history: the attempt to reproduce the system in other countries, without the ground for its existence, will be not only senseless, but noxious in the highest degree. To divide a nation forever into two factions, and to set these factions to wage a perpetual war, such a war as that of factions always is, and with the usual weapons of intrigue, mutual calumny, and corruption, is surely the strangest plan ever deliberately adopted by a political architect; and, if we could be convinced that this was the only possible mode of carrying on constitutional government, we should regard the case of constitutional government as hopeless. How can our political salvation be found in a system of which it is the inherent tendency, one might almost say the avowed object, to stir up

discord, to excite unpatriotic passions, to stimulate selfish ambitions, to deprave political character, to destroy that reasonable loyalty to the national government on which the very existence of a free community depends? If the absurdity of such a theory is not manifest enough in itself, let inquiry be made into the working of the system of party in the British colonies, where it has been retained for the personal benefit of groups of politicians, when, all organic questions having been settled, the public grounds for such combinations and for allegiance to party have ceased to exist; it will soon become manifest what are its effects upon the efficiency, purity, and stability of government, on the morality of public life, on the political character of the people. In the United States there was ground enough, and more than enough, for the existence of party while the nation was divided on the question of slavery; and it is not surprising the party spirit should have prevailed over allegiance to the nation, or that there should have been a party conflict of the utmost bitterness, which, being brought to a head by an election to the presidency, ended in a civil war. But the old materials for party having been thus exhausted, and new materials not presenting themselves, the combinations are breaking up, the lines are becoming confused, and the present Government, in undertaking the work of administrative reform, hardly relies more on the support of its own party, the regular managers of which are all against it, than on that of the best section of the other party, and less on either than on that of the nation at large.

The historian of parliamentary government in France, M. Duvergier de Hauranne, who tacitly assumes throughout his work the necessity of the party system, states its theory thus: "In free countries, where liberty is not of yesterday, there always exist, in the bosom of society, two principal tendencies, one toward liberty, the other toward authority, which manifest themselves in all legal ways, above all in the way of elections, and which usually produce two parties, having each its principles, its opinions, its flag. Of these parties one has the majority, and governs, not directly but indirectly, by the influence which it exercises, the choices which it indicates, the measures which it defends or combats. The other becomes the Opposition, and watches the Government, controls it, keeps it up to the mark, till such time as faults or a movement of public opinion change the relative position of the parties, and give it in its turn the right and the power of governing." Two tendencies, according

to this eminent writer, there must always be in the nation, one toward authority, the other toward liberty; and these tendencies are the foundations of the two parties, by the perpetual conflict of which government is to be carried on. But, suppose a man to have an equal and well-balanced regard both for authority and for liberty, to which party is he to belong? Or is he to remain in a state of suspension, and to be eliminated from politics, because he thinks rightly and is free from undue bias? Suppose the nation itself to have arrived at a reasonable frame of mind, to be practically convinced that, while the preservation of ordered liberty is the object for which authority exists, rational allegiance to authority was essential to the preservation of liberty—what then? Because the nation was all of one opinion, and that opinion evidently the right one, would the possibility of good government be at an end? Then, again, do not those who hold the view of M. Duvergier de Hauranne perceive that, while it is essential to their theory that there should be only two parties, that of authority and that of liberty, that of the Government and that of the Opposition, the fact is that in France there are a dozen, that the same is the case in other countries, and that even in England, though the Conservative party, which is a party of interest, retains its unity, the Liberal party, which is a party of opinion, is splitting into sections, which are becoming every day less amenable to party discipline, and therefore weaker as a whole? It is evident that, as intellectual activity and independence of mind increase, sectional differences of opinion will multiply, and party organization will become more impracticable every day. Nothing will be left us but hollow, treacherous, and ephemeral combinations of cliques which have no real principle of union, and which will be torn asunder again by mutual jealousies almost as soon as they are combined. Intrigue and cabal will continually gain force; the hope of a stable government will grow more faint; until at last the people, in sheer weariness and despair, will fling themselves at the feet of any one who promises to give them stability and security with the strong hand.

An executive council, regularly elected by the legislature, in which the supreme power resides, and renewed by a proper rotation and at proper intervals, so as to preserve the harmony between the legislature and the executive, without a ministerial crisis or a vote of censure, is the natural and obvious crown of an elective polity; and to something of this sort, we venture to think, all

free communities will be ultimately compelled to have recourse, by the manifest failure of the party system. If further security for the responsibility of the executive to the legislative, and for the maintenance of harmony between the two, were deemed needful, it might be provided that, besides the limitation of office to a certain term, each member of the council should be liable to removal at any time for special cause, by the vote of a certain proportion of the assembly. Such a provision would have enabled the French Legislature to get rid of Barras and his two accomplices in the Executive Directory as soon as it became manifest that they were conspiring against the Constitution.

A national assembly, elected under such conditions as may appear to be most favorable to the ascendancy of intelligence and public spirit, representing the undivided sovereignty of the nation, always in existence, renewed by such installments as may preserve its popular character without rendering it the sport of temporary passion, legislating under rules the best that can be devised for securing deliberate action, and in its turn electing the members of a responsible executive—such, once more, seems the natural organization of a community which, in the course of human progress, has discarded the hereditary principle, and adopted the elective principle in its stead. No constitution can protect itself against the external violence of a great army, if the army is willing, at the bidding of a military usurper, to cut the throat of public liberty. No constitution can change the political character of a nation, or cure, as by magic, the weakness and servility contracted by centuries of submission to a centralized and arbitrary administration. No constitution can neutralize the bad effects produced on public spirit and on mutual confidence by the decay of religious belief in the minds of a great part of the nation, and the absence or imperfect development of any new faith. No constitution can eliminate the general vices of human nature, or the special vices of the particular nation. But such a constitution as we have indicated would at least not contain in itself the certain seeds of its own destruction; it would not be liable to legal dissolution by any external power; it would continue to exist, to do its work better or worse, to renew itself by an operation as regular as the seasons, and which there could never be a special temptation to interrupt; without inducing torpor, it would avoid anything like a violent crisis, such as is brought on by a general election, es-

pecially after a penal dissolution; it would keep the way always open to the reform of what is bad, by means of improved elections, and without a revolution; it would give full play to any increase of virtue and intelligence which there might be among the people; its course would no doubt be at first somewhat halting and unsatisfactory among a people whose training has been so unfortunate, but it could hardly fail to the ground, or fail to answer in a tolerable way the ordinary ends of government.

Of the present constitution, unfortunately, the contrary is true. It does contain in itself the almost certain seeds of its own destruction. The quasi-monarchical power, presidency, marshalate, or whatever it is to be called, and the Senate, which is sure to have an aristocratic character, will probably remain, as they are now, the double basis of a perpetual reaction in favor of the hereditary principle, to which privilege, with good reason, clings; and recent experience renders it highly probable that the two, if firmly united, would be able by successive dissolutions, combined with the exercise of government influence in the elections, to place in the utmost peril, and practically to annihilate, the organ of the national sovereignty, and the national sovereignty itself. The constitution of "three powers" is a constitution of civil war.

In discussing constitutions, however, and the revision of constitutions, we are haunted by the unwelcome apprehension that something of a sterner kind may yet be in store for France. We do not greatly fear that a soldier, whose name is associated with nothing extraordinary or great except defeat, will conceive the design of founding a military empire in his own interest. We do not greatly fear the clericals, since the catastrophe of Eugénie and her priests, and when Ultramontanism, in spite of its recent

spasm of aggressive energy, is manifestly losing ground throughout educated Europe. We do not even greatly fear Bonapartism in itself, simply as a movement in favor of the restoration of a military despotism for the benefit of a discredited dynasty. What we fear is the implacable hostility of aristocracy to a republic based upon equality. In France the three aristocracies, Legitimist, Orleanist, and Bonapartist, are now collectively strong; their wealth has greatly increased; they begin to feel a common interest, social and political, though they are at present ranged under the banners of different pretenders, and have hitherto, by their disunion, saved the Republic. One and all, they instinctively hate equality, and those hate it most bitterly whose nobility is of yesterday. You may demonstrate as clearly as you please that aristocracy has had its hour, that humanity is passing into another phase, that the best and most glorious part which a man who inherits the influence of aristocracy can play is to smooth the transition into a new era: some of the finer minds, and of those who can hope to maintain their position by their own character and intellect, will perhaps listen to you; the mass will obey the bias of class, cling to privilege, and constantly conspire against equality and any institutions by which equality is upheld. Their feelings toward the democratic masses are not those of mere political difference, but of hatred more bitter than that which is felt by a foreign enemy, and aggravated by contempt. The aristocratic conspiracy, for such at bottom it was, of De Broglie and Fourtou has for the moment failed; but the attempt will be perpetually renewed: and it will be fortunate, indeed, if the question between the republic and the aristocracy is finally decided without adding another convulsion to the ninety years' agony of France.—*Contemporary Review*.

RUSSIAN AGGRESSION,

AS SPECIALLY AFFECTING AUSTRIA-HUNGARY AND TURKEY.

By LOUIS KOSSUTH.

IT will not be amiss to ventilate a little the Eastern question. Not as if I could say anything new, but because purified notions may consolidate instinctive aspirations into convictions, and longings into purposes.

The Eastern question is a European question. There is no power in Europe that would not feel that the phases of that question are connected more or less, mediately or immediately, with its own interests.

Whence comes the importance of this question?

How and when did the Eastern question become a European question?

By the increase of the Russian power, and since the time when Russia—by the diminution of the Turkish Empire and the dismemberment of Poland—*increased to formidable proportions, and thus became dangerous to the freedom of Europe.*

I feel thankfully indebted to the Porte; and I do not, like many people, consider gratitude to be a burden, but to be a dear obligation. I learned to esteem highly the noble qualities of the Turkish national character; and I learned it the more from the admirable phenomenon that this people of tenacious morals could not be corrupted in their rich social virtues even by the pestiferous air which has floated over them from Constantinople through a period of several centuries, during which this capital has been converted into a witch-kettle of European intrigues, fighting for the maintenance of the equilibrium. This corrupt influence has found among the higher circles around that kettle individuals accessible to bribery; but the country people remain attached to the moral feelings and to the holy relics of social virtues, in the same way as in Hungary the eternal holy flame of nationality has been kept burning around the hearths of our people, while it has been extinguished in the palaces. It is true that the Turkish people remain still far behind in what we call civilization. This is not the fault of their susceptibilities, nor of their willingness; but it is quite certain that only national morality can supply a good soil for the roots of liberal institutions, and that they decay or become false without it. Quite as certain is it that the world would admirably con-

template how easily the most liberal institutions would take root, how naturally they would become acclimatized among the Turkish people, if Europe would but prevent the hereditary foe of the Turkish Empire from interfering with the spread of endeavors inspired by the warnings of time.

But these are my personal views, my individual sympathies. Sympathies, however, are no centre of attraction for the politics of the world, but self-interest is; and, though for a long time the conservation of the Turkish Empire was a dogma of the politics of the European equilibrium, and is still so *in foro conscientie*, it does not follow that Europe is in love with the Turks, but only that it *abhors the increase of Russian preponderance.* And rightly so.

The Eastern question is a question of Russian power. "Hinc omne principium, huc refer exitum." This is the summary of European interests, considered from the European point of view. Every policy is either a cheat or a fallacy which does not take this fact as a starting-point.

The Eastern question is a question of Russian power. If this line be struck out, the Eastern question ceases, *ipso facto*, to be a European question. It descends at once to the level of internal questions, whose changing phases may be followed sympathetically or antipathetically, according to the inspiration of political principles or instinctive feelings; but they will never disturb the sleep of any European power. The Turkish Porte may succeed (and I wish from my innermost soul that she may succeed) in conciliating all her nationalities of diverse races and creeds, either on the ground of equality of rights, surrounded by constitutional institutions, or by personal union, or on the ground of a strict federative system; or, if she does not succeed, and on the ruins of her fallen power the nationalities of her empire should rise to autonomy, asserting their national individuality, all this will not threaten the peace or the liberty of Europe—all this will never be converted by anybody into a European question.

On the contrary, the Eastern question lies in the actual situation. Every aggression, either on

the integrity of the Turkish Empire or on her sovereignty, will always threaten the peace of Europe, because every direct or indirect increase of Russian preponderance in Europe will be a step to the fulfillment of that prophecy of Napoleon, that "*Europe will become Cossack.*"

They speak of humanity. Good God! where is the *Christian* power in Europe that has not unscrupulously disowned human feelings, not only when its own interests were concerned, but very often from mere revenge? What bitter feelings and remembrances crowd into my brains with feverish heat when I think that I am a Hungarian! and how many other terrible examples could I quote, through the long line of historical atrocities, down to the insane brutality of the French Commune, and to the subsequent reprisals of loosened fury! And I ask, Where and when has the trampling down of humanity, the traces of which are visible all over the world, been made a European question?

But it is impossible not to feel indignation in our human bosoms when we see that the very same power which rose by trampling down the freedom of its people, from the Vistula to the Behring Strait, from the Euxine to the glacial sea, covers its dangerous schemes with the veil of humanity, and increases continually the giant stature of its power by such systematic consistency and pitiless cruelty as stand unequalled in history.

There is no question of humanity here, but simply of the increase of Russian preponderance. The one is only dust thrown into the eyes of mankind that they may not see the other.

And they speak of freedom, of self-government! But the thing stands thus, that while Russian power presses upon the southeastern part of Europe, the Christian nationalities of the Turkish Empire will never be reconciled to the suzerainty of the Porte, nor can they become free and independent. They can only be instruments of Russian policy—sometimes by force, sometimes willingly, but always serviceable instruments.

Look at Servia. As far as the Porte is concerned Servia was a free country, quite as much so as any other European nation, and she wanted nothing but the mere title to be entirely independent. She was more independent than Hungary is at present with respect to her political, financial, and economical administration, in every point of view, even as regards the tribute payable to the Porte. But she was not free, she was not independent, with respect to Russia; she could not be so. Whoever has a protector has a mas-

ter too. Not that the Servians would not prefer to be free Servians, rather than vassals under Russian rule; but because they are unable to resist Russian pressure. This is the fatal necessity of the situation. The dust of verbal assurances was thrown into the eyes of Europe from St. Petersburg. It was said that the czar kept back Prince Milan from waging war. But Russian agents stirred up the fire of war; the easily inflammable passions of the Servian people were fanned by the prospect of securing Bosnia, and by the phantasmagoria of a "great Servia." Russian money overflowed Servia, a Russian general was placed at the head of the Servian army; Russian officers, and even such as were in active military service, were sent expressly on furlough; and thousands of Russian soldiers crowded to Servia. And thus under the Servian mask it was that Russia began war against the Turks, in order to get a pretext to continue the war unmasked. The Servians were intoxicated with the war-cry of Slavonian liberty (which liberty blooms of course in Russia very nicely!) without perceiving that they fought, bled, and died not for freedom, but in the interests of Russian preponderance. And what has become of "free" Servia? There she hangs on Russia's pleasure. She is at present a vassal of Russia. Russian military patrols keep the Servians "in order" at Belgrade. These are very edifying things, and very instructive too.

Or, let us look at Roumania. I have here no room to draw up an epitome of history, but it would be very advisable if the diplomatists would do so and study it a little. They would learn therefrom what is meant when Russia guarantees "self-governmental reforms" by "occupation of territory." I wish only to recall to mind that, since the time of the capitulation between Mircea and the Sultan Bajazet on the part of Wallachia, and between Bogdan II. and Selim I. on the part of Moldavia, the Porte has always respected the liberty and self-government of Roumania. She has respected them in such an unheard-of liberal way that the mighty Porte, the sovereign power, conceded to her vassals the most unbounded religious liberty, excluding even from these vassal provinces her own creed, and did not grant to her own Mohammedan subjects even the right of possessing there any landed property. The Turks have never violated that treaty. *Næe!* Roumania was free; she is indebted for all her troubles and misfortunes (and, alas, how much has she suffered!) to the meddling of Russia. And every Roumanian patriot feels that, if Russian

power surrounds Roumania—this island in the midst of a Slavonian sea—his fatherland will be broken to pieces by the folds of the boa-constrictor. Every Roumanian dog knows it! And it was Europe that guaranteed the freedom and neutrality of Roumania!

And still Roumania is the high-road by which Russia marches to wage war against Turkey. Roumania is still the basis of the Russian war-operations against the Porte, as it was in the year 1849 of those against the Hungarians. The Roumanian Government prayed, with clasped hands, to the guaranteeing powers that they would protect her neutrality. But the Russians are very clever politicians; they chose the right moment in which to stir up anew the Eastern question.

England is powerful. She can defend Constantinople and sweep the Russian flag from the seas. But she is not a Continental power. She alone cannot send an army of some hundred thousand men to Roumania.

France is still maimed; she begins to recover, but she suffers from her past losses. If she were not maimed, Russia would not dare what she dares now.

The German Imperial Government has polite words for every one, but it is its policy not to allow an alliance of any European power with Turkey against Russia, in order to localize the war. If this succeeds, it will be of the greatest service to Russia, as she will thus have an opportunity of preparing for the occupation of additional territory by raising internal convulsions in the Turkish provinces. And she will do it at the given time as well in Hungary as in Austria. And what is the key to this policy of Prince Bismarck? Nothing else but that he is afraid to offend Russia, as she might think of giving to France an aiding hand to procure revenge.

Lucky Italy, who deserves her luck for her constancy centuries ago, and who wins provinces by losing battles, is on the lookout to see whether there is visible on the horizon a completing ray of light for the "Stella d'Italia."

In the councils of Austria the traditional demon of "rapine" goes about, and, where he does not appear, the paralysis of irresolution "hums and haws" from one day to the other.

Hungary is a province, and not a state; she cannot follow an independent policy. She has given up herself. She is treated to death.

They counted on all this at St. Petersburg, ere the "pacific" Czar Alexander became such a resolute "champion."

For Roumania the end will be that the free

Roumania whose neutrality has been guaranteed by the powers will be held in dependence by Russia, as she has been so many times before. The Roumanian-Russian alliance is an accomplished fact, and by it Roumania has become the auxiliary of Russia. What could the Roumanians have done? Could they, left alone to themselves, have resisted the Russian pressure? Could they, wolf-like, have shown their teeth to her whom the European powers regarded with lamb-like patience? The situation coerced them.

This is the philosophy of the Eastern question. As long as Russia is conscious of her overwhelming power, and knows that she may press with all her might upon the Turkish Empire, nobody can there become free or independent. They may change masters, get a new patron, but the new patron's vital power consists in an autocracy in whose outspread arms Freedom dies, and only the weeds of the *Nihilismus* pullulate secretly. Such a "patron" they may get, but nobody can become free under "Russian protectorship."

And it is right that I should mention here what misconceptions there are as to the meaning of the tide of feelings and apprehensions that shakes the nerves of the Hungarian nation. They say the Hungarians are afraid of the freedom of their neighbors, the Slavonians. This is not true. It is only intrigue that can say so, only blindness or silliness that can believe it.

Hungary and the Hungarians' love of liberty are "twins born the same day." They have lived together a thousand years. The Hungarians nowhere and never feared, and do not fear liberty. And they were never exclusive in their love of liberty; they never accommodated even their privileges to certain races. And we are the less afraid of the liberty of our Eastern neighbors, since I feel thoroughly convinced that if these nations were to become free—really free, not Russian serfs—then Hungary (if she may still keep the mastership of her own destiny) would be quite ready to inaugurate with them such defensive combinations as, though in the interest of the European equilibrium, would also uphold and secure their *individual national independence*.

And I am convinced also that such a combination, in which the Turkish nation may very naturally join, is one of the chief necessities of the logic of history. Only in this order of ideas can be found security for the independence of minor nations against the pressure of the greater aggrandizing powers.

We are not afraid of liberty, but of the increase of Russian power. That is what we Hun-

garians are afraid of. We fear that, if the Turkish Empire should be dismembered, if its sovereignty should be undermined previous to the removal of this danger, and if this dismemberment and undermining should be provoked by Russia, and turned to her profit, the result would not be that free nations would rise out of the ruins of the Turkish Empire; but rather the result would be Russian occupation, or else (which is the same thing, though more dangerous) Russian servitude, accompanied, as a compensation, by the "grand idea" of affinity of race as a honeyed cake; and the Slavonian nations would be fettered to the Russian yoke. This would, in some inevitable way, have a tendency to enslave Hungary as well, and we should finally, after many and great struggles, be brought to perdition, as Poland was a century ago.

And I must observe that the danger that threatens us threatens still more the Austrian Empire. There is between us such a community of interests as gives the power to secure the removal of this danger; and the Government can thus count on the whole nation, which would rise as if her millions were only one man, not merely in blind obedience, but with all the power which a nation can exert when it defends its existence, its very life.

This is the danger that shakes the heart-strings of the Hungarian nation. This makes it ready for every exertion, for every sacrifice, in order that the integrity of the Turkish Empire and the sovereignty of the Porte may not become a prey to Russian tyranny and aggrandizement.

Remove this danger, and we shall always approve the regenerational endeavors of the Turkish nationalities, and shall feel great pleasure if this regeneration succeed without destruction of races, language, or creed—the old internal hatreds being superseded by equal laws and equal freedom. We Hungarians shall thus acquire in the Turkish Empire such friends as could not be found elsewhere on the surface of the whole earth. But if Fate, whose skein is composed of the thread of the immutable past, should decide that all these endeavors shall be fruitless, owing to so many impediments being thrown in the way of their fulfillment by foreign intrigues, egotism, meddling, and passion, then we are very much afraid of the liberty of our neighbors. If the contrary happen, however, we will welcome them at the round table of free and independent nations; we will offer them our hands, and aid them so that their liberty and independence may be secured against every external aggression.

Far from my fatherland I live in solitary seclusion, and shall die there. But if I am forced to forget much, there is something I can never forget; it is that I know the Hungarian heart, on whose throbbing my hand has so often rested.

I shall now state why I think that Hungarian public opinion should occupy a determinate position on this Eastern question.

It was diplomatically acknowledged, during the crisis of 1854, how dangerous Russian power had become to the liberty of Europe, and it was then seen that the future could only be secured against the renewal of this question by that power being reduced to lesser proportions, such as would not endanger Europe.

This was what England aimed at in the Crimean war of 1854. But her programme could not be carried out then in consequence of the *attitude of Austria*, as may be seen from some of the articles in the French *Moniteur*, containing those official revelations with which Napoleon III. tried to soothe English public opinion, the fluctuations of which I then strove to direct, and which strongly demanded the restoration of Poland.

And the programme not being carried out is the reason why this question now shows itself in a still more dangerous form than it has ever done since that time.

In a more dangerous form, I say, because the Russian preponderance of power has assumed such a character as against the liberties of Europe generally, and against those of our country particularly, as shows her aim to be new territorial annexations.

The Emperor of Russia has written upon his banner "The Slavonic Cause." This was the phrase used by him on the occasion of his war-like speech at Moscow. This phrase had hitherto been paraded only in the Slavonian dictionaries for private use; it had not before appeared in the plan of the confessed policy of the Russian Government. It now appears from beneath the ground, where it had before worked mole-like—rising, on the arms of the absolute autocrat of 82,000,000 serfs, to the daylight as an active power. The czar now occupies the position of the declared champion of Panslavism.

And what is this Panslavism? This is no merely national matter, no affair of national freedom. It absorbs the different Slavonic nations into one single race. It substitutes race for nationality; power of race for liberty.

The signification of "The Slavonic Cause"

as a Russian war-cry is this : that the cabinet of St. Petersburg seeks, wherever there are Slavonians, instruments wherewith to paralyze the policy of some other power, to cripple its force, and to find in the Panslavists wedges with which it may split states asunder, if they stand in the way of Russia's extension of power ; and to create new combinations, either as her tools or her objects, for the sake of her aggrandizement.

At present it is the Turkish Empire that is the anvil upon which Russia strikes with her Panslavistic hammer. Her first object is the country which forms an angle betwixt the vital artery of our fatherland and Austria—the Danube, and her estuary on the coast of the Euxine.

That after the Turks we and Austria would next be struck upon is quite clear. Not to see this is blindness. To see and not to prevent it is suicide.

This is no mere question of sympathy or antipathy. It is a matter of vital importance for Hungary that the integrity and sovereignty of the Turkish Empire should be secured, and that Russia, who is the enemy of the liberties of Europe, should have her poison-fangs torn out before she can consolidate and increase her annexations for her own advantage.

This is the philosophy of the situation.

It is a fact that, with respect to this danger, the workings of diplomatists afford to us Hungarians no comfort. They dissimulate ; they will not even show that they are aware of the real danger.

The traditions of the past are very disquieting. It is an historical fact that there is not a single example of Austria having taken the part of Turkey against Russia. She has always been biased in favor of Russia. She has always, indeed, declared openly for her. There have been cases when she acted as mediator, as at Nimierow ; and, as soon as she heard of the capture of Cracow by the Russians, and their invasion of the Crimea, she attacked with armed force the oppressed Turks. She made a treaty with the Russians for the dismemberment of Turkey. She had a share in the prey. She accepted the half of Moldavia (Bukovina) as a compensation for Poland, of which she got only a small part. So it was planned by Kaunitz and Gallitzin.

These are the traditions of Viennese policy on the Eastern question.

That a continuation of this traditional policy would be dangerous in the highest degree to our fatherland and to the monarchy is clear. To

permit Russia to become either the direct lord or the dictator of the southern Slavonians, to be the steel hoop which compresses them, is equivalent to multiplying the splitting wedges.

I cannot believe that these dangerous traditions can be continued within the circles of a constitutional government. But there are very influential circles, apart from constitutional bodies, that stick to this traditional policy. They are fond of those siren songs which are always heard when Austria has lost something, and whose burden is, "Go for compensation to the East."

These are very disquieting things. And it is a fact that the Hungarian Government has till now done little to soothe or to appease the mind of the nation. Its reservedness has transgressed the farthest limits. Though reservedness may be safe in some cases, when it overreaches itself it is a fault, a blunder.

Now, as the situation is full of danger, as diplomacy gives no comfort, as the traditions of the past are disquieting, and as the Government does nothing to appease the people, it is not only a natural consequence, but it is also a postulate of self-preservation, that the nation should now occupy such a position on the Eastern question as should make the whole world aware what is the political tendency most conformable or most contrary to our national interests.

The interruption of the manifestations of public opinion, caused by the very sinister prorogation of the Hungarian Diet, was explained, if not as a change of mind, at least as a loss of interest, and gave rise to the apprehension that in the councils of the Viennese cabinet certain influences, whose existence is an open secret, might gain the preponderance.

This apprehension was very well founded. The "taking up" of a position preparatory to becoming a sharer in the booty was nearly accomplished when, fortunately, the Turkish victories stopped these dangerous preparations, and Hungarian patriotism watchfully called out, "Be on thy guard, Hungarian ! who will keep watch for thee, if thou thyself doest it not for thy fatherland ?" And it spread all over the country, loudly proclaiming to friends and foes that the Hungarian nation wakefully watched.

When I speak of the Hungarian nation, I do not mean the Magyar race, but every faithful son of the fatherland, without distinction of race, tongue, or creed, who sticks patriotically to that type of government which has belonged to Hungary for a thousand years, and who wishes to see also Hungary remain as Hungary in the future,

with her unity and indivisibility forever secured.

This it is that serves as a criterion of the public opinion of the Hungarian nation. This, and not an inflamed sentimentality, sympathetic or antipathetic, is the starting-point of the conviction, that dikes should be raised against the Russian extension; for, if we do it not, we expose our fatherland and the monarchy, whose interests in this respect are identical, to the necessary consequence that the Russian power, increased already by the dismemberment of Poland to formidable proportions, would attack, after this new augmentation of force, the Austro-Hungarian monarchy as a boa-constrictor that compresses her giant folds around the body of her prey, or as a hundred-armed polypus that screws itself into the flesh.

That this would be the unavoidable consequence of Russian extension cannot be doubted, considering the geographical position and ethnographical situation of the Austro-Hungarian monarchy.

Then it will no more be a question of the Hungarian race—reduced by the Russophiles only to four millions of inhabitants; it will be a question whether Hungary shall remain Hungary.

And now it is necessary to point out a dangerous network which already hangs around us. This network is knitted out of that erroneous conception that the power of Russia can only become dangerous to us by territorial occupation.

They say: "The czar has given his word that he will not *occupy*; and the czar is an honest man" (Brutus is an honorable man); "let him then manage" (I very nearly wrote mismanage) "in the East. The present vocation of the Austro-Hungarian monarchy is to remain in readiness" (and, of course, only in the south, where we can do mischief to the Turks, but in no imaginable case to the Russians), "and only to step into action if the czar should break his word, and want to occupy while the peace negotiations last. Oh! then we shall draw out the sword from the scabbard, and then we shall do—this and that."

The nation should be on its guard against this network. It is a very dangerous network.

1. I say, if the czar should come out victoriously from this war, then the Vienna cabinet will not draw the sword to impede the czar in his occupation, but only that it may participate in the booty. God save our poor country from this suicidal tingling of swords, where infamy would cover the suicide! But let us keep also

in mind that God protects only those who defend themselves.

2. I say, even if the Viennese cabinet would impede at *such a time* the Russian occupation, it would not find a single ally to assist it to overthrow an accomplished fact, such as it could secure at present if it wished it, for the far easier task of preventing Russian occupation from becoming an accomplished fact. Prussia would not help her out of this difficulty with Russia; France would not help her; Italy would not help her. The Vienna cabinet would then have, not an ally more, but a *mighty ally less*, one who under given circumstances would prove better than any other, *and this is the Turk*. We should lose him by your network policy; we should lose him without replacing him by any other. We should lose him, whether the czar occupied territory or not. In the case of his raising army after army against the forsaken Turks, and finally conquering them—then, of course, a Turkish alliance would be out of the question. Or if the Turk, losing patience at the foul play of Europe, and above all of the Vienna cabinet, should say, "Well, if Europe, and especially the Vienna cabinet, does not care for me, I do not care for them either," and should sign a separate peace with Russia—then the Vienna cabinet might stare at your wooden idol, eliseid by its own political wisdom, and write protocols, which would be "set aside" by the "world's judge," History, as has always happened.

Thus this policy of looking out for the keeping or not keeping of the czar's word is either bad calculation or criminal calculation; either crime or folly. Take your choice.

But there is a still more decisive view for us. This is, that the menacing danger for the Austro-Hungarian Empire would not be removed even if the czar kept his word and did not occupy; for, even if he did not occupy, but terminated the war victoriously, the fact that he had conquered would secure for him the power of leadership—that dictatorial influence which is his designed aim, and is written on his banner as "The Slavonic Cause." And for the Austro-Hungarian monarchy the danger is not greater from the czar extending his power by occupation than it would be if he showed by victory that he can be a mighty stronghold of "The Slavonic Cause," and thus extend his influence over the Eastern Slavonians and over those that are with them in the same camp—viz., our neighbors on the left hand, as well as those on the right hand, and also in our own country. These he could dispose of as

their leader, their lord, their protector. The Muscovite papers do not conceal that, as the banner of "The Slavonic Cause" is unfurled, so, after the Turkish "Slavonic Cause," the "Slavonic Cause" of the Austro-Hungarian monarchy will follow. And this is no idle boast; it is logic. This latter kind of Russian extension is really more dangerous for us and for Austria than any occupation of territory—a mode of extension which does not win over, but alienates, those whose country is occupied. It is not a desirable fate to be a Russian subject, and an occupation is, at the worst, but a boa-constrictor, against which it is still possible to struggle; but the other one is the polypus: if he pierces into our flesh, there is no possibility of extrication left for us.

The danger which arises from the Russian movement cannot be averted effectually from the Austro-Hungarian Empire by watching the czar's promise; for in either case he will occupy a conspicuous place on the page of history as the victorious leader of Pan Slavism. The Slavonian aspirations toward a universal monarchy will gather around czarism; this will be the star that will lead the way, the Messiah to whose call they will listen, the idol they will adore, the lord who will command them, and whose obedient serfs they will be; and thus *Pan Slavism will develop into Pan Slavo-czarism.*

But, if we send the czar who unfurled the Pan Slavonic banner back as a loser, then the wings of his Genghis-Khanic flight will be clipped, the charm broken, and the Pan Slavic aspirations will lose their force. The Slavonians will perceive that it is not safe to carve for themselves an idol in order to adore him as the god of liberty. The prop will be found broken, and the support will fall asunder like loosened sheaves. The different Slavonic nations will not seek salvation in the worshiping of the czarism that leads to Russification, and therewith to the fetters of slavery, to drunken misery, and dreams of brutality; but, in the conservation of their individual nationality, in the elevation and maintenance of the vestal-fire of their self-esteem, they will find the road that leads to freedom. And we Hungarians will welcome them heartily on this road, accompany them with warm sympathy, as we accompanied them in past times, and, as far as we are able, aid every pulsation of the vital power of yon miraculous Slavonic "*living statue*," whose national consciousness has never been broken, either by seduction or by the storm of long-sufferings.

Really, if there be any situation that is clear, the present one is.

The Turk has understood the signs of the time. He gave a constitution to the communities of his empire, without distinction of race, tongue, or creed, on the basis of equality before the law. His enlightened statesmen provided that all the excrescences of exclusiveness, which had been successively added to the morally pure civilization of Mohammedanism, should be buried in the grave of the past. The Czar of all the Russias threw his army into the midst of this peaceable undertaking to prevent the Turks from realizing this liberty. He was afraid that, when even the half-moon should reflect the glare of the sun of liberty, this glare might penetrate into the darkness of his servile empire, as the beams of the Hungarian peasant-emancipation had penetrated the night of Russian slavery.

The Austro-Hungarian Government must reckon with itself as to what can be claimed legally and fairly from the Turkish Government in the interests of its Christian subjects, without undermining thereby the existence of the Ottoman Empire. Let them come to a mutual understanding with each other. It will not be so difficult, since the Porte has intelligence and good-will as well. They should conclude a treaty of alliance on the basis of this understanding, for the repulse of the Russian attack which threatens our fatherland and the Austrian monarchy very dangerously. With this alliance consummated, let Austria-Hungary say to Russia: "Well, the Turks have administered justice to their subjects, and thou wouldst still continue the war. This can have no other meaning than that thou strivest to extend thy power. This we cannot permit in the interests of our monarchy, and we are firmly resolved not to allow it. Then let the bloodshed cease."

And it would cease. The Russian would not expose himself to the chance that, while the Turkish lion stood in front of him, the Austro-Hungarian military force should take up a position behind his back and cut off his retreat. The fatherland and the monarchy would be saved without striking a single blow, or at a proportionately small sacrifice; which sacrifice might be reduced to the concentration of a conspicuous army-corps. This demonstration should of course be made on the Danube and in Transylvania, but not in Dalmatia, nor on the Croatian military frontier, which would be very ridiculous if it were not at the same time very suspicious. And with the safety of the fatherland and of the monarchy

the demands of humanity would be considered also, for it is indeed very shocking that there should be a war in the nineteenth century, which, in its horrors, exceeds the Mongol invasion in the thirteenth century. And the protection of the Eastern Christians would also be vouchsafed, without crippling the integrity and independence of the Turkish Empire or the dignity of the state. These results, which can be attained thus, but only thus, would secure the weight, the authority, the splendor, and the fame of our monarchy in the highest degree.

I have only tried to show the political bearings, not to lay down precise schemes of action. I feel convinced that the looming danger can only be averted from our country and from the monarchy by a policy having the above-named tendency.

And it is certain that, with such a tendency, the Government could securely count on the self-sacrificing readiness of the entire Hungarian people without exception of party.

And why does not the Government attempt it? Such a chance is very rare. Why not use it? These circumstances open up to Count Julius Andrassy the opportunity of covering himself with great and lasting glory. He can become the savior of his fatherland, of the monarchy, of the reigning dynasty, if he will understand the work of the hour. He will be their grave-digger if he does not do it, or if he dares not do it.

What hinders him from doing it?

I hear Prussia mentioned. Yes, ten years ago the nation was frightened into the delegations by the Russian hobgoblin, and now she is like to be driven into the arms of Russia by the terror of Prussia.

I will not deny the Russian inclinations of the Berlin cabinet. The personal leanings of the Emperor William have a share in this, possessing undoubtedly great weight in the decision of the Berlin policy. And the false position of Germany has also a share therein, into which false position she has been thrown by the conquest of Alsace and Lorraine, which seems even to push into the background a consideration which should never be lost sight of by Germany, at present the first power of Europe. This consideration is that every increase of the Russian power must necessarily compromise the primatial position of the German Empire in Europe; and that, in the last analysis — against which personal inclinations struggle in vain — it may lead to a collision between the German and Slavonian races, the like of which has not yet been witnessed by the world.

Rome and Carthage cannot exist side by side for long.

But, however strong the present inclinations of the Berlin cabinet may be, they cannot go so far as to compel Prussia to take Russia for her patron, and become the client of the latter. And, in the last resort, the German Imperial policy has to reckon with the other German princes and with the German nation; and among the former, as well as in the ranks of the latter, there are those who recollect Russian patronage and the significance of clientship for Germany under Russian rule. And those who recollect this would soon warn the Berlin cabinet that German blood belongs to Germany, and not to the Russians.

The knowledge of the logic of history, which I have acquired by long study and painstaking (and the cares that whitened my hair have their own tale to tell), and, at last, experience, have taught me that the German Emperor might give advice in the shape of Russian inspirations, but that, whatever be the policy of the Vienna cabinet in the Eastern question, it is certain that, to favor Russia, the German Empire will never declare war against the Austro-Hungarian monarchy.

I take all that they say about Prussian threats for mere claptrap, originating from yonder camarilla, that strives—and, alas! strives with great effect—that the Vienna cabinet should do the same things in aid of the aggressive Russian policy against Turkey that it did against Poland, when Russia undertook to annihilate the independence of that unhappy country, and for the same end—viz., that she should become a sharer in the robbery, instead of allying herself with Turkey, as she ought to have done with the Poles, to frustrate the robbery.

This is the danger which I see, like a death-prophesying bird, with outstretched wings, fluttering over my country; and my patriotism stimulates me to call to mind other things in connection with certain premonitory reflections on the rising manifestations of public opinion.

I repeat that the important point for the Hungarian nation in this question is this: that by the war which rages in our neighborhood the vital interests of our fatherland, as well as those of Austria, are jeopardized.

I place weight on the fact that at present the vital interests of Austria are in harmony with our vital interests.

My views on the subject of the connection between Austria and Hungary are known. These

interests are in such opposition with reference to reciprocal state-life and mutual state-economy, that it is utterly impossible even to fancy any form of connection that would be satisfactory to both countries. It is for this that I remain in exile—a living protest against this connection.

I do not, therefore, consider it to be my duty to feel sad forebodings for the special interests of Austria when its danger does not at the same time threaten the interests of our fatherland. But, when the danger of the one walks arm in arm with that of the other, I put great weight thereupon, in order that Austria should feel the danger in unison with Hungary.

We stand in the face of a war that threatens our country and Austria with mortal dangers if we do not aid the Turks in impeding the extension of Russian power. This war has found Austria in a state-connection with Hungary. I do not think that Russia would listen to us if we should tell her she should delay the war till this connection be dissolved. She would surely not delay. Then things stand thus: that the same King of Hungary whom our nation asks to frustrate the Russian aggressive policy is also Emperor of Austria. This Austrian emperor stands very often in opposition to the King of Hungary. This time he is not so. And I think that the wishes of our nation can only gain in weight when she asks her sovereign to fulfill his duty as savior of the country, by acting as he ought to do as King of Hungary; also, in the mean time, pointing out that this is his interest as Emperor of Austria as well. It is for this reason—namely, that I like to appeal also to Austrian vital interests—that I repeat emphatically that the vital interests of Hungary and of Austria are identical.

This view is perfectly justified by the political significance and far-reaching importance of the Eastern question as it stands with reference to us.

If the Turkish Empire were to be under no pressure from the power that threatens the liberty of Europe—a colossus increased to formidable proportions by the dismemberment of Poland—then the Eastern question would be nothing else than a home question between the Turks and the other peoples of different races in the Turkish Empire.

And if this question stood thus, neither the integrity nor the dismemberment of the Turkish Empire, nor the reforms conceded or denied to the nations of that empire, would affect in the least, not the more distant countries of Europe, but not even us or Austria, who are her neigh-

bors, except from a humanitarian, sympathetic, or antipathetical, point of view.

We have learned to appreciate justly the fundamental features of the Turkish character. We are aware, as I have said, that we possess in the Ottoman nation such reliable friends as we could not find anywhere else in the world, because our interests are so identical that there is not only no opposition, but not even a difference between us. We recollect gratefully the generosity shown to us by the Turks in the days of our sorrow; and it is honorable on our part to remember this warmly just now in the days of their sorrow. And so it is certain that we Hungarians should follow all regenerative endeavors of the Turks with heartfelt sympathy and blessing. We should feel gratified if they succeed in removing the obstacles in their way to liberty. On the other hand, if in consequence of Russian pressure the dismemberment of the Ottoman Empire should be identical with the aggrandizement of Russia, there would not be a single Hungarian who would not consider the territorial integrity of Turkey, and the upholding of its sovereignty, as a *conditio sine qua non* of the maintenance of our own integrity and independence. No one would think of shedding his blood nor offering aid to the Turks if it were not for the threatening attitude of Russia; but for that we should not look with anxiety on the aspirations of the Slavonic nations.

Though all the provinces of Turkey should gain such an "autonomy" (!) as that which is prepared for the Bulgarians by Prince Cherkaski after the Russian pattern and in the Russian language, still the Eastern question would not be solved, but would then be revived in the face of Europe, and especially in that of Hungary and Austria, in such tremendous proportions as it has not yet reached.

Yes, because the Eastern question, I repeat again, is a question of Russian power; clearly, distinctly, a question of Russian aggrandizement.

And it will remain so until Europe, after a tardy repentance, shall at last determine the restoration of Poland, and thus avert the curse from herself which she has incurred by the crime of that partition.

Only by the restoration of Poland can Russia be pushed back upon her ancient boundaries, where she could in her still vast empire let her subjects become free men, and thus occupy a still glorious and prominent place at the round table of civilized nations, but a place whence she could no more threaten us, and Austria, and Europe,

with her Panslavo-czaristical and universal-monarchical ambitions. Only when it shall be made sure on the banks of the Vistula that she can never more suffocate Turkey—only then will the Eastern question step down to an internal and, if you like it, to a humanitarian level, and be solved in such a way as not to be dangerous to Europe.

But so long as this does not happen, the Eastern question will always remain a Russian question of power. If the Turkish Empire should be dismembered in consequence of Russian pressure, or even if it should be crippled, I repeat that every inch lost by the Turks would only increase Russian power. The diminution of Turkish sovereign independence would increase Russian influence, which would act as a dissolving poison on us and on Austria; and the unavoidable consequence would be that the nations which had been severed from the Turkish rule would not become free, but Russian serfs—forming the tail of that boa-constrictor which presses us closely, the arms of that polypus which clings to our flesh.

These are the conditions which induce the Hungarians to adopt the view that their very existence is endangered by the war in their neighborhood.

And these considerations are so momentous that, if we Hungarians should continue to look on in cowardly inactivity at the dismemberment of the Turkish Empire, or, which is identical, at the aggrandizement of Russian power—if we should look on in cowardly inactivity while the boa-constrictor gathers material to form a new tail from the southern Slavonians, while the polypus makes out of them new trunks—it would be such suicidal insanity that I cannot find a word to designate it. We should be worse than the worms creeping upon the ground if we did not protect ourselves against it.

These are sad times. After so much blood has been spilt that the nations might become independent, we are still in the position that the fancy and the will of two or three purple-clad mortals are decisive, and not the will of the people. But the Hungarian people will live—they will not go so far in their resignation as to commit suicide for the sake of any mortal man whatever. We must raise a dike against the extension of Russian power. And, to do that, we must conserve and uphold the unity and the independence of the Turkish Empire; for at present that is the practical way to construct a dike. This view is firmly upheld by the Hungarian nation, whatever form of expression they may use to state their

will; and in this respect all the Hungarians are of the same opinion without difference of party. They are of the same opinion, for they are convinced that this is a vital interest of our fatherland. And justly, therefore, Hungary feels indignation, and disavows—the whole Hungarian nation does it—that immoral and impolitic idea, that the Austro-Hungarian monarchy should become an accomplice in the occupation of any part of Turkey for the sake of the enemy of our country's vital interests.

Governments should never be in opposition to the popular wishes when governments wear the constitutional toga. It is the worse policy if they are. On the present occasion the wishes of the nation show themselves so unmistakably plain, that it would be a dangerously daring feat if the Government should try to elude them by some parliamentary trick. It is a question of existence. The nation knows this well. And ours is a loyal nation. Therefore, I say to those in authority: Comply with her wishes. Don't force her to take in her own hands the insurance of her life. She will do it if she is forced to it, because she will not die. The Hungarian nation will not be a worm to be trampled upon by the heel of the trampler. She will not suffer that the bowing diplomatists of czars and Cæsars should convert Hungary into a powder-barrel to be exploded by Russian intrigues with a Panslavonic match.

They told thee, Hungary: "Be reconciled with Austria that thou mayest be safe from the Russian." Thou hast been reconciled: let us see the conciliator, where is he?

Almighty Father! if the Hungarians were but independent!

"De profundis ad te, Domine, clamavi."

I know that what I have been saying is nothing new. But still I thought it right to speak my mind, as the Prime-Minister of Hungary has made a very startling declaration.

When it was resolved in a public meeting of citizens that the integrity of the Turkish Empire should be upheld even by armed force, the Prime-Minister of Hungary gave the following answer: "*That it is not allowable to shed Hungarian blood for the interests of any other power, and that the Government will never give its consent that the heroic sacrifice of the Hungarian nation should be made for others.*"

So the Hungarian prime-minister still considers the upholding of the Turkish Empire against the Panslavonic standard-bearer, the Russian czar, as being for the interests of "others."

Every inhabitant of Hungary, who wishes the conservation of our country, and those, also, who speculate on her overthrow, know that *our country's existence is at stake*. The prime-minister is, perhaps, the only man in Hungary who does not see this.

But, since the crippling of the integrity of the Turkish Empire is identical with the aggrandizement of Russian power, nobody in the world has the right to say that Hungarians are sacrificing Hungarian blood for the sake of others, when they offer to shed it for the upholding of the integrity of the Turkish Empire. The prime-minister ought to know that this willingness is a flower that has grown in the soil of self-preservation, and opened its cup under the shining of the purest patriotic sunbeams.

The Hungarian prime-minister has spoken a startling word. If this is to be the standpoint of the Government, I declare most emphatically that the interests of Hungary are in dangerous hands.

Whoever, *in this war*, considers the upholding of the Turkish Empire to be a foreign cause, *will not raise a dike to the extension of the Russian power: for he is not far from the thought of sharing with the Russians in the Turkish booty*.

But I should like to believe that this most unlucky expression was only an unconsidered pistol-shot, which went farther than it was intended. I do not say that the Hungarian Government has deliberately thrown itself into the arms of those who are undoubtedly stirring dangerous questions in the regions of diplomatic circles. I can doubt, I can foresee, but I cannot assert, for I don't know it. But alas! I know that neither in the declarations of the Hungarian Government, nor in the actions of the leader of the foreign policy, can a Hungarian patriot find comfort.

It will not be amiss to call to mind now, when the representatives of the country are assembled again, that the nation, without difference of parties, expects that they will rise above party spirit and secure the fulfillment of the nation's will.

The most weighty declaration of the Hungarian prime-minister has been that in which (I quote it word by word) he assured the House of Representatives that *there is not a single person among the leaders who thinks it ought to be the aim of our foreign policy that the power and sovereignty of Turkey should be changed*.

This declaration has been greatly applauded, because (as I know positively) on both sides of the House many persons who were present at

the first hearing interpreted the speech, full of diplomatically-clever phraseology, as assuring them that the directors of the foreign policy of the monarchy would hold it to be their task to see that the power and sovereignty of Turkey should remain unchanged.

Alas! the Hungarian prime-minister did not only not say this, not only did he not want to say it, but, on the contrary, when some days later two of the representatives ascribed this sense to the declaration of the prime-minister, the latter contradicted that explanation of his words.

"Quasivi lucem, ingemui que reperta."

The far-famed ministerial declaration comes to nothing else but this: "The house of our neighbor is so situated with reference to our house, that if his catches fire ours will catch fire too. The house of our neighbor has been attacked by robbers and incendiaries with torches. Our household takes fright for our dwelling, and the responsible watcher of the Hungarian household says, 'Don't be anxious; I give you the assurance that among us, your watchmen, there is none who would hold that it is his task to burn down our neighbor's house!'"

The other declaration of the prime-minister has been, that "*the Government has not given to any one, in any sense whatever, a promise what it will do; nor have they assumed any obligation, but they possess their full freedom of self-decision.*"

From this declaration we learn two things, but neither of them is comforting. We learn that the Government does not know yet what it will do. It has no fixed aim. Its policy has no certain tendency. It sails about without a compass. It expects good luck wherever the wind shall blow. If this be policy, it is a very improvident one.

"The hour brings its own counsel" (*Kommt Zeit, kommt Rath*). This is the summary. Such determination according to the occasion may be a very good thing in itself, it is well to know *how* we shall reach the aim we have in view; but I don't think, in the present international imbroglio of affairs, which endangers the vital interests of the country, that to relegate the tendency of policy (not the *how*, but the *what*!) to the chance of future decision, can be advisable or even permissible.

And I am very fearful that the prime-minister has told the truth. I see that the Minister of Foreign Affairs, by the consent of the leaders of both parties, has constructed for himself a scheme wherein he can indeed place many things,

but what are these things? This he leaves to the future. "*Kommt Zeit, kommt Rath.*" The signification of the plan is the following: "Let the Russians do whatever they like. Our position toward them is a friendly neutrality." *Neutrality, and friendly*: a steel hoop, made of wood! *Contradictio in adjecto.* But, alas! still true. *Friendly* toward Russia; *hostile* toward Turkey; but no *neutrality*. When a country is affected in her vital interests by a war, as our country is now, neutrality is an absolute impossibility. Inaction is no neutrality. That this hitherto observed inaction has been of great service to the Russians is a fact crying to heaven and earth. But I will now continue the scheme. "If the Turks shall be victorious, everything will remain as it has been; and we shall mediate during the final negotiations, in order that the Turk may not press too hardly on the Russians, with whom we shall keep on 'friendly terms.' If, on the contrary, the Russians advance victoriously, 'we shall take up a position' in behalf of the conquered Turks; we shall strive to moderate the Russian exactions at the final negotiations; but, in any case, if the Russians rob, we will rob too, *if possible down to Salonica!* And then we will say to Hungary and to Austria: '*Well, we have secured the interests of the monarchy in the face of the Russian extension-policy.*' The Russians have annexed, but we have annexed also; the equilibrium which was upset by robbery has been restored by robbery."

Such is the "scheme" of the policy of "*freedom of self-decision*," of which the prime-minister has been boasting. I shall be very glad if the patriotism of the national representatives should give such a guarantee for the fulfillment of the people's wishes as may refute my suspicion—I had nearly written my "*certainty*."

The second thing we learn from the quoted declaration is this, that our Government *has no ally*. I think that, under such circumstances, there are two things which are the chief duties of a government. The one is that it shall see its way clearly with reference to the tendency of its policy—of this I have spoken already; the other is that, in order to secure this policy, it should think of getting allies. It is a bad case that the Government has no allies. I could even call this also neglect of duty, because they could have had allies if they had had a good policy.

But it is still worse that the *untrammelled attitude*, of which the prime-minister has boasted, *favours the Russians*. Since the beginning of the complications we have heard of nothing so em-

phatically as the confederacy of the three emperors, which was formerly styled "a friendly understanding." One of these three confederates is the czar. My dear fatherland! thou art indeed in great danger from that *untrammelled attitude* which operates in friendly relations with Russia. Hitherto it has acted in that way. I could cite many testimonies; I will quote only a single one.

The Government says it has no obligations. What! Has it not entered into an engagement to let Roumania be occupied by Russia who unfurled the banners of "The Slavonic Cause," and so to convert this province into a place for her military operations, notwithstanding that the neutrality of that country has been guaranteed by the European powers, under whose protectorate it has been placed? Yes, they have engaged themselves, and by a formal bargain, because they have expressly stipulated, as a reward, that the czar shall not force Serbia into war.

This fatal obligation is the source of all the evils which have happened hitherto and which will happen hereafter, and of all the dangers that threaten our country.

But the thing does not end here. The world is filled with anxiety lest even this stipulation should be omitted, and lest the Viennese cabinet should not try to prevent the czar from taking Serbia into action. Lo! because the Turkish lion has struck the czar over the fingers, the great czar is in want of the perjury of little Serbia, to whom Turkey the other day granted forgiveness. Thus the *untrammelled attitude leans again toward Russia*.

The representatives of Hungary will, no doubt, without party difference, feel the danger that menaces them through this new aggravation of circumstances.

I must now advert to a third governmental declaration, and I find it very weighty.

When an interpellation was directed to the Government with reference to its policy, instead of confessing its leanings, it avoided the question by declaring that *the interests of the Austro-Hungarian monarchy have led and will lead their policy, and that the interests of the monarchy under every circumstance will be considered*.

The Government, in fact, always serves up the same dish, nobody knowing whether it is fish or flesh, not even the butler who serves it. This is the question, in what direction (*not by what means, but in what direction*) the minister seeks his policy? and whether he seeks it in a direction conformable to the interests of the monarchy?

If they should again serve a dish, which is neither "fish nor flesh," in the House of Representatives, and if the House should be contented with this assurance (as we heard out-of-doors), that "*the Government keep before their eyes the wish of the nation that the interests of the monarchy—in opposition to the Russian policy of extension—should be secured,*" the ambiguity of the situation would not be at all changed, and the door would still be left open; so that, if events took another turn, the water would be turned to grind the mill for those "influences that wish to get a share," and our nation would some morning awake to find that, under the *pretense of securing the interests of the monarchy*, things had happened which the nation abhors as it does damnation.

I do not speak so because I have forebodings; it is not my object to enter into questions of principles. I don't want to quote the sad pages of our own history, nor the examples of Polignac or MacMahon, to show that it has always been so; and that there has never been any impiety without the reigning power invoking interests of state when committing it. But, as we stand in view of the danger of Russian extension, I pray my countrymen to look for that page of history where they will see it written *how the Viennese cabinet understands the securing of the interests of the monarchy when face to face with Russian aggressive policy!* This has such an actuality of interest that I nearly shudder when I think of it.

Whoever looks at those pages must feel convinced that *the Viennese cabinet never did understand the securing of the interests of the monarchy so that the Russian extension should not be permitted; but it so understood them as that, whenever the Russians commit robbery, Austria must rob as well—that, when Russia extends herself, Austria ought to do the same.*

So, I repeat for the third time, it understood them at the division of Poland, and so it has understood them ever since, without exception, when face to face with the Russian policy of extension. This is an awful remembrance.

And this they call the policy of restoring the equilibrium!

And what has history said of that awful policy? I do not speak even of morals, of honesty which is always the best policy in the end, though it was a long time ago struck out of the vocabulary of diplomacy. I point to facts.

By this policy the Russian power has been swollen to giant-like proportions, which now

menace the whole world. The consequence of this policy is the war of to-day, and Russia now smooths her way, through the Turkish "Slavonic cause," to the Hungarian and Austrian "Slavonic cause."

On the other hand, this policy of sharing has not saved the Austrian dynasty from withering. Russia has grown up; Austria has dwindled.

And what will be the result if the Vienna cabinet should again follow this damnable policy of expediency?

In the past it has put a razor in the hand of Russia; now it would put this razor to the throat of Hungary, and also of Austria.

"*Duo cum faciunt idem, non est idem.*"

There can be no doubt that what the Russians would rob from the Turks, what their influence would win on both shores of the Lower Danube and on the Balkan peninsula, would form a real increase of their power, an augmentation of their strength; and the influence thus acquired would act upon the Slavonians of the Austrian Empire, and upon those of the Hungarian crown, like the loadstone on iron. Those Slavonians that would be caught by Russia, she would take with her.

On the contrary, what the Viennese cabinet would pilfer, under the shadow of the Russian highwayman, from the Turkish Empire, would only weaken us, and become eventually our death; because it would eternally multiply and put into further fermentation all the already fermenting and dissolving elements. The Slavonians who would be caught by the Viennese cabinet would take the latter with them.

And what would be the infallible final result? The punishment of *talio*. If St. Petersburg and Vienna should divide the rags of the torn Turkish Empire, twenty-five years would not elapse before the Russians, the Prussians, and the Italians, would divide Austria and Hungary among themselves, perhaps leaving something of the booty to Wallachia, as the reward of subserviency to Russia. This is as true as that there is a God.

Well, I feel no call to be anxious about the dismemberment of Austria, if free nations might step into her place; but I do feel it my duty to be anxious about a dissolution by which Russian power and Russian influence would be increased. I feel it so much my duty that, if our fatherland were connected with Austria only by the ties of good neighborly friendship, and if Austria were threatened by the Russians, I would most determinedly say to my countrymen, "Defend thy Austrian neighbor to the last drop

of thy blood against Russia," just as I say now, "Defend thy Turkish neighbor to the last drop of thy blood against Russia."

The reigning dynasty of Austria must reckon with the logic of history. A time may come—it must come—when her German provinces—will go home. Well, well, I say: the royal throne of the palace at Buda is a very glorious seat. It will be good to think about how, after its thousand years' history, it may not be menaced by the Russian monster—neither in the form of a boa-constrictor, nor in that of a hundred-armed polypus. The time is come to think of it, now that the Turkish lion is fighting his life or death struggle so gloriously. Let us not lose the opportunity. "*Sero medicina paratur.*" "Mene! Mene! Tekel! Upharsin!"

I do not say that the Hungarian Government has given itself up to the impulses of robbery; I say only that this is not excluded from the "scheme." This vampire sits on its bed, on its chest, on its arms. Shake off the vampire, I say. *Free your arms, and step at the head of the nation.* It is a glorious place. In such a great crisis it is a very small ambition to aim, by the cleverly-construed phrase of "taking notice," at getting a vote of confidence from your party. You should act so that the confidence of the whole nation should surround you. You can do it. You should adopt the policy that has been pointed at by the whole nation. You should

not contradict yourselves, for you said that your *hands were free*.

To the representatives of the nation I would like to cry out from my remote solitary place: "The fatherland is in danger—in such danger as it has never been in before, viewing the irrevocability of the consequences. Then let the fatherland not be made a party question among yourselves, my countrymen! Let the genius of reconciliation hover over you when you stand arm-in-arm around the altar of our fatherland. I do not ask you to upset the Government, but I beg of you to place it in such a situation that its stability would be guaranteed by the fulfillment of the nation's wishes. *The action of Serbia has supplied you with an opportunity which answers even diplomatical considerations.* Don't let this occasion escape you."

The fulfillment of the nation's will is the purest loyalty. I say so—I, who never yield. It is true, I do not like the Austrian eagle in our fatherland. But I wish not that this eagle should be consumed in flame by the Russian; and I shudder at the thought that Hungary may be the funeral stake.

I am a very old man. I long ago overstepped the line assigned by Scripture as the limit to human life. Who knows whether this be not my last word? May it not be the voice of one who cries in the desert!—*Contemporary Review.*

HYDROPHOBIA AND RABIES.

By Sir THOMAS WATSON.

IN the May number of this Review I intended, successfully I think, that the group of diseases rightly included among those called zymotic may, by means of wise legislation, and the equipment of suitable machinery, be eventually banished from this island. The favorable reception of my paper by many competent judges of its subject-matter encourages me to speak of another disease, also very destructive of human life, though numerically not so destructive as these, but even more dreadful and alarming to the mind than any of them. This plague, also, I hold to be one of which we might get permanently rid. The disease, or rather the pair of diseases, to which I advert consists of hydro-

phobia in the human species and rabies in the canine. It is well to keep in mind the distinction between these two. There would be no hydrophobia were there no rabies; there can be no rabies unless it be communicated by a rabid animal; but they are not identical diseases. To use the concrete form of speech, rabies in the *dog* is quite different and distinct from hydrophobia in the *man*. The term hydrophobia is often erroneously applied to both diseases, but the rabid dog is never hydrophobic.

There has been an astonishing increase of hydrophobia in this country within the last half-century. Mr. Caesar Hawkins, writing in 1844, says that only two cases of the disease had been

admitted into St. George's Hospital since he first knew it twenty-five years earlier. Now, mention of such cases is constantly being made in the newspapers. Since the beginning of the present year, no less than thirteen deaths from hydrophobia have been recorded within the limits of the London Registration.

So many erroneous notions are afloat on this subject, that it may be neither uninteresting nor useless to the general reader to have a plain, untechnical history of the two diseases, which are inseparably connected by reciprocal relationship, the one being the parent of the other. In the canine race rabies can propagate rabies; but hydrophobia does not (as I believe) ever reproduce itself.

The first thing to be noticed about hydrophobia is, that, frequent as it has become, many medical men pass through life without witnessing the disease at all. Hence there has, strangely enough, sprung up in some minds a fancy that no such disease has ever happened. Sir Isaac Pennington, who was in my time the Regius Professor of Physic at Cambridge, and who had never seen a case of hydrophobia, could not be persuaded that any one else had seen anything more than a nervous disorder, produced by the alarmed imagination of persons who, having been bitten by a dog reputed to be mad, and having the fear of feather-beds before their eyes, have been frightened into a belief that they were laboring under hydrophobia, and ultimately scared out of their very existence. It was at that time currently believed, at least by the vulgar, that any one afflicted with this terrible disorder was dangerous to those about him; and it was customary for his neighbors, or associates, to put an end at once to his woes and to their own cowardly dread of him by smothering him between two feather-beds.

But a far more eminent man than the Cambridge professor, even Sir George Cornewall Lewis, was possessed with a similar incredulity on this subject, until convinced of his error by Mr. Hawkins, who had then seen eleven or twelve cases of hydrophobia—a larger number than perhaps any man in this country ever saw before or since. One reason for this was that he had received from Sir Robert Ker Porter, our minister in South America, specimens of a substance called *guaco*, a supposed preventive and cure of hydrophobia and of snake-bites, and had on that account been summoned to cases of hydrophobia by various other practitioners.

I have myself seen four cases of that fear-

ful malady, and I feel sure that no one who has even once watched its actual symptoms could fail to recognize it again, or could mistake any other malady for it, or wish to witness it thereafter. What these truly remarkable symptoms are I shall explain presently. It would, *a priori*, seem incredible that so many persons who have been bitten by mad dogs should have suffered so precisely the same train of symptoms, and have at last died, from the mere force of a morbid imagination. But a single fact conclusive against such a belief is that the disease has befallen infants and idiots, who had never heard or understood a word about mad dogs or hydrophobia, and in whom the imagination could have had no share in producing their fatal distemper.

The steady increase in the population of this kingdom implies a corresponding, though perhaps not proportional, increase in the number of its dogs. In this way the area is ever growing larger of a field ready for the reception of the poisonous germ of rabies, and for the production in due time of a more or less copious crop of hydrophobia. The report for this year of the Postmaster-General contains the strange statement made by the local postmaster of a large town in the north of England, that in the year 1876 twenty per cent. of his men—one in every five—were bitten by dogs. A parliamentary return of last session tells us that in the year ending with last May, 973 sheep and lambs were killed by dogs in ten of the counties of Scotland, and in most cases the owners of the dogs could not be discovered. There is in London a Home for stray and lost dogs. It has been affirmed in print by the well-known Secretary to the Society for Preventing Cruelty to Animals, that upward of 1,500 dogs are taken to this Home every month. It is notorious that the tax on dogs is evaded to an enormous extent. All this serves to disclose the presence among us of a national nuisance, and a growing source of national dishonesty and of serious national peril. It is grievous to me to have to write in a strain so depreciatory of a race of animals that I love so well. But *corruptio optimi pessima*. It is an illustrative fact that, according to the Reports of the Registrar-General, no less than 334 persons died in England of hydrophobia in the decade of years ending with 1875.

Like other specific contagious diseases, hydrophobia has its period of incubation; and it is a somewhat variable period, lying for the most part between six weeks and three months. From

a tabular account of 120 cases of the disease referred to by Mr. Hawkins, it appears that five-sixths of the whole number occurred between eighteen days and three months. Mr. George Rigden, of Canterbury, has lately stated in the *Lancet* the following remarkable fact: He saw many years ago in one of the hospitals in London two patients who had been bitten at the same time by a cat which had been bitten by a rabid dog. Although the two patients had severally received their bites within a few minutes of each other, the respective outbreaks of hydrophobia were separated by an interval of two weeks. A like uncertainty of the access of the disease has been noticed among infected dogs. On the night of June 8, 1791, the man in charge of Lord Fitzwilliam's kennel was much disturbed by fightings among the hounds, and got up several times to quiet them. On each occasion he found the same dog quarreling; at last, therefore, he shut that dog up by himself, and then there was no further disturbance. On the third day afterward the quarrelsome hound was found to be unequivocally rabid, and on the fifth day he died. The whole pack were thereupon separately confined, and watched. Six of the dogs became subsequently mad, and at the following widely different intervals from the 8th of June, namely, 23 days, 56, 67, 81, 155, and 183 days.

Much longer periods, however, than any that I have hitherto mentioned are on record. In one instance, which was treated in Guy's Hospital, and the particulars of which were carefully investigated by Doctor (now Sir William) Gull, the disorder broke out more than five years after the patient had been bitten by a pointer-bitch below his left knee. There a scar was visible, and the hydrophobic outbreak was preceded by pain in that spot. In the first volume of the *Lancet* the case is narrated by Mr. Hale Thompson of a lad who died hydrophobic seven years after a bite by a dog on his right hip, where there remained a cicatrix. For twenty-five months before his death this patient had been in close confinement in prison, and out of the way of dogs altogether.

Long periods of this kind cannot reasonably be regarded as periods of genuine or normal incubation. In explanation of them I some forty years ago published certain views of my own, but I do not know that they have been (to use a barbarous modern term) indorsed by any of my professional brethren. I imagine that the virus implanted by the rabid animal may remain lodged in the bitten spot, shut up perhaps in a nodule of lymph, or detained somehow in temporary and

precarious union with some one of the animal tissues, without entering the blood itself for a longer or shorter time—in some cases, perhaps, never.¹ Some curious facts, fortifying this hypothesis of mine, have been noticed respecting another animal poison—the vaccine virus. The following statement is quoted by Mr. Grove, in the *Monthly Journal of Medical Science* for November, 1853:

"A girl, aged fourteen years, was seized with influenza. She complained of pain in each arm at the spots where, when an infant, she had been vaccinated; and, in fact, in these places vaccine vesicles now became perfectly developed. An elder sister was revaccinated with lymph thence obtained; beautiful vesicles formed, and ran a natural course."

At the Obstetrical Society of London in 1860, Dr. Hodges stated that—

"In May, 1854, he vaccinated a little boy three years of age, but the arm did not 'rise' within the usual period. In the following May, however, a vesicle spontaneously formed, with an areola on the seventh and eighth days, gradually declining on the eleventh and twelfth; a permanent cicatrix, marked by pits, remaining and giving evidence of the genuine vaccine disease."

If my hypothesis be well founded, it may account for some of the cases in which persons bitten by a rabid dog escape hydrophobia altogether.

The well-known fact that the bitten spot, wound, or scar, very often becomes the seat of some fresh morbid phenomena (variously spoken of as pain, redness, swelling, coldness, stiffness, numbness, tingling, itching), which spread toward the trunk of the body just before the paroxysmal symptoms of hydrophobia show themselves, is strongly in favor of the belief that the poison may lie inert in the place of the original hurt for some time, and then, in some obscure way, get liberated and set afloat in the circulating blood.

Pain, sensations of pricking, and other pe-

¹ I find that Dr. Anthony Todd Thomson, in the thirteenth volume of the "*Medico-Chirurgical Transactions*," 1836, has been tiresome enough to forestall me in this suggestion. He is commenting upon a case of hydrophobia caused by the bite of a cat, and he conjectures "that the virus remains dormant in the part where it is deposited by the tooth of the rabid animal, until a certain state of habit renders the nerves in its vicinity susceptible of its influence, and this being communicated, a morbid action is begun in these nerves, and extended to the respiratory nerves, which induce the whole train of symptoms constituting the disease."

culiar feelings, preceded the manifestation of the hydrophobic condition in three of the four cases seen by myself; in the fourth case no inquiries appear to have been made on that point. In another instance which Mr. Herbert Mayo witnessed and examined after death, he found the inner part of the cicatrix blood-shot, and a gland in the armpit had swelled at the coming on of hydrophobic symptoms; and I find among my notes of Mr. Abernethy's lectures another striking case still more to the purpose. A very intelligent boy had been bitten in the finger by a dog. He was taken into St. Bartholomew's Hospital. Caustic had been freely used, affecting the sinewy parts, and producing a terrible sore; yet the boy was recovering himself, and the sore was healing. One day, as Mr. Abernethy was going round the hospital, he saw and spoke to the boy, who said he thought he was getting well, but that he had on that day an odd sensation in his finger, stretching upward into his hand and arm. Going up the arm were two red lines like inflamed absorbents. Doubtless they were such. Mr. Abernethy made light of the matter, ordered a poultice and some medicine. Early the next morning he again visited the ward, pretending that he had some other patient there whom he wished particularly to see; and when going out again he asked the boy, in a careless tone, how he was. The boy said he had lost the pain, but felt very unwell, and had not slept all night. Mr. Abernethy felt his pulse, told him he was rather feverish, as might be expected, and asked him if he was not thirsty, and would like some toast and water. The boy said he *was* thirsty, and that he *should* like some drink. When, however, the cup was brought he pushed it from him; he could not drink. In forty-eight hours he was dead.

The symptoms of hydrophobia, stated in broad outline, are these: excessive nervous irritability and terror, spasmodic contractions of the muscles of the throat, excited by various external influences, and especially by the sight or sound of liquids, and by attempts to swallow them, and sometimes absolute impossibility of swallowing them, earnest attempts to do so notwithstanding.

When fluids are offered to and pressed upon the patient, he will take the vessel containing them into his hand, but draws back his head to a distance from it with a repelling and apparently involuntary gesture; meanwhile he makes a succession of hurried gasping sighs and sobs, precisely resembling those which occur when one

wades gradually and deeply into cold water. The sound of water poured from one vessel into another, gusts of air passing over his face, the sudden access of light, the waving of a mirror before his eyes, the crawling of an insect over his skin—these are things which in an hydrophobic patient suffice to excite great agitation, and the peculiar strangling sensation about the fauces. He goes on rapidly from bad to worse; in most cases more or less of mania or delirium is mixed up with the irritability. Illusions of the senses of sight and of hearing are not uncommon. The sufferer is very garrulous and excited. In some cases, but not in all, there is incontinence of urine. Foam and sticky mucus gather in his throat and mouth, and he makes great efforts by pulling it with his fingers, and by spitting, blowing, and hawking, to get rid of it; and the sounds he thus makes have been exaggerated by ignorance and credulity into the foaming and barking of a dog. In the same spirit the palsy of his lower limbs, which sometimes takes place, rendering him unable to stand upright, has been misconstrued into a desire on his part to go on all-fours like a dog. Vomiting is a frequent symptom. The pulse in a short time becomes frequent and feeble, and the general strength declines with great rapidity. Death occasionally ensues within twenty-four hours after the beginning of the specific symptoms. Most commonly of all, it happens on the second or third day; now and then it is postponed to the fifth day; and in still rarer instances it may not occur till the seventh, eighth, or ninth day.

Usually, the paroxysms, becoming more violent and frequent, exhaust the patient; but occasionally the symptoms undergo a marked alteration before death. The paroxysms cease, the nervous irritability disappears, the patient is able to eat and drink and converse with ease, those sights and sounds which so annoyed and distressed him before no longer cause him any disquiet. The late Dr. Latham had an hydrophobic patient under his care in the Middlesex Hospital. On going one day to the ward he fully expected to hear that the patient was dead, but he found him sitting up in his bed quite calm and free from spasm. He had just drunk a large jug of porter. "Lawk, sir!" said a nurse that stood by, "what a wonderful cure!" The man himself seemed surprised at the change; but *he had no pulse*; his skin was as cold as marble. In half an hour he sank back and expired.

It has been alleged that tetanus may be mistaken for hydrophobia, but the differences be-

tween the two are very clearly marked. It is true that slight touches of the body will excite the tetanic spasm, but it is the rigid or abiding form of spasm, which relaxes gradually and slowly; whereas in hydrophobia the spasms are sudden and frequent, such as are popularly called convulsions. In tetanus there is no thirst, seldom any vomiting, no accumulation of tough and stringy mucus in the mouth and throat. The mental faculties are clear, and the patient is serene, and what is called heart-whole, to the last.

The symptoms of rabies, as witnessed in the dog, have been well described by Mr. Youatt. The earliest is a marked change in the animal's habits. Of course this will be more perceptible by those acquainted with the dog, and cognizant of his habits. The dog becomes sullen, restless, his eyes glisten, there is often slight squinting, and some twitching of the face, with a continual shifting of posture, a steadfast gaze expressive of suspicion, an earnest licking of some part on which a scar may generally be found. If the ear be the affected part, the dog is incessantly and violently scratching it; if the foot, he gnaws it till the skin is broken. Occasional vomiting and a depraved appetite are also early noticeable. The dog will pick up and swallow bits of thread or silk from the carpet, hair, straw, and even dung. Then the animal becomes irascible, flies fiercely at strangers, is impatient of correction, which he receives in sullen silence, seizes the whip or stick, quarrels with his own companions, eagerly hunts and worries the cats, demolishes his bed, and if chained up makes violent efforts to escape, tearing his kennel to pieces with his teeth. If at large he usually attacks such dogs as come in his way, but if he be naturally ferocious he will diligently and perseveringly seek his enemy. About the second day a considerable flow of saliva begins, but this does not long continue, and it is succeeded by insatiable thirst. He appears to be annoyed by some viscid matter in his throat, and in the most eager and extraordinary manner he works with his paws at the corners of his mouth to remove it, and while thus employed frequently loses his balance and rolls over. A loss of power over the voluntary muscles is next observed. It begins with the lower jaw, which hangs down, and the mouth is partially open; the tongue is less affected; the dog is able to use it in the act of lapping, but the mouth is not sufficiently closed to retain the water; therefore, while he harghs over the vessel

eagerly lapping for several minutes, its contents are very little, or not at all, diminished. The palsy often affects the loins and extremities also; the animal staggers about, and frequently falls. Previously to this he is in almost incessant motion. Mr. Youatt fancies the dog is subject to what we call spectral illusions. He starts up and gazes earnestly at some real or imaginary object. He appears to be tracing the path of something floating around him, or he fixes his eyes intently on some spot on the wall, and suddenly plunges at it; then his eyes close, and his head droops.

Frequently, with his head erect, the dog utters a short and very peculiar howl; or if he barks it is in a hoarse, inward sound, totally unlike his usual tone, terminating generally with this characteristic howl. The respiration is always affected; often the breathing is very laborious; and the *inspiration* is attended with a singular grating, choking noise. On the fourth, fifth, or sixth day of the disease, he dies, occasionally in slight convulsions, but oftener without a struggle.

It is a common and misleading mistake to think that the rabid dog, like the hydrophobic man, will shun water, and that if he takes to a river it may safely be concluded that he is not mad. On the contrary, as I have already hinted, there is no dread of water, but unquenchable thirst; the animal rushes eagerly to water, plunges his muzzle into it, and tries to drink, but often is unable to swallow from paralysis of his lower jaw, which prevents him from shutting his mouth.

Another opinion not at all uncommon is, that healthy dogs recognize one that is mad, and fear him, and run away from his presence, in obedience to some mysterious and wonderful instinct, warning them of their danger. According to Mr. Youatt, this is quite unfounded. Equally mistaken is the notion that the mad dog exhales a peculiar and offensive smell.

I do not know whether the period of incubation in a dog which has been infected with rabies by the bite of another rabid dog has been accurately ascertained; but that the disease may be imparted by a dog so infected before the symptoms of rabies become manifest is clear from the following instance, with which I have been favored by Mr. Wrench, of Baslow, in Derbyshire:

"A small terrier" (he writes) "belonging to myself was bitten by an undoubtedly rabid dog, and was consequently destroyed about a fortnight afterward, and before it had shown any symptoms of disease. In the mean time it had licked the cropped

ears of a bull-dog puppy which had not been near the first-named rabid dog, and this puppy went mad about eight weeks after his ears were licked."

From what animals may the infection be received? We are sure that the disease, by the inoculation of which hydrophobia may be caused in man, is common in the dog; and that it has often been communicated to the human animal by the fox also, the wolf, the jackal, and the cat. The death from hydrophobia of a boy after being bitten by a raccoon is recorded by Dr. Russell, of Lincoln, Massachusetts, in the "Transactions of the American Medical Association" for 1856. Mr. Youatt declares that the saliva of the badger, the horse, the human being, has undoubtedly produced hydrophobia; and some affirm that it has been propagated even by the turkey and the hen. The same author mentions a case in which a groom became affected with hydrophobia through a scratch which he received from the tooth of a rabid horse. This would seem to settle the question as respects that animal; but as horses, cows, and fowls, do not usually bite, we have not many opportunities of furnishing a positive answer to the general question.

The grandfather of the present Duke of Richmond died, in Canada, of hydrophobia, communicated, it was then thought, by a fox. But I was told in 1862, on the authority of a person who was living at Montreal at the time of the duke's death, and was acquainted with his family, that his disease was caused by the bite of a dog; and I was afterward informed by Mr. Lawrence Peel, the duke's son-in-law, that it was uncertain whether the bite was made by a fox or by a dog. The duke was interfering in a fray between a tame fox and a pet dog—the fox retreating into his kennel. It is not certainly known which of the animals had rabies.

The disease is said to have been caused by the *scratch* of a cat. Now, we know that cats, as well as dogs, frequently apply their paws to their mouths, especially when the latter part is uneasy, as it clearly is in mad dogs. The fact, therefore, of the production of the disease by a scratch from the claws of a cat, if thoroughly made out, would afford no proof, nor scarcely even a presumption, that the disease can be introduced into the animal system in any other way than by means of the saliva.

Several important questions at once present themselves respecting these two diseases:

First, is a man who has been bitten by a mad dog, and in whose case no preventive measures

have been taken, a doomed man? I have answered this question in the negative already. Few, upon the whole, who are so bitten become affected with hydrophobia. John Hunter states that he knew an instance in which, of 21 persons bitten, one only fell a victim to the disease. Dr. Hamilton estimated the proportion to be 1 in 25. But I fear these computations are much too low. In 1780 a mad dog in the neighborhood of Senlis took his course within a small circle, and bit 15 persons before he was killed; three of these died of hydrophobia. The saliva of a rabid wolf would seem to be highly virulent and effective. These beasts fly always, I believe, at a naked part. Hence, probably, the fatality of their bites. The following statement relates exclusively to the wolf: In December, 1774, 20 persons were bitten in the neighborhood of Troyes; 9 of them died. Of 17 persons similarly bitten in 1784 near Brive, 10 died of hydrophobia. In May, 1817, 23 persons were bitten, and 14 perished. Four died of 11 that were bitten near Dijon; and 18 of 24 bitten near Rochelle. At Bar-sur-Ornain 19 were bitten, of whom 12 died within two months. Here we have 114 persons bitten by rabid wolves, and among them no fewer than 67 victims to hydrophobia; considerably more than one-half. There is no doubt, however, that the majority of persons who are bitten by a mad *dog* escape the disease. This may be partly owing to an inherent inaptitude for accepting it. There are some upon whom the contagion of small-pox has no influence. This peculiarity exists apparently even among dogs. There was one dog, at Charenton, that did not become rabid after being bitten by a rabid dog; and it was so managed that at different times he was bitten by thirty mad dogs, but he outlived it all. Much will depend also upon the circumstances of the bite, and the way in which it is inflicted. If it be made through clothes, and especially through thick woollen garments, or through leather, the saliva may be wiped clean away from the tooth before it reaches the flesh. In the fifth volume of the *Edinburgh Medical and Surgical Journal* there is a case described by Mr. Oldknow, of Nottingham, in which a man was bitten in three different places by the same mad dog, namely, in the groin, the thigh, and the left hand; the bite on the hand was the last. Now, it seems that but for this last bite, on a naked part, he might have escaped. It is noteworthy that the local sensations preliminary to the fatal outbreak of hydrophobia occurred only in the hand and arm. The attacking dog probably shuts his mouth

after each bite, and thus recharges his fangs with the poisonous material. In a report from America, it is stated that, of 75 cases, the injury was received on the hand in 40 instances, on the face in 15, on the leg in 11, on the arm in 9.

It is this frequent immunity from the disease in persons who have been bitten that has tended to confer reputation upon so many vaunted methods of prevention. Ignorant men and knavish men have not failed to take advantage of this. They announce that they are in possession of some secret remedy which will prevent the virus from operating; they persuade the friends of those who die that the remedy was not rightly employed, or not resorted to sufficiently early; and they persuade those who escape that they escaped by virtue of the preventive remedy. If the plunder they reap from the foolish and the frightened were all, this would be of less consequence; but, unfortunately, the hope of security without their undergoing a painful operation leads many to neglect the only trustworthy mode of obtaining safety.

A still more anxious inquiry next arises. Whoever has been bitten by a rabid or by a suspected animal must be considered, and will generally consider himself, as being in more or less danger of hydrophobia. This dread is not entirely removed even by the adoption of the best means of prevention. Now, how long does this state of hazard continue? When is the peril fairly over? After what lapse of time may the person who has sustained the injury lay aside all apprehension of the disease? To this inquiry no satisfactory reply can be given. In a vast majority of instances, indeed, the disorder has broken out *within two months* from the infliction of the bite. But the exceptions to this rule are too numerous to permit us to put firm trust in the immunity foreshadowed by that interval. Cases are recorded in which five, six, eleven, nineteen months have intervened between the insertion of the poison and the eruption of the consequent malady. Nay, there are well-authenticated instances, as I have already said, of the lapse of twenty-five months, of more than five years, or even of seven years. In these cases it is most probable that some unsuspected reinoculation, some fresh application of the peculiar virus, has taken place. If not, then we must conclude that the poison really lies imprisoned in the bitten part, and only becomes destructive when, under certain obscure conditions, and at indefinite periods, it gets into the circulation.

I say nothing about the morbid appearances

found in persons dead of hydrophobia, for I am not addressing professional readers. But, as a help toward determining whether a dog which may have been destroyed under equivocal circumstances was indeed rabid, it may be useful to state that in the stomach of a really mad dog there are always to be found very unnatural contents—straw, hay, coal, sticks, horse-dung, earth—as well as a quantity of a dark fluid, like thin treacle, altered blood in fact.

And here it may be well to deprecate and denounce a practice much too common with us, that, namely, of at once destroying a suspected dog, by which some one has been bitten, but about the true condition of which there exists no absolute certainty. The dog should be securely isolated and watched; a day or two will be sufficient for solving the anxious question. If he should prove really mad, he should then of course be put to death, as mercifully as may be. If, on the other hand, he remains well, not only will the life of a possibly useful and favorite animal be saved, but, what is of incomparably greater importance, the mind of the bitten person will be freed from a harassing sense of dread, with which it might otherwise be haunted for years to come.

The most important question of all in relation to my present purpose, is whether rabies can be excited by any other cause than inoculation of the specific virus; in other words, whether it has any other source than contagion.

Many persons believe that the disease may, and does often, arise *de novo*; and causes have been assigned which certainly are not true causes. Thus it has been ascribed to extreme heat of the weather. It is thought by many to be especially likely to occur during the dog-days; and to be in itself a sort of dog-lunacy, having the same relationship to Sirius that human insanity has to the moon—which in one sense is probable enough. But abundant statistical evidence has been collected in this and in other countries, that the disease occurs at all seasons of the year indifferently. The cautions, therefore, which are annually put forth in hot weather, as to muzzling dogs, etc., whatever may be their value, would be as opportune at any other time. The disorder has been attributed to want of water in hot weather, and sometimes to want of food, but MM. Dupuytren, Breschet, and Magendie, in France, caused both dogs and cats to die of hunger and thirst, without producing the smallest approach to a state of rabies. At the Veterinary School at Alfort three dogs were subjected to some very

cruel but decisive experiments. It was during the heat of summer, and they were all chained in the full blaze of the sun. To one salted meat was given, to the second water only, and to the third neither food nor drink. They all died, but none of them became rabid. Nor does the suspicion that the disorder may have some connection with the rutting period in these animals appear to rest on any better foundation.

Some very interesting points still remain to be considered as to the communication of these diseases from one person or animal to another.

Mr. Youatt, whose experience on this subject was very large, did not think that the saliva of a rabid animal could communicate the disorder through the unbroken cuticle. He believed that there must be some abrasion or breach of surface. He held, however, that it might be communicated by the mere contact of the saliva with the mucous membranes. Of its harmlessness on the sound skin he offered this presumptive evidence—that his own hands had many times been covered with the saliva of the mad dog with perfect impunity. He has recorded some singular instances in which hydrophobia and rabies were caused by contact of the morbid saliva with the mucous membranes. A man endeavored to untie by the help of his teeth a knot that had been firmly drawn in a cord. Eight weeks afterward he died undeniably hydrophobic. It was then recollected that with this cord a mad dog had been tied up. A woman was attacked by a rabid dog, and escaped with some rents in her gown. In the act of mending it she thoughtlessly pressed down the seam with her teeth. She also died. Horses are said to have died mad after eating straw upon which rabid pigs had died. Portal was assured that two dogs which had licked the mouth of another dog that was rabid were attacked with rabies seven or eight days afterward. Mr. Gilman, of Highgate, in a little pamphlet on Hydrophobia, quotes an instance from Dr. Perceval, in which a mad dog licked the face of a sleeping man, near his mouth, and the man died of hydrophobia, although the strictest search failed to discover the smallest scratch or abrasion on any part of his skin. These facts, if authentic, settle the question; unless, indeed, the lips of those who perished happened to have been chapped or abraded.

It is a fearful question whether the saliva of a human being afflicted with hydrophobia is capable of inoculating another human being with the same disease. Mr. Youatt says it is, that

the disease has undoubtedly been so produced. If this be so, the fact should teach us—not to desert or neglect these unhappy patients, still less to murder them by smothering, or by bleeding them to death—but to minister to their wants with certain precautions; so as not to suffer their saliva to come in contact with any sore or abraded surface, nor, if it can be avoided, with any mucous surface. On the other hand, all carefulness of that kind will be superfluous if the disease cannot be propagated by the human saliva. Certainly many experimenters have tried in vain to inoculate dogs with the spittle of an hydrophobic man; but there is one authentic experiment on record which makes it too probable that the disease, though seldom or with difficulty communicated, may yet be communicable. The experiment is said to have been made by MM. Magendie and Breschet, at the Hôtel Dieu, in Paris, and to have been witnessed by a great number of medical men and students. Two healthy dogs were inoculated on June 19, 1813, with the saliva of a patient named Surlu, who died the same day in the hospital. One of these dogs became mad on the 27th of the following month. They caused this dog to bite others, which in their turn became rabid also; and in this way the malady was propagated among dogs during the whole summer. Now this, though a very striking statement, ought not to be considered conclusive, for it is possible that the disease in the first dog might have had some unknown and unsuspected origin. We have enough, however, in this one experiment to make us observe all requisite caution when engaged in attending upon an hydrophobic patient.

In an elaborate and valuable treatise on “Rabies and Hydrophobia,” Mr. George Fleming adduces conflicting evidence as to the safety or danger of drinking the milk of a rabid animal, and he wisely advises the avoidance of such milk. Pertinent to this question I have received from Mr. Wrench, of Baslow, even while this paper is passing through the press, the following history, which shows that the disease is transmissible from the mother to her offspring through the medium of her milk:

“In the middle of May, 1876, on Mr. Twigg’s farm, Harewood Grange, near Chatsworth, a mad dog bit eighteen sheep out of a flock of twenty-one, which were at the time suckling thirty lambs. The sheep were all bitten about the *face*, and had evidently been defending their lambs during the greater part of the night in which the attack was made. Mr. Twigg examined both sheep and

lambs, and could not find a single wound on any of the latter. In about a month both sheep and lambs began to die at the rate of two or three a day. The sheep ran wildly about, sometimes carrying stones in their mouths, and the lambs ran away. Of the eighteen sheep that had been bitten sixteen died; and of the thirty lambs, not one of which was believed to have been bitten, fourteen died. On the next farm the same thing happened to a smaller extent."

What can be said of the treatment of hydrophobia or of rabies? There is no authentic case on record that I am aware of in which a hydrophobic person has recovered. As it has been so it is still. *ἰατρὸς ἱάται θάνατος*—the Physician that cures is Death. It would be idle to discuss any curative measures after the peculiar symptoms of the disease have once set in.

Not so, however, with respect to prevention; that is the most important object of our practice—that and the euthanasia.

The early and complete excision of the bitten part is the only means of prevention in which much confidence can be placed; and even that is open to a source of fallacy. In the majority of cases no hydrophobia would ensue, though nothing at all were done to the wound. No doubt many persons undergo the operation needlessly. But in no given case can we be sure of this. If excision should for any reason be impossible, the wound should be cauterized. Of the efficacy of the latter plan we have this evidence: Mr. Youatt, who trusted to it, and who had himself been bitten seven times, tells us that he had operated with the lunar caustic—nitrate of silver—on more than four hundred persons, all bitten by dogs unquestionably rabid, and that he had not lost a case. One man died of fright, but not one of hydrophobia. Moreover, a surgeon of St. George's Hospital told him that ten times that number had undergone the operation of excision there after being bitten by dogs (all of which might not, however, have been rabid), and it was not known that there had been a single fatal issue. Excision, in my judgment, must, when practicable, be the most trustworthy and eligible procedure. Trousseau recommends, as a ready and quick preventive, the actual cautery—that is, the destruction of the poison and the tissues of the bitten part by searing them with a red-hot iron. They might be as readily and thoroughly destroyed by brushing the interior of the wound, by means of a glass brush, with nitric acid.

But if the wound be of such a size and in such a place that it can be excised, what is the

best method for its excision? This is the advice of my old master, Abernethy:

"The cell" (he says) "into which a penetrating tooth has gone must be cut out. Let a wooden skewer be shaped as nearly as may be into the form of the tooth, and then be placed into the cavity made by the tooth, and next let the skewer and the whole cell containing it be removed together by an elliptical incision. We may examine the removed cell to see if every portion with which the tooth might have had contact has been taken away: the cell may even be filled with quicksilver to see if a globule will escape. The efficient performance of the excision does not depend upon the extent, but upon the accuracy, of the operation."

Early excision, then, is almost a sure preventive; but in all suspicious cases, if the operation have been omitted in the first instance, it will be advisable to cut out the wound or its scar within the first two months, or at any time before preliminary feelings in the spot foreshow the coming outbreak. Later would be too late. Dr. Richard Bright has recorded a case in which the arm was amputated upon the supervention of tingling and other symptoms in the hand on which the patient had been bitten some time before; but the amputation did not save him.

The new power which we have happily obtained of suspending sensation *generally* by the inspiration of certain vapors, or *locally* by the ether-spray, will contribute at least to the prevention of hydrophobia by divesting the process of excision or cauterization of its pain, and therefore of its terrors.

For my own part, if I had received a bite from a decidedly rabid animal upon my arm or leg, and the bite was such that the whole wound could not be cut out or thoroughly cauterized, my reason would teach me to desire, and I hope I should have fortitude enough to endure, amputation of the limb above the place of the injury.

As to the euthanasia, it may best be promoted by some narcotic drug; and I know of none more eligible than the chloral hydrate, administered in such doses and at such intervals as may suffice, without shortening life, to quiet the restless agitation, and to mitigate the sufferings, of its inevitable close. Should the patient be unable to swallow that remedy, recourse may be had, under similar limitation, to its subcutaneous injection, or to some anæsthetic vapor.

What, it may be asked, should be done by or for a man who has been bitten by a rabid animal,

and has no access to immediate medical help? Should he, the wound being within reach of his lips, or should another person for him, try to suck out the inserted venom? That would probably be his first instinctive thought. But when I call to mind what Mr. Youatt has said of the danger attending the contact of the poisonous saliva with even sound mucous membranes—and, further, the risk that the sucker's lips might, whether he knew it or not, be chapped or abraded—I dare not counsel the expedient of suction. By adopting it the sufferer might be rushing, or bringing his helping neighbor, into the very peril he was anxious to avert.

A cupping-glass would be a safer application of the same principle, provided that the place and size of the wound would admit of its being covered by the glass. But, at best, a cupping-glass extemporized and clumsily used under urgent and agitating circumstances can scarcely be advisable.

What I should most strongly recommend, and fortunately it is very easy of performance, is this: First, that a bandage tight enough to restrain the venous circulation should be applied just above the wound, between it and the heart; and next, that without any delay a continuous stream of tepid or cold water should be poured from a height, and therefore with a certain degree of force, upon and into the wound. This might be done from the spout of a tea-kettle, or better from a water-tap, and it should be persevered with even for an hour or two, or until the arrival of medical aid. In this way the implanted poison would, in all likelihood, be thoroughly washed away, and the safety of the sufferer secured. Nevertheless this process need not exclude subsequent excision or cauterization, should one or the other be feasible or thought desirable, "to make assurance doubly sure."

The opinion which, as my readers must have anticipated, I entertain, that rabies has at present no other source than contagion, has been combated with the same arguments as have been used in the analogous case of small-pox; such as that the disease must at some time have had a beginning, and therefore why not now? that it often springs up where no contagion can be traced, and sometimes where contagion seems to be impossible. These arguments were discussed in my former paper, and their futility fully demonstrated. I refrain, therefore, from reconsidering them here. But as I then related two striking instances in which contagion had been deemed impossible, but in which its operation was at length detected by

some very singular evidence, so I will here give a condensed account of a like result under similar circumstances in respect of rabies.

Mr. Blaine, Mr. Youatt's partner, was consulted about a gentleman's dog, and pronounced it undoubtedly rabid. But the dog, it was alleged, had never for many months been out-of-doors, nor, indeed, out of the sight of its master, or, in the master's absence, of his valet, who had especial charge of the dog. Concurring with Mr. Youatt in opinion, and anxious to learn the truth in a matter so important, Mr. Blaine examined the servants very closely; and it was at length remembered by the footman that he had had to answer his master's bell one morning when the valet, whose business it was to take the dog from the bedroom, was accidentally absent; and he also distinctly recollected that the dog accompanied him to the street-door while he was receiving a message, went into the street, and was there suddenly attacked by another dog that was passing, seemingly without an owner. The wandering dog was, no doubt, rabid.

Again, a Newfoundland dog, which was chained constantly to his kennel during the day, and suffered to be at large during the night within an inclosed yard, became rabid; and as no dog was known to have had access to the yard, the owner felt sure that the disease must have arisen spontaneously. Mr. Blaine, however, elicited the facts that the gardener to the family remembered to have heard when in bed one night an unusual noise, as if the Newfoundland dog was quarreling with another. He recollected, also, that about the same time he saw marks of a dog's feet in his garden, which lay on the other side of the yard, and the remains of hair were noticed on the top of the wall. About the same time the neighborhood had been alarmed by the absence of a large dog belonging to one of the inhabitants, which had escaped from confinement during the night under evident symptoms of disease. Here also was a ready solution of the previous mystery.

I can pretend to no originality on this subject. Mr. Youatt believed that rabies in the dog, and in all creatures, results always from the introduction of a specific virus into the system. He maintained that a well-enforced quarantine—every dog in the kingdom being confined separately—for seven months would extirpate the disease. And the late Sir James Bardsley proposed a plan which he thought would prove efficacious for getting rid of the pestilence.

"It consists" (he wrote) "merely in establishing a universal quarantine for dogs within the kingdom, and a total prohibition of the importation of those animals during the existence of this quarantine. The efficacy of this preventive scheme rests upon the validity of the following propositions: First, that the disease always originates in the canine species; secondly, that it never arises in them spontaneously; thirdly, that the contagion, when received by them, never remains latent more than a few months. If these propositions have been established, it clearly follows that by destroying every dog in which the disease should break out during strict quarantine, not only would the propagation of the malady be prevented, but the absolute source of the poison would be entirely suppressed."

It is much to be wondered at that these wise suggestions should have remained so long neglected by our sanitary authorities.

No reference has been made either by Mr. Youatt or by Sir James Bardsley to the possible perpetuation of the disease by rabid cats. Mad cats, however, are far less common than mad dogs. A cat is not an aggressively fighting animal. At any time, it would rather fly from than resist an attacking dog; and, if there were no dogs to receive and to impart the disease, rabies would soon, so far as the cat is concerned, die out of its own accord.

I have now set forth to the best of my ability—and, perhaps, too much in detail—the amount of our knowledge upon a subject which is at present painfully engrossing the attention of the public. I have shown that we possess no valid evidence of the spontaneous origin, nowadays, of rabies in the dog or in any other animal; and that hydrophobia owes its parentage exclusively to the poison furnished in the first instance by the rabid dog, or by rabid animals of the same species with the dog.

I propose next to fortify my position by pointing out that large portions of the habitable world, abounding in dogs, are now, and have always been, entirely free from those dreadful twin pests, rabies and hydrophobia.

It is my good fortune to have found among my own friends and acquaintances several persons able to give me authentic and valuable information on this subject.

Thus the Bishop of Lichfield, who lived more than twenty-five years in New Zealand, tells me that he never heard of a mad dog in those islands, and that Bishop Abraham's experience, who was for seventeen years resident there, agrees with his own.

Bishop Macdougall writes me word that there is in Borneo a native dog, like a small jackal, but with a curly rather than a bushy tail, kept in numbers by the Dyaks for hunting deer and pigs. These dogs never bark, but when on the scent for game howl with a very musical note. The Chinese settlers also have brought in a dog, resembling the Pomeranian breed. These bark abundantly, and among the settlers, who eat the puppies as a delicacy, they are so numerous as to have become a general nuisance; yet, during the twenty years in which the bishop resided at Sarawak, he never heard of a single instance of rabies.

I was told a few years since, by Sir Henry Young, that in Tasmania, of which he was for seven years the governor, although there were plenty of dogs, there had been no *mad* dogs, and therefore no hydrophobia. Evidence to precisely the same effect has been furnished to a friend of mine by Sir Valentine Fleming, who left Tasmania in 1874, after a residence there of about thirty-two years. He testifies to the great number of dogs in that colony, and to the total absence of hydrophobia. Again, I have it under the hand of Sir George Macleay, who, with Captain Sturt, diligently explored, for other purposes, all the settlements of what has been well called the "insular continent" of Australia, that the dogs there are troublesomely plentiful, that hydrophobia is utterly unknown, and that rabies has never been witnessed in the dingo, or wild-dog of those parts.

It had been stated by Dr. Heineken that curs of the most wretched condition abound in Madeira; that they are afflicted with almost every disease, tormented with flies and heat, and thirst and famine, yet no rabid dog was ever seen there; and I have quite recently been assured by Dr. Grabham, whose personal knowledge of Madeira covers sixteen years, and who states that he is well acquainted with the local traditions, and the writings of medical men there, that rabies and hydrophobia are, and always have been, unknown in that island.

Mr. Thomas Bigg-Wither spent three or four years in South Brazil, within the tropics. He and his party hunted there the wild-dog and the jaguar (a species of tiger) with a pack of fifty smooth-haired dogs of various breeds, which gave tongue during their hunting. Mr. Bigg-Wither has assured me that hydrophobia and rabies are quite unheard of in that part of the world.

We have seen that conditions of temperature have nothing to do with the prevalence of these

diseases. It is interesting, however, to compare this tropical experience with what has been observed in the opposite climate of the arctic regions.

Dr. John Rae, who has been good enough to write to me on these subjects, was for twenty years in the Hudson's Bay Company's Territory, ten of which years were spent at Moose Factory, on the shore of Hudson's Bay, and a year or two each at various other stations as far north as the arctic circle, at all of which dogs in greater or less number are kept for sledging purposes, yet he cannot remember to have seen or heard of a single case of the diseases in question, either in dog or in man. "My knowledge," Dr. Rae says, "of the Esquimaux is much more limited, for, although I have seen these interesting people at various parts of the arctic coast, I have wintered only twice among them, on both occasions at Repulse Bay. But I never saw or heard of any disease resembling hydrophobia."

My distinguished friend, Admiral Sir George Back, who is cognizant of Dr. Rae's testimony in this matter, fully confirms it by his own experience gathered in five expeditions of discovery to the arctic regions during a period of eleven years' service.

A portion of Dr. Rae's information, although it has no direct bearing upon my main purpose, may prove as interesting to my readers as it has been to myself:

"The food of the dogs in Hudson's Bay consists wholly of meat or fish, or of a mixture of both; meat being the chief diet in the prairies, while fish are almost universally given (except when on a journey) in other parts of the country. In the summer, when not required for sledging, the dogs are sent in charge of a man or two to a fishery, where they can be well and cheaply fed. The usual ration is a fish weighing three or four pounds, eaten raw. The best and lightest food for the dogs when at work is dry buffalo or deer meat, about two or two and a half pounds of which is a day's allowance."¹

Colonel Home, C. B., an engineer officer living last year for some months at Constantinople, informs a friend of mine that, having a horror of hydrophobia, he made repeated and special inquiries there, and was assured that no instance of the disease was ever known in that city. He describes the scavenger-dog "as being in temper

and feeling a dog, but his appearance is that of a wolf—a dog in wolf's clothes. He has short pricked ears, and a bushy tail which looks as if it had lost a couple of joints. Usually he is of a foxy hue, but occasionally dark and almost black on the back, where a sore is often to be seen. His fur is very thick and shaggy, and he is of the same size as a wolf." There are in the Zoölogical Gardens two Syrian wolves which present an exact fac-simile of the Constantinople scavenger-dog. These dogs, as is well known, form an important institution in Constantinople, clearing the streets and eating all the offal there to be found. Colonel Home speaks of them as friendly and familiar, and in no way a nuisance, unless some tribe of "civilized" dogs quarrel and fight at night with them or with each other, when the noise they make is fearful. These civilized dogs—country or shepherds' dogs—seem to be badly named, for they are fierce and dangerous, and Colonel Home had to shoot one of two which had pursued and attacked him.

In the *Times* newspaper for the 23d of October, Mr. Ch. Kroll Laporte, of Birkdale Place, Southport, writes that he never heard of a single case of hydrophobia in Africa during travels there extending over two years.

With more time and opportunity at my disposal I might doubtless find further examples of the entire absence of rabies, and therefore of hydrophobia, from certain places; but of this I have surely said enough; and should it be alleged that in other places, where these diseases had previously been unknown, they have at length appeared, my argument will be only strengthened if I can account for this by special circumstances. To take a single instance by way of sample: I have been assured upon unquestionable authority that Demerara had not within the memory of man been afflicted by the presence of hydrophobia till the year 1872, when rabies was imported by the influx of a large number of dogs from Barbadoes, in avoidance of a tax which had there been imposed upon those animals.

If it be admitted that hydrophobia never occurs except from the reception of the specific poison from a rabid animal, it follows that, rabies being expunged, hydrophobia would necessarily disappear. For this end it would seem to be required that all dogs in the kingdom should be subjected to a rigid quarantine of several months, as recommended by Mr. Youatt and by Sir James Bardsley. In order to the effectual enforcement of such quarantine, some legislative measures, and the planning and strict observance of certain

¹ All those who have been personally conversant with the arctic sledge-dogs agree in stating that they are subject to a fatal kind of insanity quite distinct from true rabies, and accordingly not productive of hydrophobia.

regulations on the part respectively of our sanitary authorities and our police-officers, are presumably prerequisites. These are matters with which I am neither called upon nor competent to deal. There will be difficulties in the way, but I am persuaded that, if resolutely grappled with, they will not prove invincible.

Here, then, my share toward the accomplishment of the great object of this paper comes naturally to a close. Meanwhile, until the needful steps for the extirpation of rabies can be fully organized and brought into operation, great vigi-

lance will be necessary to keep in check the existing evil. The superfluity of dogs in the kingdom must be abated by the unshrinking destruction of many; and *all* dogs should be narrowly watched, most especially dogs known to have been bitten or to have been quarreling, sick dogs, wandering and ownerless dogs, and such as are the playthings of dog-fanciers and others; and all such other measures as may be legal should be taken for lessening the peril and the panic which is at present said to be "frighting the isle from her propriety."—*Nineteenth Century*.

PSYCHOLOGICAL CURIOSITIES OF SKEPTICISM.

A REPLY TO DR. CARPENTER.

By ALFRED R. WALLACE, F. R. S.

IN the last number of this periodical Dr. Carpenter has treated his readers to a collection of what he terms "Psychological Curiosities of Spiritualism." Throughout his article he takes Mr. Crookes and myself as typical examples of men suffering under "an epidemic delusion comparable to the witchcraft epidemic of the seventeenth century," and he holds up our names to wonder and scorn because, after many years of inquiry, observation, and experiment, and after duly weighing all the doubts suggested and explanations proposed by Dr. Carpenter and others, we persist in accepting the uniform and consistent testimony of our senses. Are we, indeed, "psychological curiosities" because we rely upon what philosophers assure us is our sole and ultimate test of truth—perception and reason? And should we be less rare and "curious" phenomena if, rejecting as worthless all our personally acquired knowledge, we should blindly accept Dr. Carpenter's suggestions of what he *thinks* must have happened in place of what we *know* did happen? If such is the judgment of the world, we must for a time submit to the scorn and ridicule which usually fall to the lot of unpopular minorities, but we look forward with confidence to the advent of a higher class of critics than our present antagonist, critics who will not condescend to a style of controversy so devoid of good taste and impartiality as that adopted by Dr. Carpenter.

It is with great reluctance that I continue a

discussion so purely personal as this has become, but I have really no choice. If Dr. Carpenter had contented himself with impugning my sanity or my sense on general grounds, I should not think it worth while to write a word in reply. But, when I find my facts distorted and my words perverted, I feel bound to defend myself, not for the sake of my personal character, but in order to put a stop to a mode of discussion which renders all evidence unavailing, and sets up unfounded and depreciatory assertions in the place of fair argument.

I now ask my readers to allow me to put before them the other side of this question; and I assure them that, if they will read through this article, they will acknowledge that the strong language I have used is fully justified by the facts which I shall adduce.

Those who believe in the reality of the abnormal phenomena whose existence is denied by Dr. Carpenter and his followers have, for the most part, been convinced by what they have seen in private houses and among friends on whose character they can rely. They constitute a not unimportant body of literary and scientific men, including several Fellows of the Royal Society. The cases of public imposture (real or imaginary) so persistently adduced by Dr. Carpenter do not affect their belief, which is altogether independent of public exhibitions; and they probably, with myself, look upon the learned doctor, who tilts against facts as Don Quixote

did against windmills, and with equally prejudicial results to himself, as a curious example of fossilized skepticism. Thus Sergeant Cox, who often quotes Dr. Carpenter, and is now quoted by him with approval, speaks of the learned doctor, in his recent address to the Psychological Society, as being "enslaved and blinded" by "prepossession," adding:

"There is not a more notable instance of this than Dr. Carpenter himself, whose emphatic warnings to beware of it are doubtless the result of self-consciousness. An apter illustration of this human weakness there could not be. The characteristic feature of his mind is prepossession. This weakness is apparent in all his works. It matters not what the subject, if once he has formed an opinion upon it, that opinion so prepossesses his whole mind that nothing adverse to it can find admission there. It affects alike his senses and his judgment."

I propose, therefore, as a companion picture to that of Messrs. Crookes and Wallace, the victims of an epidemic delusion, to exhibit Dr. Carpenter as an example of what prepossession and blind skepticism can do for a man. I shall show how it makes a scientific man unscientific, a wise man foolish, an honest man unjust. To refuse belief to unsupported rumors of improbable events, is enlightened skepticism; to reject all second-hand or anonymous tales to the injury or depreciation of any one, is charitable skepticism; to doubt your own prepossessions when opposed to facts observed and reobserved by honest and capable men, is a noble skepticism. But the skepticism of Dr. Carpenter is none of these. It is a blind, unreasoning, arrogant disbelief, that marches on from youth to age with its eyes shut to all that opposes its own pet theories; that believes its own judgment to be infallible; that never acknowledges its errors. It is a skepticism that clings to its refuted theories, and refuses to accept new truths.

Near the commencement of his article Dr. Carpenter tells us that he recurs to this subject as a duty to the public and to assist in curing a dangerous mental disease; and that he would gladly lay it aside for the scientific investigations which afford him the purest enjoyment. But he also tells us that he honestly believes that he possesses "unusual power of dealing with this subject;" and as Dr. Carpenter is not one to hide the light of his "unusual powers" under a bushel, we may infer that it is not pure duty which has caused him, in addition to writing long letters to *Nature* and announcing a "full answer" to myself and Mr. Crookes in the forthcoming new edi-

tion of his "Lectures," to expend his valuable time and energy on an article of forty-eight columns, founded mainly on such a very shaky and unscientific foundation as American newspaper extracts and the unsupported statements of Mr. Home, the medium;¹ while it is full of personal animosity and the most unmeaning ridicule. With extreme bad taste he compares a gentleman, who, as a scholar, a thinker, and a writer, is Dr. Car-

¹ Mr. Home has always been treated by Dr. Carpenter as an impostor: yet now he quotes him as an authority, although Mr. Home's accusations against other mediums are never authenticated in any way, and appear to be in many cases pure imagination. Dr. Carpenter will no doubt now disclaim any imputation against Mr. Home, and pretend to consider him only as the victim of delusion. But this is absurd. For does he not maintain that Mr. Home was never "levitated," although in several cases the fact was proved by his name being found written in pencil on the ceiling, where it remained? This must have been imposture if the levitation were not, as claimed, a reality. Do not the hands, other than those of any persons present, which have often appeared at Mr. Home's *séances* and have been visible and even tangible to all present, prove (in Dr. Carpenter's opinion) imposture? Do not the red-hot coals carried about the room in his hands prove chemical preparation, and therefore imposture? Is not the increase or decrease of the weight of a table, as ascertained by a spring-balance, which I have myself witnessed in Mr. Home's presence, a trick, according to Dr. Carpenter? Is not the playing of the accordion in one hand, or when both Mr. Home's hands are on the table, a clever imposture in Dr. Carpenter's opinion? But if any one of these things is admitted to be, not an imposture, but a reality, then the whole foundation of the learned but most illogical doctor's skepticism is undermined, and he practically admits himself a convert to the *facts* of modern spiritualism. But he does *not* admit this; and as Mr. Home has carried on these alleged impostures during his whole life, and has imbued thousands of persons with a belief in their genuineness, Dr. Carpenter must inevitably believe Mr. Home to be the vilest of impostors and utterly untrustworthy. Yet he quotes him as an authority, accepts as true all the malicious stories retailed by this alleged impostor against rival impostors, and believes every vague and entirely unsupported statement to a like effect in Mr. Home's last book! This from an ex-professor of medical jurisprudence, who ought to have some rudimentary notions of the value of evidence, is truly surprising. It may be said that, although Dr. Carpenter thinks Home an impostor, *we* believe in him, and therefore ought to accept his evidence against other mediums. But this is a fallacy. We believe that he is a *medium*, that is, a machine or organization through whom certain abnormal and marvelous phenomena occur; but this implies no belief in his integrity or in his judgment, any more than the extraordinary phenomenon of double individuality exhibited in the case of the French sergeant (which formed the subject of such an interesting article by Prof. Huxley some time ago) implies that the sergeant was a man of high moral character and superior judgment.

penter's equal, to Moses & Son's kept poet; while with a pitiable inappropriateness he parodies the fine though hackneyed saying, "See how these Christians love one another," in order to apply it satirically to the case of a rather severe, but not unfair, review of Mr. Home's book in a spiritual periodical.

I will now proceed to show, not only that my accusations in the *Quarterly Journal of Science* for July last—which in Dr. Carpenter's opinion amount to a charge of "willful and repeated *suppressio veri*"—are proved, but that a blind reliance on Mr. Home and on "excerpts from American newspapers" has led him to make deliberate statements which are totally unfounded.

I will first take a case which will illustrate Dr. Carpenter's wonderful power of misstatement as regards myself:

1. In a letter to the *Daily News*, written immediately after the delivery of Dr. Carpenter's first "Lecture on Mesmerism" at the London Institution a year ago, I adduced a case of mesmerism at a distance, recorded by the late Prof. Gregory. The lady mesmerized was a relation of the professor, and was staying in his own house. The mesmerizer was a Mr. Lewis. The sole authority for the facts referred to by me was *Prof. Gregory himself*.

2. While criticising this Mr. Lewis in his "Lectures" (p. 24), Dr. Carpenter says, referring to my *Daily News* letter: "His (Mr. Lewis's) utter failure to produce either result, however, under the scrutiny of skeptical inquirers, obviously discredits all *his previous statements*; except to such as (like Mr. A. R. Wallace, who has recently *expressed his full faith in Mr. Lewis's self-asserted powers*) are ready to accept without question the slenderest evidence of the greatest marvels." (The italics are my own.)

3. In my "Review" of Dr. Carpenter's book (*Quarterly Journal of Science*, July, 1877, p. 394) I use strong (but, I submit, appropriate) language as to this injurious and unfounded statement. For Dr. Carpenter's readers must have understood, and must have been intended to understand, that, in sole reliance on this Mr. Lewis's *own statements*, I placed full faith in them without any corroboration, and had also publicly announced this faith; in which case his readers would have been justified in thinking me a credulous fool not worth listening to.

4. Writing again on this subject (in last month's issue of this Magazine, p. 545), Dr. Carpenter does not apologize for the gross and injurious misrepresentation of what I really said,

neither does he justify it by reference to anything else I may have written; but he covers his retreat with a fresh *suggestio falsi*, and ridicules me for using such strong language (which he quotes) merely (he says) because he had reflected on my "too ready acceptance of the slenderest evidence of the greatest marvels"—a phrase of Dr. Carpenter's which I never objected to at all because it was a mere expression of opinion, while what I did object to was a misstatement of a matter of fact. This is Dr. Carpenter's idea of the way to carry on that "calm discussion with other men of science" to the absence of which he imputes all my errors. (Note A, p. 705.)

Dr. Carpenter is so prepossessed with the dominant idea of putting down spiritualism, that it seems impossible for him to state the simplest fact in regard to it without introducing some purely imaginary fact of his own to make it fit his theory. Thus, in his article on "The Fallacies of Testimony" (*Contemporary Review*, 1876, p. 286) he says: "A whole party of believers will affirm that they saw Mr. Home float out of one window and in at another, while a single honest skeptic declares that Mr. Home was sitting in his chair *all the time*." Now, there is only one case on record of Mr. Home having "floated out of one window and in at another." Two of the persons present on the occasion—Lord Adare and Lord Lindsay—have made public their account of it, and the third has never declared that Mr. Home was "sitting in his chair all the time," but has privately confirmed, to the extent his position enabled him to do so, the testimony of the other two. Is this another case of Dr. Carpenter "celebrating" his facts to suit his theory, or will he say it is a purely hypothetical case? Yet this can hardly be, for he goes on to argue from it: "And in this last case we have an example of a *fact*, of which," etc., etc. I ask Dr. Carpenter to name the "honest skeptic" of this quotation, and to give us his precise statement; or, failing this, to acknowledge that he has imagined a piece of evidence to suit his hypothesis. (Note B, p. 706.)

It is only fair that he should do this because, in another of his numerous raids upon the poor deluded spiritualists, he has made a direct and, as it seems to me, completely unsupported charge against Lord Lindsay. In his article on "Spiritualism and its Recent Converts" (*Quarterly Review*, 1871, pp. 335, 336) Dr. Carpenter quotes Lord Lindsay's account of an experiment with Mr. Home, in which Lord Lindsay placed a powerful magnet in one corner of a totally dark room, and then brought in the medium, who after a few

moments said he saw a sort of light on the floor; and to prove it led Lord Lindsay straight to the spot, and placed his hand upon the magnet. The experiment was not very remarkable, but still, so far as it went, it confirmed the observations of Reichenbach and others. This Dr. Carpenter cannot bear; so he not only proceeds to point out Lord Lindsay's complete ignorance of the whole subject, but makes him morally culpable for not having used Dr. Carpenter's pet test of an electro-magnet; and he concludes thus: "If, then, Lord Lindsay cannot be trusted as a 'faithful' witness in 'that which is least,' how can we feel assured that he is 'faithful also in much?'" By what mental jugglery Dr. Carpenter can have convinced himself that he had shown that Lord Lindsay "cannot be trusted as a faithful witness," I am at a loss to understand. But the *animus* against the friend of and believer in Mr. Home is palpable. Now that Lord Lindsay has achieved a scientific reputation, we presume there must be two Lord Lindsays as well as two Mr. Crookeses: one the enthusiastic astronomer and careful observer, the other the deluded spiritualist and "psychological curiosity." As these double people increase it will become rather puzzling, and we shall have to adopt Mr. Crookes's prefixes of "Ortho" and "Pseudo," to know which we are talking about.¹ It will be well, also, to note the Scriptural language employed by Dr. Carpenter in making this solemn and ridiculously unfounded charge. It reminds one of the "I speak advisedly" (in the celebrated *Quarterly Review* article now acknowledged by Dr. Carpenter) which Mr. Crookes has shown to be in every case the prefix of a wholly incorrect statement.²

Dr. Carpenter heads a section of his article in last month's issue of this periodical, "What Mr. Wallace means by Demonstration;" and endeavors to show that I have misapplied the term when I stated that in certain cases flowers had appeared at *séances*, "demonstrably not brought by the medium." His long quotations from Mr. Home, giving purely imaginary and burlesque accounts of such *séances*, totally unauthenticated by names or dates, may be set aside, as not only irrelevant, but as insulting to the readers who are asked to accept them as evidence. Dr. Carpenter begins by confounding the proof of a *fact* and that of a *proposition*, and, against the view of the best modern philosophers, maintains that the latter alone can be truly said to be "demon-

strated." But this is a complete fallacy. The direct testimony of the educated senses, guided by reason, is of higher validity than any complex result of reason alone. If I am sitting with two friends, and a servant brings me a letter, I am justified in saying that that letter was "demonstrably not brought by one of my friends." Or if a bullet comes through the window and strikes the wall behind me, I am justified in saying that one of my two friends, sitting at the table, "demonstrably did not fire the pistol"—always supposing that I am proved to be in the full possession of my ordinary senses by the general agreement of my friends with me as to what happened. Of course, if I am in a state of delusion or insanity, and my senses and reasoning powers do not record events in agreement with others who witness them, neither shall I be able to perceive the force of a mathematical demonstration. If my senses play me false, squares may seem to me triangles and circles ellipses, and no geometrical reasoning will be possible. Dr. Carpenter next asserts that I "complain" of his "not accepting the flowers and fruits produced in my own drawing-room, and those which made their appearance in the house of Mr. T. A. Trollope, at Florence." This is simply not the case. I never asked him to accept them, or complained of his not accepting them; but I pointed out that he did accept the evidence of a prejudiced witness to support a theory of imposture which was entirely negatived in the two cases I referred to.¹ I implied that he should either leave the subject alone, or deal with the *best* evidence of the alleged facts. To do otherwise was not "scientific," and to put anonymous and unsupported evidence before the public as conclusive of the whole question was both unscientific and disingenuous. Now that he does attempt to deal with these cases, he makes them explicable on his own theory of imposture only by leaving out the most essential facts.

He first says that "in Mr. Wallace's own case no precautions whatever had been employed!" and he introduces this with the remark, "Now it will scarcely be believed," to which I will add that it must not be believed, because it is untrue. I have never published a *detailed* account of this *séance*, but I have stated the main facts with sufficient care² to show that the phenomenon itself was a test surpassing anything that could have been prearranged. The general precautions used by me were as follows: five personal friends were

¹ See *Nature*, November 1, 1877, p. 8.

² *Quarterly Journal of Science*, January, 1872: "A Reply to the *Quarterly Review*."

¹ See *Quarterly Journal of Science*, July, 1877, pp. 410-412.

² "Miracles and Modern Spiritualism," p. 164.

present besides myself and the medium, among them a medical man, a barrister, and an acute colonial man of business. The sitting was in my own back drawing-room. No cloth was on the table. The adjoining room and passage were fully lighted. We sat an hour in the darkened room before the flowers appeared, but there was always light enough to see the outlines of those present. We sat a little away from the table, the medium sitting by me. The flowers appeared on the polished table dimly visible as a *something*, before we lighted the gas. When we did so the whole surface of the four-feet circular table was covered with fresh flowers and ferns, a sight so beautiful and marvelous that, in the course of a not uneventful life, I can hardly recall anything that has more strongly impressed me. I begged that nothing might be touched till we had carefully examined them. The first thing that struck us all was their extreme freshness and beauty. The next, that they were all covered, especially the ferns, with a delicate dew—not with coarse drops of water as I have since seen when the phenomenon was less perfect, but with a veritable, fine dew, covering the whole surface of the ferns especially. Counting the separate sprigs, we found them to be forty-eight in number, consisting of four yellow and red tulips, eight large anemones of various colors, six large flowers of *Primula japonica*, eighteen chrysanthemums, mostly yellow and white, six fronds of *Lomaria* a foot long, and two of a *Nephrodium*, about a foot long and six inches wide. Not a pinnule of these ferns was rumpled, but they lay on the table as perfect as if freshly brought from a conservatory. The anemones, primroses, and tulips, had none of them lost a petal. They were found spread over the whole surface of the table, while we had been for some time intently gazing on the sheen of its surface, and could have instantly detected a hand and arm moving over it. But that is not so important as the *condition* of these flowers and their dewiness; and—Dr. Carpenter notwithstanding—I still maintain they were (to us) “demonstrably not brought by the medium.” I have preserved the flowers and have them now before me, with the attestation of all present as to their appearance and condition; and I have also my original notes made at the time. How simple is Dr. Carpenter’s notion that I tell this story, after ten years, from memory! How ingenious is his suggestion of the *lining of a cloak* as their place of concealment for four hours—a suggestion taken from a second-hand story by Mr. Home about a paid medium, and therefore

not the lady whose powers are now under discussion! How utterly beside the question his subsequent remarks about conjurers, and hats, and the mango-trees, produced by Indian jugglers!

If the case certified by Mr. T. A. Trollope, the medium’s person (not her dress only, as Dr. Carpenter says) was carefully searched before sitting down; but now it is objected that “an experienced female searcher” would have been more satisfactory, and the fact is ignored that phenomena occurred which precluded the necessity of any search. For, while the medium’s hands were both held, a large quantity of jonquils fell on the table, “filling the whole room with their odor.” If Dr. Carpenter can get over the “sudden falling on the table” of the flowers while the medium’s hands were held, how does he explain the withholding of the powerful odor “filling the whole room” till the moment of their appearance? Mr. Trollope says that this is, “on any common theory of physics, unaccountable,” and I say that this large quantity of powerfully-smelling jonquils was “demonstrably not brought by the medium.” I have notes of other cases equally well attested. In one of these at a friend’s house, to which I myself took Miss Nicholl, eighty separate stalks of flowers and ferns fell on the table while the medium’s hands were both held. All were perfectly fresh and damp, and some large sprays of maiden-hair fern were quite perfect. On another occasion, I was present when twenty different kinds of fruits were asked for, and every person had his chosen kind placed before him on the table or put at once into his hands by some invisible agency. These cases might be multiplied indefinitely, and many are recorded which are still more completely beyond the power of imposture to explain. But all such are passed over by Dr. Carpenter in silence. He asks for better evidence of certain facts, and, when we adduce it, he says we are the victims of a “diluted insanity.”¹ In the supposed Belfast exposure by means of potassium ferrocyanide, I objected that the only evidence was that of a prejudiced witness, with a strong *animus* against the medium. Dr. Carpenter now prints this young man’s letter (of which he had in his lecture given the substance), and thinks that he has transformed his *one* witness into *two* by means of an anonymous “friend” therein mentioned. He talks of the “immediate detection of the salt by *one* witness and the subsequent confirmatory testimony of the *other*”—this “other”

¹ Dr. Carpenter’s “Mental Physiology,” second edition, p. 362.

being the anonymous friend of the "one witness" letter! Unfortunately, this "friend" wrote a letter to the papers in which he brought an additional accusation, which I have proved, by the testimony of an unimpeachable witness, to be utterly unfounded. (*See Quarterly Journal of Science*, July, 1877, page 411.) We may, therefore, dismiss the "exposure" as, to say the least, not proven.

Dr. Carpenter heads one of his sections, "What Messrs. Wallace and Crookes regard as 'Trustworthy Testimony';" and, before I remark on its contents, I wish to point out the literary impropriety of which Dr. Carpenter is guilty, in thus making Mr. Crookes responsible for the whole contents of my article in the *Quarterly Journal of Science* because he happens to be the editor of that periodical. I might with equal justice charge upon the editor of *Fraser* all the misstatements and injurious personal imputations which Dr. Carpenter has introduced into an article, accepted, doubtless, without question on the strength of his high scientific standing.

Under the above heading, Dr. Carpenter attempts to show that Colonel Olcott (whose investigation into the character of Mrs. White and her false declaration that she had, on certain occasions, personated "Katie King," I quoted in my review) is an untrustworthy witness; and his sole proof consists in a quotation from a published letter of the colonel's about bringing an "African sorcerer" to America. This letter may or may not be injudicious or foolish—that is matter of opinion. But how it in any way "blackens" Colonel Olcott's character or proves him to be "untrustworthy" as a witness to matters of fact, it must puzzle every one but a Carpenter or a Home to understand.

The next example I shall give of Dr. Carpenter's "unusual power of dealing with this subject" is, a most injurious misstatement referring to my friend Mr. Crookes. Dr. Carpenter heads a section of more than eight columns, "Mr. Crookes and his Scientific Tests," and devotes it to an account of Eva Fay's performances, of Mr. Crookes's "inconsiderate indorsement of one of the grossest impostures ever practised," and of the alleged exposure of the fraud by Mr. W. Irvine Bishop. The following quotation contains the essence of the charge, and I invite particular attention to its wording:

"... her London audiences diminishing away, Eva Fay returned to the United States, carrying with her a letter from Mr. Crookes, which

set forth that since doubts had been thrown on the spiritualistic nature of her 'manifestations,' and since he, in common with other Fellows of the Royal Society, had satisfied themselves of their genuineness by 'scientific tests,' he willingly gave her the benefit of his attestation. This letter was published in *fac-simile* in American newspapers."

I can scarcely expect my readers at once to credit what I now have to state; that, notwithstanding the above precise setting forth of its contents, by a man who professes to write under a sense of duty, and as one called upon to rehabilitate the injured dignity of British science, such a letter as that above minutely described never existed at all! A private letter from Mr. Crookes has indeed, without his consent, been published in *fac-simile* in American newspapers; but this letter was *never* in the possession of Eva Fay; it was not written till months after she had left England, and then not to her, but in answer to inquiries by a perfect stranger; moreover, it contains not a word in any way resembling the passages above given! Sad to say, Dr. Carpenter's kind Boston friends do not appear to have sent him a copy of the paper containing the *fac-simile* letter, or he would have seen that Mr. Crookes says *nothing* of "the spiritualistic nature of her manifestations;" he does *not* mention "other Fellows of the Royal Society;" he does *not* say he was "satisfied of the genuineness of the scientific tests," but especially guards himself by saying that the published account of the experiments made at his own house are the best evidence of his belief in her powers. He does *not* "give her the benefit of his attestation," but simply says that no one has any authority to use his name to injure her.

The number of the New York *Daily Graphic* for April 12, 1876, containing the letter in *fac-simile*, is now before me. An exact copy of it is given below, and I ask my readers to peruse it carefully, to compare it with Dr. Carpenter's precise summary given *as if from actual inspection*, and then decide by whose instrumentality the honored distinction of F. R. S. is being "trailed through the dirt," and who best upholds his own reputation and that of British science. Is it the man who writes a straightforward letter in order to prevent his name being used to injure another, and who states only facts within his own personal knowledge; or is it he who, for the express purpose of depreciating¹ the well-earned reputation

¹ "In the United States more especially . . . the names of the 'eminent British scientists,' Messrs. Crookes and Wallace, are 'a tower of strength.' And

of a fellow-man of science, publishes without a word of caution or hesitation a purely imaginary account of it?

MR. CROOKES'S "FAC-SIMILE" LETTER.

"Nov. 8, 1875.

"To R. Cooper, Esq.

"c/o C. Maynard, Esq.

"223 Washington Street,

"Boston, Mass., U. S. A.

"DEAR SIR,

"In reply to your favor of Oct. 25, which I have received this morning, I beg to state that no one has any authority from me to state that I have any doubts of Mrs. Fay's mediumship. The published accounts of the test *séances* which took place at my house are the best evidence which I can give of my belief in Mrs. Fay's powers. I should be sorry to find that any such rumors as you mention should injure Mrs. Fay, whom I have always found most ready to submit to any conditions I thought fit to propose. Believe me, very truly yours,

"WILLIAM CROOKES."

Notwithstanding this attack, all the evidence Dr. Carpenter can adduce as to the alleged exposure of Eva Fay has really no bearing whatever on Mr. Crookes's position. Long and wordy letters are given *verbatim*, which only amount to this: that the writers saw a clever conjurer do what they *thought* was an exact imitation of Eva Fay's performances, and of those of mediums generally. But a most essential point is omitted. Neither of the three writers says *he ever saw Eva Fay's performance*. Still less do they say they ever saw her *in private* and *tested her themselves*; and without this their evidence is absolutely worthless. Mr. Crookes has said nothing, good or bad, about her public performances; but she came *alone* to his own house, and there, aided by scientific friends, in his own laboratory, he tested her by placing her in an electrical circuit from which she could not possibly escape or even attempt to escape without instant discovery. Yet when in this position books were taken from the bookcase twelve feet away and handed out to the observers. The beautiful arrangements by which these tests were carried out are detailed by Mr. Crookes in the *Spiritualist* newspaper of March 12, 1875, and should be read by every one who wishes to understand the real difference be-

it consequently becomes necessary for me to undermine that tower by showing that in their investigation of this subject they have followed methods that are thoroughly unscientific, and have been led, by their 'prepossession,' to accept with implicit faith a number of statements which ought to be rejected as completely untrustworthy."—*Fraser's Magazine*, November, 1877, p. 543.

tween the methods of procedure of Mr. Crookes and Dr. Carpenter. Not one word is said, either by Dr. Carpenter's correspondents or by the *Daily Graphic*, as to this test having been applied to Mr. Bishop by an electrical engineer or other expert, and till this is done how can Mr. Crookes's position be in any way affected? A public performance in Boston, parodying that of Miss Fay, but without one particle of proof that the conditions of the two performances were really identical,¹ is to Dr. Carpenter's logical and skeptical mind a satisfactory proof that one of the first experimenters of the day was imposed on in his own laboratory, when assisted by trained experts, and when applying the most absolute tests that science can supply.² (Note C, p. 239.)

I have now shown to the readers of *Fraser* (as I had previously shown in the *Quarterly Journal of Science*) that whatever Dr. Carpenter writes on this subject, whether opinion, argument, quotation, or fact, is so distorted by prejudice as to be untrustworthy. It is therefore unnecessary here to reply in detail to the mass of innuendo and assumption that everywhere pervades his article; neither am I called upon to notice all the alleged "exposures" which he delights in placing before his readers. To "expose" malingerers and cases of feigned illness does not disprove the existence of disease; and if, as I believe has been

¹ The account in the New York *Daily Graphic* almost proves that they were not. For the clever woodcuts showing Mr. Bishop during his performances indicate an amount of stretching of the cord which certainly could be at once detected on after-examination, especially if the knots had been sealed or bound with court-plaster. Yet more: according to these illustrations, it would be *impossible* for Mr. Bishop to imitate Eva Fay in "tying a strip of cloth round her neck" and "putting a ring into her ear," both of which are specially mentioned as having been done by her. It may well be supposed that the audience, delighted at an "exposure," would not be quite so severely critical as they are to those who claim to possess abnormal powers.

² As hardly any of my readers will have seen the full account of these tests, and as the whole is too long for insertion here, I give a pretty full abstract of all the essential portions of it in an Appendix to this paper. This is rendered necessary because Dr. Carpenter declares that he is going to give, in the new edition of his *Lectures*, "the whole explanation" of the "dodge" by which these "scientific tests" could be evaded—"a dodge so simple that Mr. Crookes's highly-trained scientific acumen could not detect it." These are Dr. Carpenter's own words, in his article last month (p. 553), and it is necessary that he should be called on to make them good by really explaining Mr. Crookes's actual experiments, and not some other experiments which "American newspapers" may substitute for them.

demonstrated, the phenomena here discussed are marvelous realities, it is to be expected that there will be impostors to imitate them, and no lack of credulous persons to be duped by those impostors. But it is not the part of an honest searcher after truth to put forward these detected impostures while ignoring the actual phenomena which the impostors try to imitate. When we have Dr. Carpenter's final word in the promised new edition of his Lectures, I shall be prepared to show that tests far more severe than such as have resulted in the detection of imposture have been over and over again applied to the genuine phenomena with no other result than to confirm their genuineness.

This is not the place to discuss the reality of the phenomena which Dr. Carpenter rejects with so much misplaced indignation, and endeavors to put down by such questionable means. The careful observations of such men as Prof. Barrett, of Dublin, and the elaborate series of test experiments carried out in his own laboratory by Mr. Crookes,¹ are sufficient to satisfy any unprejudiced person that the phenomena are genuine; and, if so, whatever theory we may adopt concerning them, they must greatly influence all our fundamental ideas in science and philosophy. The attempt to excite prejudice against all who have become convinced that these things are real, by vague accusations, and by quoting all the trash that can be picked out of the literature of the subject, is utterly unworthy of the men of science who adopt it. For nearly thirty years this plan has been unsparingly pursued, and its failure has been complete. Belief in the genuineness of the phenomena has grown steadily year by year; and at this day there are, to my personal knowledge, a larger number of well-educated and intelligent, and even of scientific men, who profess their belief, than at any former period. There is no greater mistake than to suppose that this body of inquirers have obtained their present convictions by what they have seen at public *séances* only. In almost every case those convictions are the result of a long series of experiments in private houses; and it would amaze Dr. Carpenter to learn the number of families in every class of society in which even the more marvelous and indisputable of these phenomena occur. The course taken by Dr. Carpenter of discrediting evidence, depreciating character, and retailing scandal, only confirms these people in their belief that men of science are powerless in

face of this great subject; and I feel sure that all he has written has never converted a single earnest investigator.

It is well worthy of notice, as correlating this inquiry with other branches of science, that there is no royal road to acquiring a competent knowledge of these phenomena, and this is the reason why so many scientific men fail to obtain evidence of anything important. They think that a few hours should enable them to decide the whole thing; as if a problem which has been ever before the world, and which for the last quarter of a century has attracted the attention of thousands, only required their piercing glance to probe it to the bottom. But those who have devoted most time and study to the subject, though they become ever more convinced of the reality, the importance, and the endless phases of the phenomena, find themselves less able to dogmatize as to their exact nature or theoretical interpretation. Of one thing, however, they feel convinced: that all further discussion on the inner nature of man and his relation to the universe is a mere beating of the air, so long as these marvelous phenomena, opening up as they do a whole world of new interactions between mind and matter, are disregarded and ignored.

APPENDIX.

Abstract of Mr. Crookes's Experiments above referred to.

The apparatus used consisted of an electrical circuit with a reflecting galvanometer showing the slightest variations in the current, designed and arranged by one of the most eminent practical electricians. This instrument was fixed in Mr. Crookes's laboratory, from which two stout wires passed through the wall into the library adjoining, and there terminated in two brass handles fixed at a considerable distance apart, and having only an inch or two of play. These handles are covered with linen soaked in salt and water, and when the person to be experimented on holds these handles in the hands (also first soaked in salt and water) the current of electricity passes through his or her body, and the exact "electrical resistance" can be measured; while the reflecting galvanometer renders visible to all the spectators the slightest variation in the resistance. This instrument is so delicate that the mere loosening of the grasp of one or both hands or the lifting of a finger from the handle would be shown at once, because by altering the amount of surface in contact the "electrical resistance" would be instantly changed. Two experienced physicists, both Fellows of the Royal Society, made experiments with this instrument for more than an hour before the tests began,

¹ *Quarterly Journal of Science*, October, 1871, and January, 1874.

and satisfied themselves that, even with an exact knowledge of what was required and with any amount of preparation, they could not substitute anything connecting the two handles and having the same exact resistance as the human body without a long course of trial and failure, and without a person in the other room to tell them if more or less resistance were required, during which time the index spot of light of the galvanometer was flying wildly about. Comparative steadiness of the index could only be secured by a steady and continuous grasp of the two handles.

Having thus described the apparatus, let us now consider how the test was carried out. The gentlemen invited to witness it were three Fellows of the Royal Society, all of special eminence, and three other gentlemen. They examined the library; fastened up the door to the passage as well as the window with strips of paper sealed with their private seals; they examined all the cupboards and desks; they noted the position of various articles, and measured their distances as well as that of the bookcase from the handles to be held by the medium. The library was connected with the laboratory by a door close to where the medium sat, and this door was wide open, but the aperture was closed by means of a curtain. Everything having been thus arranged, Eva Fay was invited to enter the library, having up to this time been in the drawing-room up-stairs, and having come to the house *alone*. She then seated herself in a chair placed for the purpose, and, having moistened her hands as directed, took hold of the two handles. The exact "electrical resistance" of her body was then noted, as well as the deflection shown by the galvanometer; and, the gas in the library having been turned down low, the gentlemen took their places in the laboratory, leaving Eva Fay alone.

In one minute a hand-bell was rung in the library. In two minutes a hand came out at the side of the door farthest from the medium. During the succeeding five minutes four separate books were handed out to their respective authors, a voice from the library calling them by name. These books had been taken from the bookcase twelve feet from Eva Fay: they had been found in the dark, and one of them had no lettering on the back. Mr. Crookes declares that although he, of course, knew the general position of the books in his own library, he could not have found these books in the dark. Then a box of cigars was thrown out to a gentleman very fond of smoking, and finally an ornamental clock which had been standing on the chimney-piece was handed out. Then the circuit was suddenly broken, and, on instantly entering the library, Eva Fay was found lying back in the chair senseless, a condition in which she remained for half an hour. All the above phenomena occurred during the space of

ten minutes, and the reflecting galvanometer was steady the whole time, showing only those small variations which would occur while a person continued to hold the handles.

On two other occasions Mr. Crookes carried out similar tests with the same medium and always with the same result. On one occasion several musical instruments were played on at the same time, and a musical-box was wound up while the luminous index of the galvanometer continued quite steady, and many articles were handed or thrown out into the laboratory. On the other occasion similar things happened, after all possible precautions had been taken; and in addition Mr. Crookes's desk, which was carefully locked before the *séance*, was found unlocked and open at its conclusion.

Every one must look forward with great interest to Dr. Carpenter's promised "explanation" of how all these scientific tests were evaded by an unscientific impostor.

NOTE A.—Since this article was in the printer's hands, a proof-sheet of the new edition of Dr. Carpenter's Lectures has been forwarded to me at the author's request, in order that I may see what further explanations he has to give to the above case. Dr. Carpenter now attempts to justify his assertion that I had "*recently expressed my full faith in Mr. Lewis's self-asserted powers,*" by a statement of what Dr. Simpson told him several years ago, a statement which appears to have been never yet made public, and which, therefore, could not possibly have been taken into account by me, even had it any real bearing on the question at issue. It is to the effect that Mr. Lewis *might* have received information of the exact hour at which the lady he had promised to try to mesmerize at a distance fell asleep in Prof. Gregory's house, and that he *might* have afterward given a false statement of the hour at which he attempted to mesmerize her. Dr. Carpenter is excessively indignant when any doubt is thrown by me on the truthfulness or impartiality of any of his informants, but it seems the most natural thing in the world for him to charge falsehood or fraud against all who testify to facts which he thinks incredible. But even admitting that Dr. Carpenter's memory of what was told him many years ago is absolutely perfect, and admitting that Mr. Lewis (against whose moral character nothing whatever is adduced) would have told a direct falsehood in order to magnify his own powers, how does this account for the fact that the lady was overcome by the mesmeric sleep at all, when her mind and body were both actively engaged at the piano early in the afternoon? And how does it account for the headache which had troubled her the whole day suddenly ceasing? It is not attempted to be shown that Mr. Lewis's statement—that he returned home at the hour named, and at once proceeded to try and mesmerize the lady—is not true; so that, except for the supposed incredibility of the whole thing in Dr. Carpenter's opinion, there would be no reason to doubt the exact correctness of the statements made. But, even if the reader adopts the view that Mr. Lewis was really an impostor, that does not make Dr. Carpenter's

original assertion—that I had “expressed” my full faith in his “self-asserted powers”—one whit more accurate. If Dr. Carpenter had then in his memory this means of throwing doubt on the facts, why did he not mention it in his Lectures or in his article, instead of first charging me with the “expression” of a faith which I never expressed or held, and then attempting to change the issue by substituting other words for those which I really complained of?

NOTE B.—In the new edition of Dr. Carpenter's Lectures (the proof of part of which has been sent me) he supports his statement that “there are at the present time numbers of educated men and women who have so completely surrendered their ‘commonsense’ to a dominant prepossession as to maintain that any such monstrous fiction (as of a person being carried through the air in an hour from Edinburgh to London) ought to be believed, even upon the evidence of a single witness, if that witness be one upon whose testimony we should rely in the ordinary affairs of life”—by saying that “the moonlight sail of Mr. Home is extensively believed on the testimony of a single witness.” Even if it were the fact that this particular thing is believed by some persons on the testimony of a single witness, that would not justify Dr. Carpenter's statement that there are numbers of educated men and women who maintain as a principle that any such thing, however monstrous, *ought* to be so believed. As, however, there are, as above shown, *three* witnesses in this case, and at least *ten* in the case of Mrs. Guppy, also referred to, it appears that Dr. Carpenter first makes depreciatory general statements, and, when these are challenged, supports them by a misstatement of facts. Such a course of procedure renders further discussion impossible.

NOTE C.—A letter of Dr. Carpenter's has also, “at his own request,” been forwarded to me, in which he attempts to justify the conduct narrated above. In *Nature*, for November 15th, Mr. Crookes printed the letter which was given in *fac-simile* in American newspapers, with remarks of a somewhat similar character to those I have here made. Dr. Carpenter, writing three days afterward (November 18th), wishes it to be stated in *Fraser*, as his “own correction,” that this letter was *not* carried away from England by Eva Fay; adding, “What *was* carried away by Eva Fay was a *much stronger attestation, publicly given in full detail by Mr. Crookes* in a communication to the *Spiritualist*”—of which communication I give an abstract in an appendix to this article. This obliges me to add a few further particulars.

In *Nature*, October 25th, in a note to a letter about the radiometer, Dr. Carpenter says: “On the strength of a private letter from Mr. Crookes, which has been published in *fac-simile* in the American newspapers, a certain Mrs. or Miss Eva Fay announced her “spirit-

ualistic” performances as indorsed by Prof. Crookes and other Fellows of the Royal Society.” This supposed letter was “set forth” in detail in last month's *Fraser* as above stated.

In *Nature*, November 8th, Dr. Carpenter says: “And the now notorious impostor, Eva Fay, has been able to appeal to the ‘indorsement’ given to her by the ‘scientific tests’ applied to her by ‘Prof. Crookes and other Fellows of the Royal Society,’ which had been published (I now find) by Mr. Crookes himself in the *Spiritualist* in March, 1875.”

From the above it follows, that it was between October 25th and November 8th that Dr. Carpenter first became acquainted with Mr. Crookes's account of his experiments with Eva Fay; and, finding (from Mr. Crookes's publication of it) that his own detailed account of the contents of the *fac-simile* letter was totally incorrect, he now makes a fresh assertion—that Eva Fay “carried away with her” a copy of the *Spiritualist* containing Mr. Crookes's experiments. This is highly probable, but we venture to doubt if Dr. Carpenter has any authority to state it as a fact; while, even if she did, that article does not, any more than the *fac-simile* letter, justify Dr. Carpenter's allegations. It contains not one word about the “spiritualistic nature of her manifestations”—it does *not* state that he “in common with other Fellows of the Royal Society had satisfied himself of their genuineness”—it does *not* say that he “willingly gave her the benefit of his attestation.” It is a detailed account of a beautiful scientific experiment, and nothing more. Yet Dr. Carpenter still maintains (in his letter now before me) that his statements are correct, “except on the one point—one of *form* not of *substance*—that of the address of the letter in which Mr. Crookes attested the genuineness of the mediumship of Eva Fay!”

It thus appears that, when he wrote the article in last month's *Fraser*, and the letter in *Nature* of October 25th, Dr. Carpenter had not seen either the *fac-simile* letter or the account in the *Spiritualist*, and there is nothing to show that he even knew of the existence of the latter article; yet, on the strength of mere rumor, newspaper cuttings, or imagination, he gives the supposed contents of a letter from Mr. Crookes, emphasizing such obnoxious words as “spiritualistic” and “manifestations,” which Mr. Crookes never once employed, and giving a totally false impression of what Mr. Crookes had really done. So enamored is he of this accusation, that he drags it into a purely scientific discussion on the radiometer, and now, in his very latest communication, makes no apology or retraction, but maintains all his statements as correct “*in substance*,” and declares that he “cannot see that he has anywhere passed beyond the tone of gentlemanly discussion.”

—*Fraser's Magazine.*

DR. PLOSS ON "THE CHILD."

By EDWARD B. TYLOR.

DR. PLOSS'S monograph on "The Child" at once takes its place among the handbooks of the science of Culture. Its plan is to bring together and discuss in a systematic way the ideas and habits of all nations as to the birth and early treatment of their offspring. How have different peoples come to fix their various rules for the dieting, clothing, cradling, carrying, doctoring, naming, consecrating, diverting, and teaching of children, and which ways are best for the public welfare? Here are two sets of inquiries, which are too generally carried on separately, as though one belonged, so to speak, to the Anthropological Institute, and the other to the Social Science Congress. Dr. Ploss's work is to be commended for the way in which the ethnological and practical sides are worked together and made to throw light on one another. He is, no doubt, right also in following the principle that all such customs had originally a practical intention, however absurd the purpose or the way of carrying it out may seem from our point of view. It so happens that the treatment of babies, being everywhere in the conservative hands of grandmothers and old nurses, has to an extreme degree kept up archaic ideas, even in modern Europe. It is the old wives who, in spite of the doctors' protests, still swaddle infants in Germany like live mummies, to prevent their growing crooked. It is they who give the children medicine to prevent their being ill, and keep up the use of nostrums which curious inquirers may trace back through the middle ages to Hippocrates and Galen, and wonder how old they were then. Nations, dynasties, faiths, may rise and fall, but old wives' tales hold on. Sometimes, indeed, a new name and adaptation is fitted to the old idea, as when the Three Fates or Norns give up to the "Three Maries" the task of spinning the child's thread of life; but there need not even be this change—in Albanian folklore the three classic *Moirai* (*Mire*) still deal out its destiny. Of all the many relics of early religion mentioned in the present book, perhaps none carries us so far back into the region of primitive animism as the Swiss peasant custom when a mother dies in child-birth, of putting a pair of shoes into her coffin that she may come back for six weeks to tend the child, for else she may appear and complain that she has to walk

barefoot through the thistles and thorns. If mother and child both die, they give her needle and thread and soap, that she may do her sewing and washing for it. North American Indians or South-Sea Islanders could hardly go beyond this, or do it with much clearer intent. If, then, ideas so ancient can be kept up in the midst of modern cultured nations, how much further may the nursery customs of the barbarians have carried on unbroken clews to guide our minds back into the prehistoric world!

The plan of looking for practical purpose at the origin of every custom is particularly applicable to those which may have been at first sanitary rules settled by habit for the public benefit, but which now present themselves under the more solemn aspect of sacred rites, and are even claimed as enjoined on man by divine revelation. On these customs our author, in his double capacity of physician and ethnologist, gives an opinion of some weight. Thus, he insists on the hygienic usefulness of the widely-distributed customs and ordinances as to the separation and purification of mothers (chapter iii.). North and South Americans, Polynesians, Tartars, African negroes, are alike in having as to this matter severe rules severely enforced, though they often can give no further reason for them than ancestral tradition, and fear that harm would come if they were set aside. From the similarity of the rules ordained in the great Old World religions, such as Brahmanism and Parsism on the Aryan side, and Judaism and Mohammedanism on the Semitic side, it can hardly be doubted that what the law-givers of these faiths did was to adopt, with more or less modification, an already existing customary law, reënacting it under new religious sanction. It is curious to notice how nearly this particular group of social rules has disappeared, at any rate as express ordinances, from Christendom, where little is left except a few popular superstitions and the rite of "churching," which is the scarcely recognizable descendant of the Jewish purification. Another wide-lying custom, familiar to us from its forming part of the Levitical law, is circumcision, but the study of its distribution over the world makes it probable that here again we have a case of prehistoric custom being adopted into national law (chapter xiv.). There is no reason to assume

its first origin even in Egypt, the country where its earliest traces appear in the great Old World district it now occupies. How it reached Australia, Feejee, perhaps even South America, before Europeans visited these countries, or whether it was invented there, there is no evidence. But as to the reason of it, there is a fair case in favor of those who agree with Dr. Ploss that it was adopted from belief in its being a practically beneficial operation. At any rate, those who find in it the more mystic purpose of a symbol or a sacrifice must find it harder to explain why as such it has come to prevail over so large and distant regions.

Among customs derived from early stages of culture in Europe one deserves especial notice, which probably dates back far beyond the cromlechs and dolmens. Though the memory of its original purpose may be lost among the peasants who keep it up, it may still be interpreted among the tribes of the savage and barbaric world, to whom it properly belongs. This is the practice of deforming the skulls of infants (chapter xiv.). Within the last generation or so, medical observers have put on record its extensive prevalence in France, the custom of Normandy being for the nurses to give the baby's skull the approved sugar-loaf shape by means of bandages and a tight cap, while in Brittany the long shape of the new-born child's head is disapproved of, and pressure is applied to make it round. This latter appears to have been the old Swiss custom, to judge from a passage in the seventeenth-century "*Hebammenbüchlein*" of Muralt: "As soon as the nurse has the child on her lap she looks it all over to see if it is well shaped, then gives its little head the round form, and puts on a scarlet fur and cap to preserve it." It is interesting to find the nurses not only shaping the babies' skulls, but shaping them to different types in different districts. One is reminded of the two contrasted portraits in Wilson's "Prehistoric Man," representing heads from two tribes of Northwest America, one (the Newattee) shaped into a cone, the other (the Chinook) with the forehead flattened and broadened, so that the unfortunate child looks in front like an aggravated case of water on the brain. So in New Caledonia some tribes prefer a long-head and others a flat-head type, and compel the infants' plastic little skulls to grow accordingly. This difference of opinion as to the desirable form of skull helps to explain the origin of the custom, as having arisen from the type of the dominant race, being artificially produced or exaggerated. On this supposition we should expect to find, as we actually do, flat-

headed or round-headed conquerors and nobles set up as models in different districts. Such a state of things is well shown among the Flat-head Indians, who enslave the neighboring tribes with undistorted skulls; the children of these captives are not allowed to have their skulls bandaged in the cradle, so as to imitate the badge of nobility, and even white men are despised for having round heads like slaves. Just as naturally the nurses in Turkey in the sixteenth century, as the famous surgeon Vesalius mentions, gave the children bullet-heads, and among the Asiatic population of Constantinople it seems to be done still. The motive popularly assigned is that a round head suits best for wearing a turban, but the real reason probably lies much deeper in the imitation of the round skulls of the conquering Tartar race. The details, which show how large a part of mankind have habitually practised cranial deformation, suggest the question whether any nations have been perceptibly injured by it. There are remarkable cases to the contrary, such as that of the Chinooks, whose monstrous deformation is said not to increase the mortality of the children, or even to prevent their growing up fully to the savage level of strength, bravery, and cleverness. On the other hand, travelers have set down some races with compressed skulls as exceptionally stupid. It is more to the purpose that in modern France medical observers, such as Foville and Lunier, have noticed among the insane an unusual proportion of patients with artificially distorted skulls, and have also remarked a prevalence of mental disease in those districts where the nurses still most persistently keep up the practice of skull-shaping.

That the origin of ceremonies is to be sought in practical proceedings is a principle not only accepted by Dr. Ploss, but particularly well illustrated by several of the topics he deals with. Thus, in connection with so practical a matter as the feeding of the child, there have sprung up ceremonial customs of giving it the first taste of milk and honey, or butter and honey; with this, again, comes to be associated a peculiar meaning, that it confers the right to live, it being a well-known rule that the child, having once tasted milk and honey, is not to be killed or exposed (chapter xiii.). Again, what can be more prosaically practical than cutting a child's hair? Yet hair-cutting, especially for the first time, appears on both sides of the world as a high ceremonial act. It was so among rude American tribes such as the Abipones; in New Zealand the shaving of the child's head with an obsidian knife was done

by a grandfather or priest, fasting and with solemn accompaniment of chants; among the hill-people of India hair-cutting is a ceremony connected with the naming of the child and its reception into the tribe; with the Chinese it is one of the principal formalities of the festival held when the mother brings out the three-months-old child and the father gives it a name. Not to quote too many cases, we need only refer to the ancient Greek and Roman customs, recollecting that relics of the classic rite may still be seen in Europe within the limits of the Greek Church, where clipping and offering locks of the child's hair is associated with the baptismal ceremony (chapter xiv.). The best-known and most perfect example of a practical dietetic proceeding giving rise to a religious ceremony may be seen among the various nations who have consecrated the act of bathing, especially the bathing of the child, into a rite of lustration or baptism. A tolerably full collection of details is given by Dr. Ploss (chapter xiii.).

This principle that we must seek practical purpose as the foundation of custom, even among the lowest savages, must be qualified by remembering that the means may be such as we know to be ill adapted to their ends, while these ends themselves may be useless or even very harmful. They are none the less to be classed as practical if they show distinct purposes, pursued by means believed to be effective. Viewed in this light, the repulsive details in Dr. Ploss's dissertation on infanticide (chapters xxiii.-iv.) are mostly intelligible. The actual food-question among rude and half-starved wandering tribes, whether another child can be kept; the dislike of the parents to add to the troubles of life; the difficulty among many tribes of disposing of female children in marriage, which leads to girls being so often killed or abandoned, while boys are brought up; are among the reasons operating in the most practical way, especially in the lower culture, where the question of infanticide is not one of right and wrong at all, but it is for the parents to decide whether a child is to live or not. Few changes in the moral code are more remarkable than that which separates the Australian, the Chinese, the ancient Roman or German in this respect from the nations of Christendom. It is true that European practice shows an evil discrepancy from principle. England is worse than other countries for the poisoning of children with opium while the mothers are away at factory-work, while German slang has the hideously-suggestive name of "*angel-maker*" (*Engelmacherin*)

for the women in whose charge such babies are left. In studying the motives of infanticide, however, we have to separate those which, to our judgment, are practical—such as want, indolence, or shame—from other motives, happily incapable of producing such results in the civilized world, but which at lower grades of culture have a considerable effect in bringing about infanticide. These are the sacrifice of children to propitiate deities, and the opinion that children ought not to live if they show unlucky symptoms, such as cutting the upper front teeth first. Among the most remarkable puzzles of superstition in the world is the wide-spread practice of killing twins, one or both (chapter xxiv.). Not sufficiently accounted for by the reason sometimes assigned that the mother cannot rear both, this set of customs probably finds its real explanation in magical ideas. Magic is, indeed, among the most important factors in generating custom, as the present book would amply prove if it proved nothing else.

To magic belongs the "*couvade*," which, as one of the most remarkable habits still lingering within the pale of civilization, is here elaborately treated in a chapter by itself (chapter v.). To a modern European it may at first seem strange that any intelligible train of ideas should have made it customary for a father, on the birth of his child, to fast or otherwise diet himself, abstain from violent exertion, or even lie up altogether. Yet the modern savages who do these things often have a distinct notion of what they mean, and Dr. Ploss is inclined to accept their main explanation as the correct one, much as his present reviewer did in investigating the subject years ago (Tylor, "*Early History of Mankind*," chapter x.). The native explanation in question is that the child is sympathetically affected by the actions of the father, who abstains accordingly from certain food and work which might not suit the baby. From this point of view the *couvade* is simply one case of that system of superstitious belief which may be called sympathetic magic. Savage parents, in fact, begin to take these precautions against sympathetically injuring the child long before it is born. Thus, we hear of the father fasting or abstaining from particular food, lest the child should suffer; while sometimes the precise magical motive comes clearly into view, as where a Dyak avoids killing any creature or using a knife, lest he should hurt the unborn child—or where a Carib will not eat wild-hog lest his baby should be born with a snout. That the *couvade* proper has the same origin

with these prenatal fancies, of which it is, indeed, a continuation, seems plain when we observe that, after the children in question have been born, and the fathers have accordingly entered on due course of couvade, the Dyak diets himself on rice and salt, lest other food should hurt the child's digestion; while the Carib father gives as his reason for not eating sea-cow that if he did the child might grow up like it, with little round eyes. Attempts have been made by ethnologists to account for the couvade on other grounds, but they break down on wide comparison of the evidence, while this strengthens the sympathetic explanation given by the couvaders themselves. The details of the couvade are not, indeed, all accounted for; as, for instance, it is not clear how even a Carib can think his child to be benefited by himself being, not only half starved, but profusely bled, and having cayenne pepper rubbed into his wounds. But there is abundant evidence to prove the tendency of the pre-scientific mind to the main principle of the couvade, that children are sympathetically affected by what happens to persons with whom they are anyhow connected. So well does this fit even with the European peasant's state of thought, that a whole group of superstitions based on it have established themselves in German folk-lore, which Dr. Ploss (vol. i., p. 141) may well consider analogous to those of the couvade-observing savages, who hold that a baby's health may be affected by its father taking a pinch of snuff. These German superstitions apply to the godparents, whose close social connection with the godchild has led to the popular superstition that it will grow up with their peculiarities, and especially be affected by their conduct at the baptismal ceremony; therefore the godfather must wash himself properly, and the godmother put on a clean shift, or the child will grow up dirty; the godfather must not look round on his way to church, or the child will be an idle stare-about; nor must the godfather carry a knife about him, lest the child should be a suicide; and so on through other provisions, to be found in Dr. Ploss's book, or in the copious collection of German folk-lore whence they are quoted, the enlarged second edition of Prof. Adolf Wuttke's "*Deutsche Volksaberglaube der Gegenwart*." In forming an opinion

as to the history of the couvade, the difficulty lies in deciding whether its appearance in districts of Europe, Asia, Africa, and America, is to be accounted for by supposing that it sprang up independently in several regions; or whether, having been once invented in some one magic-seeking tribe, it spread thence over the world. The present reviewer has been unfortunate as to this discussion, his remarks having led first Sir John Lubbock, and now Dr. Ploss, to think that he ventured on the utterly rash inference that all peoples practising the couvade are thereby proved to be of one and the same race. All that he ever really argued on this line was to make a very modest inference, that the existence of the custom among the old Corsicans mentioned by Diodorus Siculus tended to show that they might be a relic of the same population with the Basques. That tribes in the Chinese hills, or in Asia Minor, or in Navarre, should practise a curious custom like that usual among the wild tribes of Brazil, may be a reason for thinking that the ancestors of the Old World races were once in a stage of culture like that of the Brazilian savages, or that there had been communication between them, but it is hardly a ground of speculation as to blood-relationship between such unlike varieties of our race. At any rate, care will be taken in the next edition of "*The Early History of Mankind*" to guard against this misapprehension in future. The ethnological argument respecting the Basques will be upset if the recent assertion of M. Vinson ("*Basque Legends*," p. 232) proves true, that Francisque-Michel, Quatrefages, and others, have been mistaken in believing the Basques to be couvaders at all, the practice really belonging only to Romance populations such as the Béarnais.

Among corrections desirable in the next edition of Dr. Ploss's valuable work it may be noticed that the printer has come to grief conspicuously in the Hebrew of vol. i., p. 95, and that it might be wise to drop altogether the mention at page 21 of the idea that certain crescent-shaped objects found in the Swiss lake-dwellings are proofs of moon-worship. Dr. Ploss asks any who are disposed to help him in his inquiries with new information to write to his address, "*An der Pleisse 7, Leipzig*."—*Academy*.

GERMAN UNIVERSITIES.

By WALTER C. PERRY.

THERE are now twenty-one universities in the German Empire, with 1,250 professors, and some what more than 17,000 students. Of the German universities in other countries, seven are in Austria, with 676 professors and 7,700 students; four in Switzerland, with 230 professors and 1,091 students; and one in the Baltic Provinces of Russia, with 66 professors and 874 students.

The salaries of the professors in ordinary range from £120 to £450, exclusive of fees. In the case of very distinguished men they rise to £500 or even £600 per annum.

Referring to the amount expended on the universities, Mr. Gladstone, in a recent speech at Nottingham, says: "I think about £70,000 is the sum expended by the Germans and the Government of Northern Germany in producing that which is absolutely necessary in order to give efficiency to the higher education of the country." I do not know what "*the Government of Northern Germany*" exactly means, but Prussia alone spends 5,343,000 marks (£267,150) a year on her universities; and the extraordinary expenses of the present year amount to 3,000,000 marks (£150,000), chiefly for new university buildings. The total annual sum expended for educational purposes in Prussia is 38,068,000 marks (£1,903,400), and the minister Falk asks for an additional grant of 12,000,000 marks (£600,000).

The German university consists:

I. Of the *Ordinary* professors, appointed by royal patent and paid by government; the *Extraordinary* professors, named by the king's minister, who are not entitled to any salary, but often receive a small one; and the *Privatim docentes*, who derive their *Licentia docendi* from the Faculty to which they belong, and depend on fees alone.

II. Of the various directors and officers of the institutions connected with the university—the museums, observatories, anatomical theatres, laboratories, etc.

III. Of the matriculated students.

IV. Of the academical police, and the inferior officials, as secretaries, quæstors, bedells, etc.

The professors and students are divided into the four Faculties of Theology, Jurisprudence, Medicine, and Philosophy (Arts), under which last head are included, not merely Mental and

Moral Philosophy, but the Ancient and Modern Languages, History, Archæology, Mathematics, the Physical Sciences, the Fine Arts, Political Philosophy, Political Economy, and Diplomacy, etc. The Minister of Education is represented at some universities by a resident "*Curator* and Plenipotentiary," who acts as a sort of resident chancellor, and is the connecting link between the university and the government. The immediate government of the university is carried on by a *Senate*, composed in some cases of *all* the ordinary professors, in others of a certain number chosen by and from them, with an annually-appointed *Rector* at their head. The Senate generally consists of the Rector, the ex-Rector, the four Deans of Faculty, some, or all, of the ordinary professors, and the University Judge. The Rector is chosen by the ordinary professors, and is president of the Senate. He still retains the old title of "*Magnificence*," and derives a salary from a percentage on fees for matriculation, and the granting of testimonials and degrees. The *University Judge* is appointed by the Minister of Education, and transacts the legal business of the university. He is not a professor, but a practical lawyer, whose office it is to see that all the transactions of the Senate are in accordance with the laws of the land. He is also the connecting link between the academical authorities and the town police.

The courses of lectures (*Collegia*) delivered by the professors are of three kinds:

I. *Publica*.—Every ordinary or extraordinary professor is expected to deliver, *gratis*, two courses (of at least two lectures a week), extending through the whole of each "*Semester*," on some material point of the science he professes; and these are the "*Publica Collegia*." They are but thinly attended by the students.

II. *Privata*.—The arrangement of which is entirely left to the different Faculties. These are the principal lectures, and the professors receive fees (*honoraria*) from those who attend them, varying according to the number of hours in the week which they occupy, the labor required in their preparation, the cost of apparatus, etc. These lectures generally occupy an hour a day, four, five, or six times a week. The most usual fee is about eighteen shillings.

III. *Privatissima*.—These are delivered to a select number, in the private houses of the professors, on terms settled between them and their hearers.

No single thing has contributed more to injure the reputation of the German universities in the eyes of our countrymen than the unprincipled manner in which some of the most insignificant of them have exercised their right of conferring degrees. Those who are unacquainted with Germany naturally involve all her universities in the same condemnation with the two or three dishonorable corporations who have virtually sold their worthless honors to aspirants as base as themselves. A short account of the manner in which degrees are obtained in the more respectable universities of Germany may help to rescue them from unmerited reproach.

Each Faculty has the exclusive right of granting degrees in its own sphere, although this prerogative is exercised under the authority of the whole university. The Theological Faculty grants two degrees, those of Licentiate and Doctor. The Philosophical Faculty also grants two, "Master of Arts" and "Doctor of Philosophy," which are generally taken together. The Medical and Judicial Faculties give only one degree each, that of Doctor.

Whoever seeks the degree of Licentiate in Theology, and of Doctor and Master of Arts in Philosophy, must have studied three years at a university, and must signify his desire to the Dean of his Faculty in a Latin epistle, accompanied by a short *curriculum vite*. Before he can be admitted to the *viva-voce* examination, he is expected to send in a *Doctordissertation*, an original treatise, generally written in Latin, in which he must manifest not only his proficiency in the subjects in which he intends to graduate, but some power of original thought and independent research. The dean sends this treatise round to the other members of the Faculty, who have to declare in writing their opinion of its merits. If this be favorable, a day is appointed for the grand examination, which is generally carried on in Latin, and which all the members of the Faculty are expected to attend as examiners. The *Doctorandus* is then subjected to a *viva-voce* examination by each professor in turn, after which it is decided by simple majority whether the candidate has satisfied the examiners or not. If he succeeds, he is directed to hold a public "disputation" (in Latin), in presence of the dean and Faculty, on *theses* of his own selection, which are posted at the gates of the university. After the

disputation the dean addresses the *corona*, in a Latin speech, and hands the diploma to the new graduate.

To obtain the degree of Doctor of Theology, the candidate must have finished his academical studies six years, and have written some work, which, in the opinion of the Faculty, is a valuable contribution to theological literature.

The degree of *Doctor utriusque juris* is taken in nearly the same way as those in Theology and Philosophy, except that the law-student is sometimes subjected to a written examination previously to the oral one.

The Medical Faculty is the only one in which it is imperative on the student to take the degree of Doctor. In the other Faculties admission to the privileges and honors of a profession is obtained solely by passing the so-called state or government examination.

The foregoing outline may suffice to show the world-wide difference between the academical institutions of England and Germany in external form; yet they differ far more essentially in the spirit which animates them, in their *modus operandi*, and in the objects which they respectively pursue. The term university is hardly applicable to our great academies; for they do not even profess to include the whole circle of the sciences in their programme, and their mode of teaching differs in hardly any respect from that of a school. The German university, on the other hand, looks, at first sight, like a mere aggregate of technical schools, designed to prepare men for the several careers of social life. Something analogous would result from bringing together in one place our universities of Oxford and Cambridge, our theological training-schools, Inns of Court, medical schools and hospitals, and our British and Kensington Museums, with their schools of art, and then dividing the whole body of teachers and students into four faculties, and bringing it under the control of her Majesty's Government. Yet such mere juxtaposition would not alone suffice to form a German university. Such a collection in one place of professional training-schools, whose only object is the rapid preparation of young men for their future callings, *does* exist in Paris; and yet Gabriel Monod could say, without contradiction, that, with the exception of Turkey, France was the only country in Europe which possessed no university in the proper sense of the word. The German Faculties are also technical schools, but they are intimately and inseparably united by a common scientific method, which makes the practical studies of each a me-

dium of the highest scientific training. Preparation for a profession is indeed the main object of a German university; but it is not, as in France, the only one. The great principle of teaching in the former is *the continual blending of instruction and research*, and the German universities are such good schools, because they are not only places of instruction but workshops of science. The enlargement and strengthening of the mind which the English systems aims at exclusively, the Germans endeavor to combine with preparation for the practical business of life. Their professors have to supply the state with a sufficient number of young men capable of undertaking the duties of clergymen, schoolmasters, lawyers, physicians, civil servants, etc., and we know that this practical end is fully attained. But the successful result is a matter of perpetual astonishment to us, with our ideas and our experience, when we come to consider the nature of the means employed. The professor announces a course of lectures, which the student may attend or not as he pleases; and these lectures are not, as we might expect, a compendium of practical knowledge, which his pupils may commit to memory and reproduce at their examinations, and use at their first start in their professional career, but generally an original scientific investigation of some new field of thought, a peering from the heights of accumulated knowledge into the dim and cloud-shadowed horizon. In every lecture the professor is supposed to be engaged in the act of creation, and the student to be imbibing the scientific spirit and acquiring the scientific method—watching the weaver at his loom and learning to weave for himself. Whether the latter does his part or not is entirely his own concern. He is never questioned in his class or examined at the end of the term or year, and may pass his whole university life without any intimate personal acquaintance with the man whose business it is to cultivate his powers and fit him to serve his generation. The sources of the practical knowledge he needs are, of course, pointed out to him for private reading, but he is left to use them when and how he pleases, and to prepare himself alone, or in company with his fellow-students, for his distant examination. Nor is the higher work of the professor supplemented, as with us, by private tutors, “coaches,” or “crammers.” In fact, there is no part of our collegiate system which is more universally reprobated by the Germans. “What we want for our students,” they say, “is not the assistance of private tutors, but private independent study

without assistance. . . . Away with all supervision and drilling! If you were to subject our men to private tuition, and regulate and inspect their studies, you would destroy at a blow the scientific spirit in our universities. The main object of a university, as distinguished from a school, is to foster independent thought—the true foundation of independence of character. The student must, of course, be fitted to gain his livelihood, but show him where the necessary information is to be acquired, and place an examination in full view at the end of his curriculum, and he will prepare *himself* far better than if he were crammed by others, in a manner not suited, perhaps, to his mental constitution.”

I will now recapitulate the principal characteristic differences between the German and the English university.

The former, as we have seen, is a national institution, entirely supported by the state, subject to the supervision and control of the central government, frequented by all but the poorest classes of the community, and therefore immediately and directly influenced by political and social changes. The latter is a wealthy corporation enjoying a very large measure of independence, frequented chiefly by the higher and more conservative classes, but little influenced by political changes or the prevailing opinions and customs of the masses, dwelling in empyrean heights remote from the noise and heat of contending factions and all the changes and chances of the work-a-day world.

“*Senecta ab rebus sejunctaque longe,
Nam privata dolore omni, privata periculis,
Ipsa suis pollens opibus nihil indiga nostri.*”

Again, the internal government of the *Corpus Acad.* in Germany is almost entirely in the hands of the actual teachers; and the most eminent professors are also the chief rulers of the university, as rectors, deans of faculty, or members of the Senate. In Oxford and Cambridge, on the other hand, the lecturers and tutors, the working bees of the community, have but a small share of its wealth and power, which is for the most part in the hands of learned and dignified “Heads” and irresponsible Fellows, who are not expected to take much part in the actual teaching. The natural result is, that we have many admirable teachers, and many very learned men, but few writers. No impulse of rivalry or hope of promotion irresistibly impels our scholars to give the fruits of their labor to the world, and they too often enjoy them alone. We have always the uneasy feeling that there are men at our universities

who might well compete with German professors, who yet do little for the advancement of science, and are almost unknown beyond their college walls.

According to the German view of the matter, the professor ought to be a learner even more than a teacher. He is engaged in a constant race and rivalry with competitors, not only at his own university, but throughout the great republic of letters to which he belongs, and in which he seeks for fame, position, and emolument. In the choice of a professor, therefore, the university (which has the right of proposing names to the Minister of Education) and the government are guided almost entirely by the comparative merits manifested in the published writings of the aspirants. The questions asked are: "What work has he done?" "What is he doing?" A vague reputation for mere learning, a good delivery, or a pleasing style, will avail him little. They prefer, not the best teacher, as they would for the gymnasium, but the greatest thinker, the most creative genius, and leave him to make himself intelligible to the students as he can. They are not disturbed at hearing that Prof. M—— or N—— has but few hearers, and "shoots above their heads;" or by such cases as that of the philosopher Hegel, who said that "only one of his pupils understood him, and he *misunderstood* him." A light set on a hill, they think, cannot be altogether hidden, and some few may catch the prophet's mantle as he rises. They care far more for substance than form, for native gold than current silver coin; and hence it comes that so many German professors and authors are, as compared with their French and English brethren, dull and awkward lecturers, obscure and unreadable writers. And thus the German scholar works directly under the eyes of the government, the lettered public, and indeed the whole nation. Every sound that he utters is immediately heard in the vast whispering-chamber of the temple of knowledge—weighed and discussed at a thousand centres. A new discovery in science, a new edition of a classic author, a light thrown on the history of the past, any proof, in short, of superior genius or talent, may not only give him the much-coveted *Sitz und Stimme* (seat and voice) in the general council of the republic of letters, but insure him a higher place in the social scale, and offers of a more lucrative post.

The English head, professor, or tutor, when once appointed, enjoys a kind of monopoly of authority or teaching, and may do his ministering zealously or gently, without fear of rivalry, with-

out any immediate or certain gain or loss of reputation or emolument. He stands in no relation either to the government or the public, to both of which he may be almost unknown. He has no broadly-marked career before him, in which distinction and reward *necessarily* wait on great ability and great exertion, and if he is ambitious he generally leaves the university for some more extensive and promising field of labor.

The difference between the character of the English and German student is, if possible, still more striking. When an English boy leaves school for the university, he is not conscious of a very sharp break or turning-point in his life; he is only entering on another stage of the same high-road. He goes to pursue nearly the same studies in very nearly the same way as before. He expects to meet his old companions, and to indulge in his dearly-loved boyish sports on the river and in the field. He enjoys, of course, a greater degree of freedom, and receives a much higher kind of instruction, in accordance with his riper age and greater powers; but the subjects of his study are still chosen for him, and prosecuted, not for their so-called "utility," but for their value as gymnastic exercises of the mind. As at school, he is directed in his course, and the instruction is still catechetical. Throughout the whole of his career at college he is subjected to examination in certain fixed subjects, and even books, by the study of which he can alone escape reproof and obtain distinction and reward. His mind is still almost exclusively *receptive*, bound to take the food and medicine prepared and prescribed for him by duly-authorized purveyors and practitioners. He is still, in short, in general training for the race of life, and is allowed no free disposal of his time and energy, no free indulgence of his peculiar tastes.

How different the feelings and experience of the German gymnasiast, as he passes from the purgatory of school to the paradise of college! In his boyhood he has been mentally schooled and drilled with a strictness and formality of which we have no conception. Every step he takes is marked out for him with the utmost care and precision by the highest authority, and he has scarcely a moment that he can call his own. It is continually dinned into his ears that he is not to reason or to choose, but to learn and to obey; and he does obey and learn with incredible docility and industry, and toils joylessly along the straight and narrow path, between the high and formal walls, from stage to stage of his arduous school-life, clearing one examination-fence after

another, or falling amid its thorns, till the last is surmounted which separates him from the German's heaven.

And what a change awaits him there! The cap of the student is to him the cap of liberty; his bonds are loosed, his chains struck off, he is introduced into the Eden of freedom and knowledge, "furnished with every tree that is pleasant to the sight and good for food," and told that he "may freely eat of all." The very same authorities, central and local, who have hitherto demanded from him dumb and blind obedience, and controlled his bodily and mental freedom in every possible way, now loudly proclaim to him that his chief duty, the chief principle and law of his being, is—to be free. The professors contend for his applause and patronage, society allows him the greatest latitude as suited to his age and profession; the very police, so terrible to other men, looks indulgently on him, as a privileged being, and mutters as it sees him kicking over the traces, "*Es ist ja ein Student.*" For three or four long years no one has the right to dictate to him, or to bind him by any tradition or any rule. He must, of course, prepare for the inevitable examination at the end of his university career, but he may do so how and when he pleases, and in the mean time he can rest from the exhausting toils of his school-life, and cultivate at leisure the powers of which he is most conscious, and in the exercise of which he most delights. He has several universities from which to choose, and if one professor does not please him he can generally find another who is lecturing on the same subject; and he is by no means slow in recognizing which are the rising and which the setting stars in the academic firmament.

When we come to compare the results of the two systems, we find them such as we might expect. The Germans are the explorers in the world of thought, and the first settlers in the newly-discovered regions, who clear the ground and make it tillable and habitable. At a later period the English take possession, build solid houses, and dwell there. The Germans send their students out into the fields of knowledge, like working-bees, to gather honey from every side. The English lead their pupils into well-stored hives to enjoy the labors of others. The German student cares little for the accumulated learning of the past, except as a vantage-ground from which to reach some greater height. He has little reverence for authority, and, if he does set up an idol, he is very apt to throw it down again. His chief delight is to form theories of his own,

and he can build a very lofty structure on a very insufficient foundation. As compared with the "first-class" Oxford man or Cambridge wrangler he has read but little, and would make a very moderate show in a classical or mathematical tripos examination; but he has the scientific method; he is thorough and independent master of a smaller or larger region of thought; he knows how to use his knowledge, and in the long-run outstrips his English brothers. The English system produces the accomplished scholar, "well up in his books;" the reverent and zealous disciple of some Gamaliel; the brilliant essayist, whose mind is filled with the great thoughts and achievements of the past, who deals with ease and grace with the rich stores he has gathered by extensive reading; the ready debater, skilled in supporting his arguments by reference to high authority, and by apt quotations. But he is receptive rather than creative, his feathers, though gay and glossy, are too often borrowed, and not so well fitted for higher flights as if they were the product of his own mental organism. In the language of Faust, we might say of him—

"Erquickung hast du nicht gewonnen,
Wenn sie dir nicht aus eigener Seele quillt."

The German has read less, but he has thought more, and is continually striving to add to the sum of human knowledge. He is impatient and restless while he stands on other men's ground, or sojourns in other men's houses; directly he has found materials of his own, whether they be stones or only cards, he begins to build for himself, and would rather get over a difficulty by a rickety plank of his own than by the safe iron bridge of another. The same *furor Teutonicus* (the tendency to drive everything to extremes), which urges on the powerful intellect to great discoveries in the regions of the hitherto unknown, also goads the little mind to peer with fussy, feverish restlessness into every chink, to stir every puddle, "to dig with greedy hand for treasure."

The Englishman, meanwhile, looks on, and patiently waits until the new intellectual structure has been well aired and lighted, and fitted up for comfortable habitation. The German theologian or philosopher is often astonished, and not a little amused, to see some theory or system taken up by English scholars, who have just learned German, which has long become obsolete in the land of its birth, and been disowned, perhaps, by its very author.

In contemplating the past history and present state of the German universities, the question

naturally arises whether the extraordinary mental fertility which characterizes them has been owing to peculiar political and social conditions; whether it is likely, as many think, to be injuriously affected by recent important changes, and especially by the amalgamation of the different German states into one great empire, under the hegemony of Prussia. The literary fertility of their universities is generally accounted for by crediting the Germans with a certain disinterested love of knowledge for its own sake, as contrasted with our low material hankering after loaves and fishes. We need not seriously endeavor to refute so preposterous a theory, but only point to the facts that, while the encouragement of learning and research at the universities has been one of the main objects of the state in Germany, there is no country in Europe in which science (in the widest sense of the word) has received so little encouragement from government, has been left so entirely to reward itself, as in England. In fact, since there is no career in our universities for men of learning and science, no reward for *literary* activity and successful *research*, the wonder is that they have done so much, and can count so many great names among their members. The preëminence of German learning is owing to no natural superiority in the Germans, either mental or moral. To understand the intense activity which prevails in their universities, we must remember that the academic career has, for more than a century, exercised a very powerful attraction on the most active and gifted minds of the nation. Debarred by the despotic nature of their government from the arena of politics, and by class-distinction from any fair chance of promotion in the army or the service of the state, with few opportunities of acquiring wealth in commercial or industrial pursuits, the more ambitious spirits in the German *bourgeoisie* have sought the only field of honor in which the race was to the swift and the battle to the strong. We may smile at the small salaries of the German professor, but, when compared with other government officials in his own country, he is, or rather *was*, well paid, and his position in other respects is a singularly enviable one. He is in the most independent position in which a German can be placed, and enjoys a freedom of speech which is permitted to no other official, whatever his rank may be; a freedom which increases in exact proportion to his abilities and fame. His peculiar privileges are owing partly to the natural scarcity of great men, and the respect which they inspire in their countrymen, and partly to the keen

competition for the possession of the most illustrious scholars between the universities of the numerous independent states into which Germany was, until recently, divided. This active rivalry enabled the distinguished professor to hold his own even against kings and ministers. When the late Duke of Cumberland, as King of Hanover (whose motto was that "professors and harlots can always be had for money"), expelled the seven greatest men in Göttingen for a spirited protest against his *coup d'état*, they were received with open arms even by despotic Prussia. When the great Latin scholar Ritschl shook off the dust of his feet at Bonn, he was welcomed with the highest honors by the King of Saxony, and installed at Leipsic.

The maintenance of the scientific spirit is endangered by the very extension of the boundaries of science of which that spirit is the chief agent. The mass of strictly professional knowledge in each faculty is increasing every day, and the task of assimilating this engrosses more and more of the student's time and energy, and leaves him fewer and fewer opportunities for the independent prosecution of pure science. We hear it said on all sides that young men must spend at least four years at the universities, if they are not to sink into mere "bread-students;" and appeals have been made to the liberality of the German public to enable the more gifted students, by the establishment of small *Stiftungen*, to spend a longer time in study. Such appeals, by-the-way, meet with very little response in Germany. The liberality which has filled England with benevolent institutions of every kind appears to be almost unknown elsewhere. Complaints are heard in many quarters that the "*Nachwuchs*," the after-growth, the rising generation of professors, is not likely to equal its predecessors. It is not long ago since a minister of education in Prussia complained of the difficulty of filling up vacant posts in the universities in a manner satisfactory to himself and the students. How far this falling off is attributable to the causes mentioned above, or the general dearth of great men observable, at the present time, in every country in Europe, remains to be seen. One thing, however, is absolutely certain: that neither in Germany nor England can a university be sustained by the exertions of "disinterested" votaries of science. With the exception of the *Dis genti*, the born priests of science, men will not spend long years in laborious study without hope of adequate reward in the shape of money or position. Science has flourished at the German seats of learning be-

cause it has been carefully fostered and judiciously rewarded by the state. It has not flourished at our universities because, while they richly reward

the first fruits of the youthful intellect, they offer no career to the man.—*Condensed from Macmillan's Magazine.*

THE WEAKNESSES OF GREAT MEN.

THE weakness of a great man is often that feature of his character or that particular inclination in him which has most interest for the student of humanity. That Cæsar was the first general and statesman of his age—that he conquered Gaul and laid the foundations of an empire which in name at least was to subsist for more than 1,800 years—these are no doubt facts of the utmost importance; but, after all, they are the dry bones of history. The Shandean philosopher is much more interested to learn that Cæsar loved to oil his hair; that he sincerely regretted its scantiness; and that he was excessively pleased when the Senate conferred on him the privilege of wearing a laurel crown, and thus enabled him partially to conceal the injury which Nature or hard living had wrought. Dress has been one of the commonest weaknesses of great men, many of whom were not the less careful of their personal appearance because they affected an ostentatious simplicity. In the national songs of France, Napoleon is the little Corporal in the plain gray coat; but we may be sure that the gray coat was carefully arranged, even as the cocked hat was designedly worn in a fashion till then unknown. And, as a matter of fact, the emperor did not always array himself in that sober-colored vesture which Mr. Tennyson has described as the symbolic robe of freedom. An English traveler who visited Paris during the brief interval of the Peace of Amiens, and was introduced to the First Consul, has left on record his astonishment at seeing the great enemy of England in scarlet (richly laced, by-the-way, with gold). It may interest some to know that Napoleon set apart £800 a year for dress. Unfortunately, he had a weakness for white kerseymere breeches; and, being often wholly absorbed with cares of state (as courtly chroniclers apologetically observe), he would constantly spill ink, or gravy, or coffee, upon the aforesaid garments, which he hastened to change as soon as he perceived the mishap. This circumstance cost the blameless but timid Comte de Rémusat his place as Master of the Robes. For the emperor soiled his clothes, and especially his white breeches, so frequently and

so grievously, that the imperial tailor (M. Léger) was constantly receiving fresh orders, and £800 a year became quite insufficient to meet that functionary's little bills. Now, the Comte de Rémusat, who knew that the emperor hated any disorder in his accounts, was foolishly afraid to speak to him on the subject. Meanwhile M. Léger became pressing in his demands for payment. At first he sent in his bill every month, then every fortnight, then every week, then twice a week, then every day; but the Master of the Robes continued to return unsatisfactory answers. At length M. Léger, whose patience was exhausted, took the bold step of complaining to the emperor in person, at the very moment that his Majesty was trying on a new uniform. With astonishment and anger Napoleon learned that he owed his tailor £1,200. The same day he paid the bill and dismissed M. de Rémusat from his post, which was given to M. de Montesquiou-Fézensac, a chamberlain in the imperial household. "I hope Monsieur le Comte," said Napoleon, between a smile and a frown, to the newly-appointed master, "that you will not expose me to the disgrace of being dunned for the breeches I am wearing." Frederick the Great regulated this department of expenditure in a much simpler way: he had but one fine gala-dress, which lasted him all his life, for he took care not to soil it. His work-day suits were shabbier than those which gentlemen abandon to their valets—the waistcoat-pockets crammed with snuff, and the rest of the apparel liberally sprinkled with the same pungent powder. The king's most amiable weakness—if, indeed, it can be called one—was his partiality for dogs. Several of these favorites were allowed to occupy the best arm-chairs in the royal study, and were not teased when they acted as dogs will act. "After all," said Frederick, "a Pompadour would cost me much more." But Frederick had other weaknesses which were not equally amiable.

On the whole, the Great Slovens have probably been as numerous as the Great Dandies; and few will deny that utter carelessness as to personal appearance is at least as much of a weakness as its opposite. The well-known text

which some worthy people have put forward on this subject does not, when properly translated, enjoin us to "take no thought," but only "not to be over-anxious," in respect of what we shall put on.

Johnson, perhaps the greatest sloven of all ages, said one of the best things ever uttered against the puritanical view of this matter. "Let us not be found, when our Master calls us, stripping the lace off our waistcoats, but the spirit of contention from our souls and tongues. Alas! sir, a man who cannot get to heaven in a green coat will not find his way thither the sooner in a gray one." Slovenliness seems to have been rather a weakness of lawyers, as well as of literary men—*pace* the bar and the press of to-day. If in society we except "present company," so in writing we exclude persons living. Lord Kenyon was so terrible a sloven that one wonders George III. never scolded him about his personal appearance, as his Majesty once did in respect of his unlucky habit of misquoting classical authors.

"I wish, my lord," the king was pleased to remark, "that you would leave off your bad Latin and stick to your good law."

Kenyon's law was certainly good; but the judge had a weakness as well as the man. As his biographer puts it, "Lord Kenyon trusted too much to the power of the terrors of the law in guarding the right of property from fraud or violence; and he inflicted death (a great deal too often) as the most terrible, and therefore the most preventive, punishment." The weakness, however, was of the understanding, and not of the heart; the chief-justice being very far from a man of cruel disposition, as the following anecdote, at once ghastly and affecting, bears witness: He had passed sentence of death upon a young woman who had been found guilty of theft, but had intimated that he meant to recommend her to mercy. The young woman only heard the formula of the sentence, in its horrible precision of language, and fainted away. Lord Kenyon, evidently much agitated, called out: "I don't mean to hang you. Will nobody tell her that I don't mean to hang her?"

For the disciple of Mr. Carlyle the word Clothes has acquired a wide extension of meaning; and Herr Teufelsdröck might have smiled approval of the Monacan ir-reconcilable's warning, "Rabagas, on commence par une culotte, et on finit par une décoration." Ever since titles and ribbons were invented, a desire for them has been the weakness of great minds, and of minds that seemed in all things else the very types of

common-sense. Our rugged Cromwell longed to be called King Oliver; and Louis Philippe, with all his liberalism, was grieved at heart because his subjects would not let him take the style of Louis XIX., and because they made him King of the French, instead of King of France and Navarre. M. Guizot has told us of the genuine pleasure experienced by his sovereign when the Queen of England conferred on him the order of the Garter. Once he had the blue ribbon, Louis Philippe fancied he could no longer be sneered at as "King of the Barricades," but would be looked on as a thoroughly orthodox monarch, and a member of the most select society in the world. A similar weakness is said to have been displayed by a man who was, perhaps, one of the main-stays of the Orleans dynasty. He was the first member of a famous house of bankers, who settled in Paris; and is said to have taken very seriously to heart the title of baron, conferred on him by the Emperor of Austria. According to M. Larchey, the great financier never traveled without a certain purse in Russian leather, on which a baron's coronet was more than conspicuous. In the course of a certain journey he stopped at Lyons, and, it being early in the morning, entered a restaurant, where he asked for a *bouillon*, which French-bred persons think a cheering thing to begin the day with. Having dispatched the *bouillon*, M. de R—— took out the famous purse, and asked for the bill. The waiter, espying the coronet, and not being versed in heraldic lore, thought it safest to address the stranger as "Monsieur le Duc." M. de R—— gave but five sous of *pourboire*, and observed, with that accent of which the secret has died with him, "Che ne suis pas tuc." By-and-by he came back to lunch. The same waiter served him, and proved quite as attentive as in the morning. Only this time he addressed the customer as "Monsieur le Comte." The banker gave him five francs for himself, but observed, at the same time, "Che ne suis pas gonte." A couple of hours later, on his way to the station, M. de R—— stepped in once more, to take a cup of coffee. The waiter, much mystified, ventured to call him "Monsieur le Baron," and received a louis d'or by way of tip, while the giver added, with an air of grave satisfaction, these words, "Oui—che suis paron."

Altogether, the number of great men, who seemed hardly to understand how much above the symbols of external greatness they stood, is painfully large. In that list is our William III., of all persons, who took a strange pleasure in wearing the actual corporeal crown of England,

and the royal robes in which majesty is entitled to wrap itself, when to majesty seemeth good. Sir William Hamilton, again, devoted too many of the best hours of his early manhood to fishing a baronetcy (which he fancied necessary to his well-being) out of the obscurity of the seventeenth century. But for those lost hours, the Philosophy of the Conditioned might have been more completely thought out. Bacon and (in a lesser degree) Scott afford melancholy examples of a similar weakness, and its vexatious, not to say tragic, consequences.

Again, though a contempt for titles and decorations (especially since their relative value has changed) has been common enough for many a day, one cannot help thinking that the refusal of them has in not a few cases proceeded from the same motive which made others seek them. The weakness of false pride was shown not more by the Macedonian conqueror who proclaimed himself a god, than by the philosopher in the tub who was rude to him. Indeed, it was an excellent answer that Alexander made when some one praised Antipater in his hearing because that officer refused to follow the Asiatic fashions which were being adopted by his colleagues, and continued to wear black while they wore purple. "Yes," said the king; "but Antipater is all purple within." The virtue of some persons is unpleasantly ferocious. One cannot help regretting, for instance, that Bentham, when the Czar Alexander sent him a diamond ring, did not decline it—if he must have declined it—with less of a flourish of trumpets. There is something that jars on one's mind in that message about its not being his mission to receive diamond rings from emperors, but to teach nations the lessons of wisdom—or words much to that effect. Who had ever supposed it was his mission to receive diamond rings from anybody? The humility of men who are much talked about is seldom a perfectly genuine article. Did they really think nothing of themselves they would be more than human. Anent this matter, there is a curious story told of St. Philip Neri, who was commissioned by the pope to inquire into the truth of certain miracles alleged to have been worked by a nun. St. Philip employed a very simple test. He resolved to ascertain whether the nun had true humility, which, as one of the cardinal virtues, must be possessed by any one before he or she can receive the gift of performing signs and wonders. Entering her cell with a pair of dirty boots on, he pulled them off, threw them at her head, and ordered her to clean them. Vehement and shrilly

expressed was the indignation of the lady; whereat St. Philip reported to his holiness that a new saint had not arisen to edify the Church.

Among the rare instances of true Christian humility with which we meet in that long record of struggles for precedence designated as history, is one singularly affecting. Madame Mailly, the first mistress of Louis XV., is said, after her loss of the king's favor, to have led a life of unaffected piety and devotion. As the French annalist quaintly puts it, "She loved God as she had loved the king." One day, being late for church, she had some difficulty in reaching her usual seat. Several persons had to rise to let her pass, chairs had to be pushed back, and some little confusion resulted. An ill-tempered man snarled out, "that it was a pretty noise to make for a ——" "Since you know her," replied Madame de Mailly, "pray the good God for her." Still, Madame de Mailly would have done better to be punctual.

It is to be feared that the most common weaknesses of great men are of the same kind as those of little men. Formidable indeed would be the full and accurate list of illustrious gluttons, illustrious tipplers, and illustrious persons who smoked more tobacco than was good for them. In some rare cases, their weakness occasionally brought forth their strength: the conversation of Addison, many a speech of Sheridan's and of the younger Pitt's, a few songs of Schiller's, were doubtless instances of the power of wine to stimulate the mental faculties. Indeed, Schiller seems to have for a long time habitually written under the influence of a bottle of Rhenish, with which he would lock himself up in the evening, and write cheerily through the hours of the night. But unquestionably the most astonishing feat of this kind was Blackstone's composition of his "Commentaries" over successive bottles of port. One feels almost respect for the hardness of a head which could think out so clearly under such an influence some of the stiffest points of a jurisprudence which, so to say, had neither head nor tail. In speaking of the classic age of English eloquence, one must except the greatest name of all from the list of Bacchic orators. Fox could drink, and alas! get drunk; but, as a rule, he appears to have postponed his sacrifices to Dionysus till after the debates, which he could the more easily do as he lived chiefly by night. Pitt would jestingly complain that in this respect his rival took a mean advantage of him. He himself rose tolerably early, and being generally prime-minister—the

expression sounds strange in these days, but is strictly accurate—he was occupied with official business till it was time to go to the House of Commons, when he was, perhaps, already fagged and jaded with work.

Very different was Fox's mode of life during the session. At noon, or one o'clock, his friends would call on their chief and find him in bed, or lounging about in his night-shirt, looking extremely unkempt, and (if the truth must be told) dirty. A conversation would follow, plans would be arranged, and, by-and-by, his toilet done, and a cup of tea swallowed, Fox would stroll down, fresh and vigorous, toward St. Stephen's, to speak as no orator ever spoke since Demosthenes.

Tobacco has not till lately been so common a weakness of the great as the fermented juice of the grape; but famous smokers would still make a mighty and revered company. Among the earliest of Britain's worthies whose devotion to the weed was excessive, may be cited Hobbes. In Dr. Kennet's "*Memoirs of the Cavendish Family*" will be found a very interesting account of the way in which the author of the "*Leviathan*" loved to spend his day. "His professed rule of health was to dedicate the morning to his exercise, and the afternoon to his studies. At his first rising, therefore, he walked out and climbed any hill within his reaching; or, if the weather was not dry, he fatigued himself within-doors by some exercise or other, to be in a sweat. . . . After this he took a comfortable breakfast, and then went round the lodgings to wait upon the earl, the countess, and the children, and any considerable strangers, paying some short addresses to all of them. [He was then living with Lord Devonshire, sometimes at Chatsworth, and sometimes at Hardwicke.] He kept these rounds till about twelve o'clock, when he had a little dinner provided for him, which he ate always by himself without ceremony. Soon after dinner he retired to his study, and had his candle, with ten or twelve pipes of tobacco, laid by him; then, shutting his door, he fell to smoking, thinking, and writing, for several hours."

Whatever may have been the abstract merits of Hobbes's regimen, it appears to have agreed with him, for he lived over ninety-one years. The worst effect of the ten or twelve daily pipes was probably to intensify the natural irritability of his disposition; for the soothing influence of tobacco is only temporary, while its permanent effect is the opposite of calming. So at least more than one distinguished physician has

avowed. That Hobbes was terribly peevish in his old age there can be no doubt. We read that "he did not easily brook contradiction." And, to put it mildly, he had a somewhat excessive opinion of his own powers. It was one of his boasts, for instance, that, "though physics were a new science, yet civil philosophy was still newer, since it could not be styled older than his book '*De Cive*.'" One hardly remembers a more conceited observation, unless it be Cobbett's advice to young people as to the best books for them to read: "Read my books. This does, it will doubtless be said, smell of the shop. No matter. Experience has taught me," etc. Among Cobbett's weaknesses seems to have been a love of ale; or, perhaps it would be more accurate to say, a belief that ale was preordained by the celestial powers as the natural and fit liquor for Britons to quaff. The drinking of tea, which was becoming common with every order of society in his time, moved him to the fiercest indignation, as it had in a former generation excited the fears of Duncan Forbes, who conceived that the brewing interest would be ruined by the general adoption of the new beverage. The lord president of the Court of Session is reported to have rigorously forbidden the consumption of tea by his own servants—even to have dismissed a housemaid who was taken pot-handed in the act. Duncan Forbes little dreamed that the day would come when statesmen would be loudly urged to support the tea interest and discourage the beer interest. To return for a moment to Cobbett, it would be unjust not to acknowledge that he was himself of exemplary sobriety in an exceedingly tipsy age. Indeed, he recommends pure water as well as ale. But these two were, he thought, the only rational drinks. His opinion may remind some of Sydney Smith's statement that, when he went to reside in Somersetshire, the servants he had brought with him from Yorkshire seemed to think the making of cider a tempting of Providence, which had clearly intended malt, and not apples, as the legitimate produce out of which man should find the means of intoxication.

After all, there were some grave reasons for Cobbett's objection to the habitual consumption of tea and coffee (he denominated them both under the generic term of "slops"); more than one writer on the science of diet being of opinion that Nature destined them rather as medicines than as daily beverages. Both the one and the other have been the weakness of hundreds to whose intellects the world owes some of its choicest treasures. Sir James Mackintosh went so far as

to say that the power of a man's mind would generally be found to be in proportion to the amount of coffee he drank. How well Cowper loved tea, and how well he sang its praises, we all know. As to Dante, so to him, the evening brought the pleasantest hours of the twenty-four :

"Now stir the fire, and close the shutters fast ;
Let fall the curtains, wheel the sofa round ;
And while the bubbling and loud-hissing urn
Throws up a steamy column, and the cups,
That cheer but not inebriate, wait on each,
So let us welcome peaceful evening in !"

Yet one may suspect that frequent cups of tea did not improve the nervous system of the unhappy poet ; though he had other weaknesses which were of themselves sufficient to account for the final ruin of his mind.

Innumerable have been the varieties of human weaknesses in respect of things edible and potable. We forget the name of the French lady who said she would commit a baseness for the sake of fried potatoes. More than one person may have only wanted her candor to make a similar avowal of excessive affection for a particular dish. The English king who died of a surfeit of peaches and new ale was hardly a great man ; but the king who died of lampreys was in the first rank of the statesmen and warriors of his age, to say nothing of being something of a scholar into the bargain. Englishmen have small affection for the memory of Philip II., who irreparably ruined his digestion by immoderate indulgence in pastry ; but he is still regarded by Spaniards as one of their greatest monarchs. To turn to men of unquestioned genius, Byron's most innocent passion seems to have been for soda-water, on which at one time he almost subsisted, with the aid of dry biscuits. Apparently Beekford had a similar weakness for the gaseous fluid. During the three days and two nights of continuous work in which he composed "Vathek," soda-water was his principal sustenance.

The names of Byron and Beekford, unequal as they are, both call to mind one of the most frequent and most troublesome failings of the great, and of those who for their brief day were thought great. "England's wealthiest son" and England's cleverest son were, the one and the other, incorrigible posers. In spite of Mr. Matthew Arnold's fine lines, one may suspect that Byron did not allow "the pageant of his bleeding heart" to lose in effect from want of careful arrangement. "It is ridiculous to imagine," observed the blunt common-sense of Macaulay, "that a man whose mind was really imbued with

scorn of his fellow-creatures would publish three or four books every year in order to tell them so ; or that a man who could say with truth that he neither sought sympathy nor needed it, would have admitted all Europe to hear his farewell to his wife, and his blessings on his child." Among other distinguished *farceurs*, as the French plainly term persons who act off the stage, everybody will readily place Louis XIV. and Napoleon I. (perhaps also Napoleon III.) ; and, reluctantly, Chatham, together with Burke, whose dagger exhibition is hopelessly indefensible. Rousseau is perhaps the prince of the tribe ; though Diderot has not inconsiderable claims to occupy that bad eminence. Devaines, indeed, gives a wonderful account of the latter's genius for what might be called domestic tragedy. As the statesman knew the writer well (and was always accounted a veracious chronicler), there is no valid reason for refusing him credence. On the eve of Diderot's departure for Russia, Devaines went to say good-by to him. Diderot, as he assures us, received him with tears in his eyes, and led him into his study ; where, in a voice choked with sobs, he broke forth into a monologue in these terms : "You see before you a man in despair ! I have passed through the most cruel possible of scenes for a father and a husband. My wife. . . My daughter. . . Ah ! how can I separate myself from them, after having been a witness to their heart-rending grief ! We were at table ; I sat with one on either side of me : no strangers, as you may be sure. I wished to give to them and to them alone my last moments. What a dinner ! What a spectacle of desolation ! . . . We could neither eat nor drink. . . Ah ! my friend, how sweet it is to be loved by beings so tender, but how terrible to quit them ! No ; I shall not have that hateful courage. What are the cajoleries of power compared with the outpourings of nature ? I stay ; I have made up my mind ; I will not abandon my wife and daughter ; I will not be their executioner ; for, my friend, believe me, my departure would be their death." As the philosopher spoke, he leaned over his friend, and bedewed M. Devaines's waistcoat with his tears. Before the friend had time to answer with a few words of sympathy, Madame Diderot suddenly burst into the room. The impassioned address which she proceeded to deliver had at least the merit of sincerity : "And pray, M. Diderot, what are you doing there ? You lose your time in talking stuff, and forget your luggage. Nothing will be ready to-morrow. You know you ought to be off early in the morning ; yet there you are

at your fine phrases, and your business taking care of itself. See what comes of dining out instead of staying at home. You promised me, too, that you wouldn't go to-day! But everybody can command you, except us. Ah! what a man! My goodness, what a man!" Devaines with difficulty kept his countenance, and lost no time in beating a retreat. Next day he was not surprised to learn that Diderot had managed to tear himself from his wife and daughter, and that they appeared to be bearing his absence with resignation.

The truth is, that, on a careful survey of the facts, one is forced to the conclusion that Diderot made the journey partly in order to escape from the beloved one, who was a model of constancy and devotion, but had a shrill voice, which, again, was the exponent of a quick temper. He was very poor, and had advertised his library for sale. Catherine II. generously purchased it at its full price; then appointed Diderot its custodian, at a handsome salary, fifty years of which was paid in advance. It was not even required that the books should be brought to St. Petersburg. Diderot, however, determined to go and thank the empress in person, which was no doubt a graceful resolution on his part. Only there was no especial reason why he should have staid several months in Holland on the way, even if we admit that the most direct route to the capital of the czars lay through that country. Once at the court of Catherine he was petted and made much of, as may well be believed; and his delight knew no bounds. From St. Petersburg he wrote to Mdle. Voland that "while in a country called the land of freemen, he felt as a slave; but now, in a country called the land of slaves, he felt like a freeman." Either Diderot saw things Muscovite through rose-colored spectacles, or a certain orthodox empire has been progressing backward, as Americans say, for the last century.

"The first step toward philosophy," said Diderot, on his death-bed, "is incredulity." Whatever may be the worth of this axiom, one is tempted, after a perusal of "The Religieuse," to think that an excessive credulity was among the author's intellectual weaknesses. At any rate, it is clear that no scandal in respect of monks or nuns was too black or too improbable for Diderot to give it credit. Of course, the wish was father to the belief.

The credulous suspicion with which Diderot regarded a numerous class of his fellow-beings is supposed to have been the feeling with which

Talleyrand regarded the whole human race. As a matter of fact, the prince does not seem to have thought so ill of our common nature; but he had a weakness for saying "good things," which may be defined as bad things, about other people. And one of his happiest *mots* was merely a witty reproof of that spirit which greedily catches at the suggestion of a hidden motive for the plainest action. Some one told him that M. de Sémonville had a bad cold. "What interest can M. de Sémonville have in catching cold?" quoth Talleyrand. Yet, if Napoleon's greatest minister had been a more suspicious person than he really was, there would have been some excuse for him. His youth was passed in a very hot-bed of intrigue and back-stairs influence; and, if we are to admit as trustworthy the evidence of Chamfort (as there seems no reason why we should not), Talleyrand's own mother may have given him some strange lessons in the art of getting on. Certainly, there was no very healthy moral to be drawn from such a history as the following: A woman was plaintiff or defendant—it matters not which—in an action about to be tried by the Parliament of Dijon. To gain her cause, it seemed to her the most natural thing in the world to try and get some great person to say a word to the judges in her favor. With this end in view she went to Paris, and begged the Keeper of the Seals to intercede for her. On the keeper's refusal, she applied to the Countess of Talleyrand, who, taking an interest in the woman, wrote herself to the minister, but with no better success than her *protégée*. Madame de Talleyrand then remembered that her son, the Abbé de Périgord (the future Bishop of Autun), was somewhat of a favorite with the Keeper of the Seals; to whom, accordingly, at his mother's request, the hopeful young ecclesiastic was induced to write. A third refusal was the result of this third application. The fair litigant, with an energy worthy of a better object, now determined to go to Versailles, and seek to see the minister. The coach in which she went was so uncomfortable that she got down at Sèvres, intending to walk the rest of the way. She had not proceeded far before she fell in with a man who, on her asking to be shown the way, offered to take her by a short cut. They began to talk, and she told him of her trouble. He said, "To-morrow you shall have what you require." She looked at him, astonished, but made no answer. Arrived at Versailles, she succeeded in obtaining the same day an audience of the minister, who, however, declined to comply with her request. Meanwhile her new friend had

waited for her outside. On her reappearance he begged of her to stay at Versailles for the night—next day she would hear tidings of him. On the following morning he brought her just such a letter from the Keeper of the Seals as she had prayed for. Who was this walking Providence? A clerk's clerk, named Étienne. Whence his power. The father of mischief only knew.

A propos of the administration of law in olden France, it is a mournful confession to have to make that Henri IV. was not a sufficiently wise and virtuous ruler to refrain from tampering with the independence of his own judges. On one occasion, for instance, he sent for M. de Turin, who was to give judgment in the case of M. de Bouillon *vs.* M. de Bouillon la Mark, and, without preamble, said, "M. de Turin, I wish M. de Bouillon to win his suit." "Very well, sire," replied the judge; "there is nothing easier: I will send you the papers, and you shall decide the case yourself." With which words he withdrew; when some one observed to the king, "Your Majesty does not know that man—he is quite bold enough to do what he has said." The king sent after him; and, sure enough, the messenger found the worthy magistrate loading a porter with brief-bags, and directing him to take them to the palace. Tallemant des Réaux is responsible for the story. Henri's grandson naturally inherited this royal weakness for being to his subjects all in all; but even Louis IV. occasionally found a man who could face him. Thus, the Chancellor Voisin positively refused to affix the seals to a pardon, the proposed object of the monarch's clemency being known to the minister to be an irreclaimable scoundrel. The king took the seals and acted for the nonce as his own chancellor; then returned them to their regular custodian. "I cannot accept them," replied Voisin; "they are polluted." "What a man!" exclaimed Louis, half impatiently and half admiringly, as it should seem, for he threw the pardon into the fire; upon which the chancellor consented to resume the seals.

Louis's idea that he might, at a pinch, seal his own ordinances, was not unworthy of Frederick the Great, who was ready himself to discharge every possible function of the body politic, and was at once the eye, the tongue, and the right hand, of the state—occasionally, if one might push the simile so far, its foot, and booted foot, as the shins of the judges who would not take their sovereign's view of Miller Arnold's case might have testified. Probably Frederick's love of doing even the official drudgery of his

dominions may have proceeded, if we examine its final cause, from much the same reason as that which impelled him to labor at the composition of French verses. It was an ambition (and no mean ambition had it been attainable), not only to be first of all, but to be first in all things. As the Homeric chieftain was proud to be a stout spearman as well as a skilled leader, so Frederick apparently longed to be the intellectual as well as the civil head of the commonwealth which he had almost reconstructed to its foundations. Mr. Irving mentions a trait of Columbus which is sufficient evidence of a very similar weakness in the discoverer of the New World. Columbus had somewhat childishly set his heart on being the first to see land with the human eye, as if it were not enough glory to have discovered it with the eye of science, enlightened by imagination. Such as it was, Columbus fancied he had achieved the lesser as well as the greater distinction. His claim, however, was disputed by a common sailor, who, as may well be imagined, had small chance of being believed before the admiral. Maddened with disappointment at the loss of the splendid reward which had been promised, and which he had hoped to obtain, the unhappy man is said to have sworn at once his country and his faith, and to have taken service with the Moors. One can only hope he was never made prisoner by his compatriots, for the Inquisition would have made short work with him. But Columbus does not come well out of the story.

Other weaknesses of great men for doing little things have proved less harmful to others and to their own reputation. Among them may be cited Rossini's passion for making macaroni after a peculiar and, it must be admitted, an excellent fashion. He seemed as proud of his culinary accomplishments as of having composed "William Tell," which masterpiece, as will be remembered, closed his operatic career. The reason Rossini alleged for passing the last forty years of his life in almost complete idleness was akin to that weakness of timidity which made Gerard Hamilton¹ silent after his single speech. "An additional success," said Rossini, "would add nothing to my fame; a failure would injure it. I have no need of the one, and I do not choose to expose myself to the other."

¹ It may not be generally known that, once across St. George's Channel, Hamilton became more courageous. He often spoke with effect in the Irish House of Commons; it was only at Westminster that he remained mute.

Goldsmith's fond belief that he possessed a knowledge of medicine is known to all. Possibly it hastened his death, for he would prescribe for himself. Eugène Sue labored under a delusion of the same kind; only for his there was some slight ground in fact, the author of the "Mysteries of Paris" having actually been a regimental surgeon in his youth. It must be admitted, too, that a droll anecdote about Sue's performances in his later years indicates rather that he was sometimes very drunk than that he utterly lacked professional skill. He had one day dined with his friend Romieu at the Café de Paris, and had dined well—in fact, they had both dined well; and as they sauntered along the boulevards, by way of aiding digestion, Romieu slipped, fell down, and hurt his leg. Sue called a cab, put his friend in, and drove home, where he dressed the wound. He then put Romieu to bed, and settled himself into an arm-chair for the

night. Next morning he hastened to examine the wound, only to discover that he had tended the wrong leg!

Few, indeed, are the men who have been great in more than one department of human knowledge and skill; though (if one may avail one's self of the Oxford terminology) there have been a respectable number who have combined a first-class reputation in one field of distinction with a second-class in another. It is pleasant, in this year of the Rubens Terecentenary, to remember that the famous painter acquitted himself with credit in a diplomatic capacity. A lady once asked Casanova "whether Rubens had not been an ambassador who amused himself with painting." "I beg pardon, madam," replied the artist; "he was a painter who amused himself with embassies." One shudders to think of the depths of ignorance or impertinence the lady's question reveals.—*Cornhill Magazine*.

THE EDUCATION OF AFTER-LIFE.¹

BY ARTHUR P. STANLEY.

IT is said that the late King of Prussia, on seeing Eton College, exclaimed, "Happy is that country where the old is ever entwined with the new, where the new is ever old, and the old is ever new." That is most true; but, if he had come to Bristol at this time, he might have even improved on his remark, and said, "Happy is that country where the old is ever giving birth to the new, where the new is ever springing from the old." For in the cathedral he would have seen the Abbey Church of Robert Fitzharding, the fine old descendant of the wild sea-kings, awakening into a new life, and stretching forth a gigantic arm which had seemed to be paralyzed to its very socket. And he would have seen the new start of a young institution of teachers sent into this commercial city, in large measure by the en-

ergies of two ancient colleges, which a hundred years ago would have been thought the most retrograde and the most exclusive of all our academical communities. I have spoken of the Cathedral of Bristol in the proper place. Let me now say a few words on its new college.

I will not go back to the question of the utility of such institutions themselves. This was sufficiently set forth some years ago by my excellent friend the Master of Balliol, who has done so much for Oxford and for Bristol, and by those many other distinguished persons who then addressed you. The college has been begun, and it is not of the college, but of its work, that I have to speak. And, in so doing, it has been suggested to me that it might be useful to make a few general remarks on a commonplace subject—"The Education of After-Life." It is closely connected with the special functions of this institution, and it has this further advantage, that its consideration may not be altogether without profit to the more miscellaneous public.

In what sense can education be said to be carried on at all in an institution so rudimentary, so slightly equipped as this? You have no buildings, you have no antiquity, you have no traditions, you have no discipline, you have none of

¹ An address delivered by Dean Stanley on the occasion of the new session of University College, Bristol, October 27, 1877.²

² University College, Bristol, was founded in 1876. "to supply for persons of both sexes above the ordinary school age the means of continuing their studies in science, languages, history, and literature; and more particularly to afford appropriate instruction in those branches of applied science which are employed in the arts and manufactures." The funds of the college are chiefly derived from local contributions; but the college receives subsidies from Balliol College and New College, Oxford, and from the Worshipful the Clothworkers' Company of London.

those things which in our older institutions are almost the atmosphere in which education lives, and moves, and has its being. You have them not; and we do not for a moment underrate the loss. But there are here, at any rate, two materials of education, which may continue throughout life, and which are, perhaps, after all, the only two indispensable elements—the teachers and the taught.

1. The teachers—let me say something of them. When at Oxford, in my younger days, there were discussions about the reforms of the university; there was one want which we regarded as supremely felt, and this was the want of professors, that is to say, of teachers, who might be “as oracles, whereat students might come” in their several branches of knowledge. These were in consequence called into existence, and among you also they exist already. I am not now speaking personally of the actual professors, though doubtless your practical experience of them would bear out much of what I say. But I speak of the advantage to any community, to any young man or woman, of being brought into contact with higher intelligences. No operation in the way of external impulse, or stimulus, or instruction, in our passage through this mortal existence, is equal to the impression produced upon us by the contact of intellects and characters superior to ourselves. It is for this reason that a college like yours must always have the chance of contributing, directly and forcibly, to the elevation of those among whom it is placed. A body of men, brought together by the enthusiasm of teaching others, with a full appreciation of great subjects, with an ardent desire of improving not only others but themselves, cannot fail to strike some fire from some one soul or other of those who have the opportunity of thus making their acquaintance. It need not be that we follow their opinions; the opinions may vanish, but the effect remains. Socrates left no school behind him; the philosophers who followed him were broken into a thousand sections, but the influence and stimulus which Socrates left, never ceased, and have continued till the present hour. If we look for a moment at the records, on the one hand, of aspirations encouraged, of great projects realized; or, on the other hand, of lost careers, of broken hopes, how often shall we find that it has been from the presence or from the want of some beneficent, intelligent, appreciative mind coming in among the desponding, the distressed, the storm-tossed souls of whom this world contains only too many. To take the example of two poets—one whose grave

is in the adjacent county, one belonging to your own city—how striking and how comforting is the reflection of the peaceful, useful, and happy close of the life of George Crabbe, the poet; for eighteen years pastor of Trowbridge! All that happiness, all that usefulness, he owed to the single fact that, when a poor, forsaken boy in the streets of London, he bethought himself of addressing a letter to Edmund Burke. That great man had the penetration to see that Crabbe was not an impostor—not a fool. He took the poor youth by the hand, he encouraged him, he procured for him the career in which he lived and died. He was, it is hardly too much to say, the instrument of his preservation and of his regeneration. On the other hand, when, with Wordsworth, we think of Chatterton, “the marvelous boy, the sleepless soul that perished in his pride,” how impossible it is to avoid the reflection that, if he had met with some congenial sphere, such as this college now presents, some kindly hand to lead him forward, some wise direction (over and above the kindness which he met from personal friends) that might have rescued him from his own desperate thoughts, we should have been spared the spectacle of the premature death of one whose fate will always rank among the tragic incidents of the history not only of Bristol but of England.

It is too much to expect that there may be a Burke among your professors, or a Chatterton among your pupils. But the hopeful and the melancholy lesson are both worth remembering.

2. And now, leaving the body of teachers, these two instances remind me to turn to the body of students. I can but plunge in the dark to give any advice, but this much is surely applicable to all of them. I will do my best, and perhaps here and there a word may be useful.

Bear in mind both the advantages and the disadvantages which the voluntary education of students in after-life involves, by the mere fact of the freedom of choice—freedom in studies, freedom in subjects, freedom of opinions. A self-educated man is, in some respects, the better, in some respects the worse, for not having been trained in his early years by regular routine. We have an illustration of both the stronger and the weaker side of self-education in the case of Mr. Buckle, the author of the “History of Civilization.” At the time of his greatest celebrity, it was often remarked that no man who had been at regular schools or universities could, on the one hand, have acquired such an enormous amount of multifarious knowledge, and such a

grasp of so many details; while, on the other hand, no one but a self-educated man, feeding his mind here and there, without contradiction, without submission, without the usual traditions of common instruction, could have fallen into so many paradoxes, so many negligences, so many ignorances. It is enough to state this fact, in order to put you on your guard against the dangers of your position, and also to make you feel its hopes and opportunities. Over the wide field of science and knowledge it is yours to wander. The facts which you acquire will probably take a deeper hold on your minds from having been sought out by yourselves; but not the less should you remember that there are qualifying and controlling influences derived from the more regular courses of study which are of lasting benefit, and the absence of which you must take into account in judging of the more desultory and the more independent researches which you have to make. A deaf person may acquire, and often has acquired, a treasure of knowledge and a vigor of will by the exclusion of all that wear and tear, of all that friction of outer things, which fill the atmosphere of those who have the possession of all their senses. But, nevertheless, a deaf person, in order not to be misled into extravagant estimates of his own judgment, or of the value of his own pursuits, should always be reminded that he has not the same means of correcting and guarding his conclusions and opinions as he would have if he were open to the insensible influence of "the fibres of conversation," as they have been well called, which float about in the general atmosphere, that for him has no existence. Self-education is open both to the advantages and disadvantages of deafness; knowledge is at some entrances quite shut out, while such knowledge as gets in occupies the mind more completely, but always needs to be reminded that there is a surrounding vacuum. With this general encouragement, and this general warning, let us proceed.

3. There are in connection with this institution two chief departments of human knowledge open to those who educate themselves—Science and Literature. Of Science, which provides for the larger part of your instruction, I can unfortunately say but little, for the simple reason that, from my own ignorance, I have nothing to contribute on the subject. Still, I cannot be insensible to the immense enjoyment which every branch of it must furnish to those with whom it enters, not merely into the pleasures, but into the actual work, of their daily life. It is hard,

for example, to overstate the advantage which it must be to those who are immersed in the business and the commerce of a great town like this, that, amid the fluctuations of speculation, and the interminable discussions of labor and capital, they should have fixed in their minds the solid principles of political economy. It was with a thrill of delight, quite apart from agreement or disagreement, that I read not long ago of one of our chief public men in Parliament taking his stand aloof from his party, and despite his own interests, in defense of the dry and arid science of political economy, which he thought was unduly depreciated among large classes of our countrymen. Dry and arid it may be, but I cannot doubt that it is, as it were, the backbone of much of our social system, and it gives a backbone to all into whose minds it has thoroughly entered.

Then in geology, astronomy, chemistry, and the natural sciences generally, what a large field is open before you for your pleasure and profit! When Wordsworth said in his fine ode that there had passed away "a glory and a freshness" from the earth, he little thought that there was another freshness and glory coming back, in the deeper insight which science would give into the wonders and the grandeur of Nature. I have heard people say who have traveled with Sir Charles Lyell, that to see him hanging out of the window of a railway-carriage, to watch the geological formations as he passed through a railway-cutting, was as if he saw the sides hung with beautiful pictures.

4. Then, when we come to literature, what a world of ideas is opened by a public library, or even a private library—by such libraries, great or small, as have, by individual or corporate munificence, been opened in every quarter of Bristol! What a feast there is in a single good book!

We sometimes hardly appreciate sufficiently the influence which literature exercises over large phases of the world. By literature, I mean those great works of history, poetry, fiction, or philosophy, that rise above professional or commonplace uses, and take possession of the mind of a whole nation, or a whole age. It was pointed out to me the other day how vast an effect had been wrought by the famous Persian poet Ferdusi, in welding together into one people the discordant races of the Mussulman conquerors and the indigenous Persians, by his great poem on Persian history, which he, belonging to the Mussulman conquerors, wove out of the legendary lore of the conquered race. But, indeed, it is not necessary

to go to Persia for an example. How vast an influence for good has been exercised on this century by the novels of Sir Walter Scott! It is not only that, by superseding the coarser though often vigorous fictions of the last century, they purified the whole current of English literature—it is not only that they awakened an interest in the past, and also gave a just view of the present and the future, beyond almost any writings of our time, but that they bound together, in an indissoluble bond, the two nations, Scotland and England, which before that time had been almost as far asunder as if one of them had been on the other side of the Channel, instead of on the other side of the Tweed. Often it has been said, and truly, that no greater boon could be conferred on Ireland than that a genius as wide-spreading, as deeply penetrating, and as calmly judging, as Sir Walter Scott, could be raised up to give a like interest to the scenery, the history, the traditions, and the characters of Ireland.

I have given these two examples of the national influence of literature, because they show, on a great scale, what can be effected by the finest thoughts put into the finest words. To be conversant with them is an education of after-life which never ceases. We read such books again and again, and there is always something new in them. Spend, if possible, one hour each day in reading some good and great book. The number of such books is not too many to overwhelm you. Every one who reflects on the former years of his education can lay his finger on half a dozen, perhaps even fewer, which have made a lasting impress upon his mind. Treasure up these. It is not only the benefits which you yourself derive from them—it is the impression which they leave upon you of the lasting power of that which is spiritual and immaterial. How many in all classes of life may say of their own experience that which was said in speaking of his library, by one of your most illustrious townsmen, who was my own earliest literary delight, Robert Southey :

“ My days among the dead are past ;
 Around me I behold,
 Where'er these casual eyes are cast,
 The mighty minds of old :
 My never-failing friends are they,
 With whom I converse day by day.

“ With them I take delight in woe
 And seek relief in woe ;
 And while I understand and feel
 How much to them I owe,
 My cheeks have often been bedewed
 With tears of thoughtful gratitude.

“ My thoughts are with the dead ; with them
 I live in long-past years,
 Their virtues love, their faults condemn,
 Partake their hopes and fears,
 And from their lessons seek and find
 Instruction with an humble mind.”

And even perhaps some of the youngest or homeliest among us need not scruple to add :

“ My hopes are with the dead ; anon
 My place with them will be,
 And I with them shall travel on
 Through all futurity ;
 Yet leaving here a name, I trust
 That will not perish in the dust.”

5. But it is not only by books, whether of literature or science, that the self-education of after-life is assisted. When Joan of Arc was examined before her ecclesiastical judges, and was taunted with the reproach that such marvelous things as she professed to have seen, and heard, and done, were not found written in any book which they had studied, she answered in a spirit akin, and in some respects superior, to the well-known lines in which Hamlet replies to Horatio. She replied, “ My Lord God has a book in which are written many things which even the most learned clerk and scholar has never come across.” Let me take several examples, showing how education may be carried forward apart from books.

Let me touch on the experiences presented to our eyes and ears by travel. In this age it is one of the peculiar advantages offered to all classes, or almost all classes, which, in former times, was the privilege only of a few, that the great book of foreign countries and the phenomena of Nature have been opened to our view. We hardly appreciate how vast a revelation, how new a creation has been opened to us in these respects within the last fifty years. A century ago not only were the scenes to be visited closed against us, but the eye by which we could see them was closed also. The poet Gray was the first human being who discovered the charms of the English lakes which are now able even to enter into a battle of life and death against the mighty power of a city like Manchester, because of the enthusiastic interest which they have enkindled in the hearts of all who visit them. The glories of the valley of Chamounix were first made known to the European world by two Englishmen at the close of the last century. Before that time the cherished resorts of such gifted personages as Voltaire and Madame de Staël were so selected as carefully to exclude every view of Mont Blanc and his great compeers. But in our time all these various forms of beauty and grandeur are

appreciated with a keenness, and sought with an enjoyment, which must add new life and new vigor even to the most secluded among us.

6. Besides the education which distant travel may give, there is also a constant process of self-education which may be carried on nearer home. It is not only that in each successive age, or at least in the age in which we live, a new eye or faculty has been created by which we are enabled to see remote objects which to our forefathers were absolutely unknown; but, according to the familiar story which we read in our childhood, every human being may pass through the most familiar scenes with "eyes" or "no eyes." Let me illustrate this by the instruction which can be conveyed to an inquiring and observant mind by the city in which our lot is cast. "What a book!" as Joan of Arc would have said—"what a book of endless interest is opened to us in Bristol!" How it tells its own story of the long unbroken continuity of importance in which it stands second among British cities only to London! It is, as Lamartine says of Damascus, a predestinated city. Why was it of such early political eminence? Because, if I may use knowledge imparted to me since I came among you, it was the frontier fortress of the English race in the south, as Chester was in the north—to keep a watch on the wild Welshmen in their hills beyond the Severn. Why was it of such early commercial eminence, before the birth of Manchester, or Liverpool, or Birmingham, or Glasgow? Because it stood near the mouth of that great estuary by which alone at that time England was able to hold communion with the unknown West, with the Atlantic, and with the transatlantic world. At the mouth of the Severn, yet what in those early days was even yet more valued, not quite at the mouth—parted only by that marvelous cleft of the Avon, up which the ships of old time came stealing, as by a secret passage, on the back of the enormous tide of the Bristol Channel, beyond the grasp of the pirate or buccaneer of the open sea.¹ And why did it become the scene of all those pleasant tales of Miss Burney, or Miss Edgeworth, or Miss Austen, in later days, which made its localities familiar to the childhood of those who, like myself, knew Bristol like a household word fifty years before they explored it for themselves? It was the gush of mineral springs, the "hot wells," now forgotten, but then the rallying-point of fashion and society, beneath

your limestone-rocks. And what makes it such an ever-growing, ever-inspiring centre of institutions, such as Clifton College, already venerable with fame, and this new University College? It is the unrivaled combination of open downs, and deep gorges, and distant views, and magnificent foliage—magnificent still, in the wreck and devastation which cause even a stranger almost to weep, as he passes through the carnage of gigantic trunks with which the late hurricane has strewn the park of King's Weston. These are among the lessons which the education of after-life may bring out from the pages of this vast illuminated book of the natural situation of Bristol, which, more even than the Charter of King John or the Bishopric of Henry VIII., have given to it its long eventful history and its never-ceasing charm.

7. Apart from the education to be derived from inanimate objects, there is the yet deeper education to be derived by those who have senses exercised to discern between true and false, between good and evil, from the great flux and reflux of human affairs, with which the peculiarity of our times causes all to become more or less conversant. One of the experiences which the education of life brings with it, or ought to bring with it, is an increasing sense of the difference between what is hollow and what is real, what is artificial and what is honest, what is permanent and what is transitory. "There are," says Goethe, in a proverb pointed out to me long ago by Lord Houghton as a summary of human wisdom, "many echoes in the world, but few voices." It is the business of the education of after-life to make us more and more alive to this distinction. Think of the popular panics and excitements which we have outlived—of the delusions which we have seen possess whole masses of the people, educated and uneducated, and then totally pass away. You have, many of you, I doubt not, heard the story of the conversation of the most famous of all the Bishops of Bristol as he was walking in the dead of night in the garden of the now destroyed episcopal palace. "His custom," says his chaplain, "was, when at Bristol, to walk for hours in his garden in the darkest night which the time of year would afford, and I had frequently the honor to attend him. He would take a turn, and then stop suddenly short, and ask the question: 'Why might not whole communities and public bodies be seized with fits of insanity as well as individuals? Nothing but this principle, that they are liable to insanity equally at

¹ "The ancient cities of Greece, on account of the piracy then prevailing on the sea, were built rather at a distance from the shore." (Thucydides, i., 7.)

least with private persons, can account for the major part of those tragedies of which we read in history.' I thought little," adds the chaplain, "of the odd conceit of the bishop, but I own I could not avoid thinking of it a great deal since, and applying it to many cases."

Yes, Bishop Butler was right. Such madnnesses have occurred many and many a time before, and they have indeed been enacted many and many a time since. The madness of the people of London in the riots of Lord George Gordon; the madness of the people of Birmingham when they burned the library of Dr. Priestley; the madness of the people of Bristol, which laid waste, in 1831, the very garden in which Bishop Butler made the remark one hundred years ago; the innumerable theological panics which I have seen rise and fall away in my own day—are all examples of the danger to which we are exposed in public agitations unless by the stern education of after-life we deliberately guard ourselves against it.

It is with no view of producing an undue distrust either of human nature or of popular judgments that I dwell on the deep conviction of the instability of temporary judgments which this experience of life impresses upon us. Like all insanity it is best met by sanity. Like all falsehood and hollowness, it is best resisted by a determination on the part of those who know better, not to give way by one hair's-breadth to what they know in their own minds to be a fiction or a crime. If we all of us, as communities, as parties, as churches, are liable to these fits of madness, it is the more necessary that we should educate ourselves to be our own keepers. And, as in actual insanity, so in those metaphorical insanities, it is encouraging to remember that one keeper, one sane keeper, is often quite enough to control many madmen. When one verger, by his own stout arm and resolute speech, saved Bristol Cathedral from the raging mob, he did what many a magistrate, or politician, or ecclesiastic, under analogous circumstances, might do, and what they have often failed to do, and so have wellnigh ruined the commonwealth. In these illusions of which we are speaking, it is not so difficult after all to detect the ring of a true or of a hollow word, it is not impossible to scent out with an almost infallible instinct the savor of the rotten or decaying or aerid element in human opinion, or to see wherein are to be found the light and glory and sweetness of the eternal future.

8. And this leads me to speak of that education which is given in our age and in our country

more than in any other, namely, education in public affairs or politics. I remember when in Russia that a Russian statesman was speaking of the important effects to be hoped from the endeavor to give more instruction to the people; "but," he said, "there is one process of education which has been more effectual still, and that is the reform in the administration of our courts of law and the introduction of trial by jury. This, by bringing the peasants into the presence of the great machinery of the state, by making them understand their own responsibility, by enabling them to hear patiently the views of others, is a never-failing source of elevation and instruction." Trial by jury, which to the Russian peasant is as it were but of yesterday, to us is familiar by the growth of a thousand years. It is familiar, and yet it falls only to the lot of few. I have myself only witnessed it once; but I thought it one of the most impressive scenes on which I had ever looked. The twelve men, of humble life, enjoying the advantage of the instruction of the most acute minds that the country could furnish; taught in the most solemn forms of the English language to appreciate the value of exact truth; seeing the whole tragedy of destiny drawn out before their very eyes—the weakness of passion, the ferocity of revenge, the simplicity of innocence, the moderation of the judge, the seriousness of human existence—this is an experience which may actually befall but a few, but to whomsoever it does fall the lessons which it imparts, the necessity of any previous preparation for it that can be given, leap at such moments to the eyes as absolutely inestimable. But what in its measure is true of the education which a jurymen receives, and of the necessity of education for discharging the functions of a jurymen, is true more or less of all the complex machinery by which the duties, the hopes, and the fears, of English citizens are called into action. And here again the past history of Bristol furnishes so admirable an example of an important lesson of political education that I cannot forbear directing your attention to it. I mean Mr. Burke's speech in the Guildhall at Bristol, in which he refers to certain points in his parliamentary conduct in the year 1770. In making this reference you will not suppose that I am so indiscreet as to be entering on any political question, or taking the side of any political party. I am not favoring either the Anchor or the Dolphin. I am not giving any advice to either of your respected members, nor to any distinguished persons who may come here on the day of your great benefactor Colston.

No; but I am trying to impress upon you all the value of the education of after-life in raising you to the height of that great argument in which you have to confront the grave emergencies of our time and country. Burke is speaking against the folly of electors trying to engage their representatives in matters of local or peculiar interest, as distinct from the great questions of national policy. "Look, gentlemen," he says, "to the whole tenor of your member's conduct. Try whether his ambition or his avarice has jostled him out of the straight line of duty, or whether that grand foe of the offices of active life, that master-vice in men of business, a degenerate and inglorious sloth, has made him flag and languish in his course? This is the object of our inquiry. If your member's conduct can bear this touch, mark it for sterling. He may have fallen into errors; he must have faults; but our error is greater and our fault is radically ruinous to ourselves if we do not bear, if we do not even applaud, the whole compound and mixed mass of such a character. Not to act thus is folly, I had almost said it was impiety. He censures God who quarrels with the imperfections of man. . . . When we know that the opinions of even the greatest multitudes are the standard of rectitude, I shall think myself obliged to make those opinions the masters of my conscience. But if it may be doubted whether Omnipotence itself is competent to alter the essential constitution of right and wrong, sure I am that such things as they and I are possessed of no such power. No man carries further than I do the policy of making government pleasing to the people. But the widest range of this politic complaisance is confined within the limits of justice. I would not only consult the interest of the people, but I would cheerfully gratify their humors. We are all a sort of children that must be soothed and managed. I think I am not austere or formal in my nature. I would bear, I would even myself play my part in, any innocent buffooneries to divert them. But I never will act the tyrant for their amusement. If they will mix malice in their sports I shall never consent to throw them any living, sentient creature whatsoever—no, not so much as a kiting to torment. . . . I could wish, undoubtedly, to make every part of my conduct agreeable to every one of my constituents. But in so great a city, and so greatly divided as this, it is weak to expect it. In such a discordancy of sentiments it is better to look to the nature of things than to the humors of men. The very attempt toward pleasing everybody discovers a temper always flashy, and often

false and insincere. Therefore, as I have proceeded straight onward in my conduct, so I will proceed in my account of those parts of it which have been most excepted to. But I must first beg leave just to hint to you that we may suffer very great detriment by being open to every talker. It is not to be imagined how much of service is lost from spirits full of activity and full of energy, who are pressing, who are rushing forward, to great and capital objects, when *you* oblige them to be continually looking back. While they are defending one service they defraud you of a hundred. Applaud us when we run; console us when we fall; cheer us when we recover; but let us pass on—for God's sake, let us pass on!"

I venture to quote these words of everlasting wisdom from one of the greatest masters of the English language and of English political science, because they well express that kind of public education which the mere experience of life ought to give us, quite irrespective of the special political party to which one may be attached. No doubt, as Mr. Burke says, it is extremely difficult to know how far to concede to popular feeling, or, indeed, how far popular feeling is likely to be correct. We must all work with such instruments as are at hand. Yet not in politics only, but in all public affairs, not on one side only, but on both sides of public life, it is a peculiar danger of the generation in which our lot is cast, that we are often tempted to abandon the lofty and independent line which Mr. Burke and the electors of Bristol then assumed. Often, more often, I fear, than in the days of our fathers, we meanly abdicate the function of leading the opinion of those whom we ought to lead, and prefer to follow the opinion of those who are no better—who are, it may be, worse than ourselves. Sometimes, instead of choosing courses which we believe to be for the good of the country, or for the good, even, of the particular principles which we represent, we are weak enough to bow to the temporary exigencies of some passing war-cry on which we ourselves have no conviction at all, and which we only encourage for the purpose of acquiring power or influence to ourselves or our friends. It would be easy to illustrate this branch of public education by examples nearer home; but let us take the career of that distinguished French statesman who has just gone to his rest. M. Thiers had, no doubt, many faults, and upon his memory will always rest the burden of one or two of the greatest misfortunes which have overtaken his country; but it is to the later years of his course that I would call your attention. When during the German War

of 1870 the condition of France had become well-nigh desperate; when the passions, whether of the people or of their leaders, still refused to accept even the slightest proposals of peace, it was predicted by sagacious persons, both in France and in England, that the difficulty of arriving at any termination of that disastrous conflict was enhanced by the circumstance that any statesman, who ventured so far to resist the torrent of national frenzy as to make overtures to Germany, would be certain to forfeit every chance of future political success. One man, however, in that extreme emergency, was found sufficiently patriotic to sacrifice the objects of his own ambition—vast as it was—to what he believed to be the good of his country. That man was Adolphe Thiers. And what was the result? All the predictions of which I have spoken were signally falsified. The act of pacification, by which it was believed that his personal career was ruined, became the stepping-stone by which, without dissent, and with almost universal applause, he mounted to the highest place in the government of his country. And yet, once more, hardly had he been there seated, when a second catastrophe overtook the nation, before which, some of these who usually undertook to inspire and lead the masses, turned and fled in dismay. The Commune was in possession of Paris; the working-classes of that great metropolis had seized the citadel of the state. Again it was predicted that no minister who undertook the terrible task of suppressing that formidable insurrection could ever regain the confidence or the affection of the mass of the Parisian people. And yet, what was the result? After a reconquest of the capital, accompanied by severities which I do not presume to judge, but which certainly were not calculated to conciliate the regard of those whose power was thus summarily broken, the same statesman was conveyed to his grave—lamented not merely by the upper classes of society, which he had preserved from ruin, but with a singular and mysterious silence and solemnity of grief through the midst of the very population which he had thus rudely vanquished. I repeat that I do not refer to these incidents as an advocate of that remarkable man—he has much to answer for; and I am not here either to defend or to condemn—but these acts in the last great epoch of his life are an encouragement to all those who, in the spirit of Edmund Burke, are steadfast to the dictates of their own consciences, confident that they will reap their reward before God and posterity, but not without the just hope that they may even reap it in the gratitude of those whose

folly they have resisted. These and the like acts are lessons to us that the people have, at the bottom of their hearts, more sense and more justice than we give them credit for. We may trust that the mass of our fellow-countrymen, if we have had the courage in a good cause to thwart their unreasoning frenzy, will acknowledge at last that they were mistaken, and that we were right. This is the education of public life, on which much more might be said—on which I could not say less; but on which, perhaps, I have said enough.

9. There is one more general remark on the education of experience which brings us back to our college. We live in these days more rapidly than our fathers did; we see more changes; we live, as it is said, many lives in one. Now, of this rapid growth and various experience, there is one important lesson. It shows us how great are the possibilities and capabilities of human existence. A friend of mine last year with singular courage accomplished the rare and difficult task of ascending Mount Ararat. Two days after he had come down, his companion explained to an Armenian Archimandrite at the foot of the mountain what my friend had done. The venerable man sweetly smiled, and said, "It is impossible." "But," said the interpreter, "this traveler has been up and has returned." "No," said the Archimandrite, "no one ever has ascended and no one ever will ascend Mount Ararat." This belief in the impossibility of what has been done is uncommon, but the belief in the impossibility of what may be done is very common; and it is one delightful peculiarity of the history of Bristol that it enables us to bear up against this natural prejudice. It might have been thought impossible that there should have been discovered a North America as well as a South America. Yet it was discovered by a Venetian seaman, who sailed from the harbor of Bristol. It was thought that no steamer could ever cross the Atlantic. Dr. Lardner proved to demonstration in this very city of Bristol that such an event could never take place; and the late Lord Derby said that of the first steamer which crossed he would engage to swallow the boiler! Yet such a steamer started from the docks of Bristol, and safely reached New York. It might have been thought that there was something impossible in the idea of a beneficent institution, living from hand to mouth, supported by the indomitable faith of one man, living on Providence. Yet this also has been fulfilled on Ashley Down. It might have been thought impossible that the rough lads of

Kingswood should ever be reformed, or that the women of India should ever be moulded by European influences. Yet this also was accomplished in our own day by the faith and energy of a wise and gentle woman, dear to Bristol—Mary Carpenter. It might have been thought impossible that an institution like this should ever have sprung into existence, that Oxford should ever have come to Bristol—that three hundred Bristol students should have been listening to lecturers from Oxford, Cambridge, and Dublin. Yet it has been done. All these discoverers have ascended Mount Ararat; and, though the most incredulous Archimandrite may shake his head and sweetly smile, and say that it cannot be, yet these things, great and small, have been achieved—and achieved in safety.

This is one of the best fruits of the education of after-life. It encourages the hope that impossibilities may become not only possibilities but actualities. There is a great company here of the "Merchant Venturers," called so, I am told, because they made some of those mighty ventures in former times by which new lands were found—new wealth and knowledge poured into this ancient city. But there are still many voyages to be made, still much wealth to be expended, still new Ararats to be scaled. We are

all of us *Merchant Venturers*—we all of us must venture something, if we would leave something worth living for—nay, if we would have something to look forward to hereafter. *Nil desperandum* must be written, as in the porch of the Redcliffe Church, so over the entrance of every stage of our existence.

Yes, over every stage. For this is the last word I will venture to say concerning the education of life. In the transformation of opinion which is imperceptibly affecting all our conceptions of the future state, and in the perplexities and doubts which this transformation excites, the idea that comes with the most solid force and abiding comfort to the foreground is the belief that the whole of our human existence is an education—not merely, as Bishop Butler said, a probation for the future, but an education which shall reach into the future. The possibilities that overcome the impossibilities in our actual experience show us that there may yet be greater possibilities which shall overcome the yet more formidable impossibilities lying beyond our experience, beyond our sight, beyond the last great change of all. Through all these changes, and toward that unseen goal, in the words of Mr. Burke, "*let us pass on—for God's sake, let us pass on!*"—*Macmillan's Magazine*.

THE GREEK MIND IN PRESENCE OF DEATH,

INTERPRETED FROM RELIEFS AND INSCRIPTIONS ON ATHENIAN TOMBS.

By PERCY GARDNER.

AT Athens the gravestones of the ancient inhabitants are not only among the most interesting, but among the most extensive, remains. Near Piræus, through all the Ceramicus, and in many other parts of the city, excavations have constantly brought to light a vast quantity of inscribed and sculptured slabs and columns, which have mostly, unlike antiquities of many other classes, remained at Athens, and now fill one wing of the new museum and the whole space in front. But there is a group of gravestones of even greater interest which are left standing, just where they were disinterred, by the old road which led through the gate Dipylon, from Athens to Eleusis, the road annually trodden by the procession at the Eleusinia. These tombs, in size and beauty superior to the rest, are preserved for

us, as is supposed, by a fortunate chance.¹ Sulla, when he attacked Athens and remorselessly massacred the miserable inhabitants, made his approach close to the gate Dipylon. There he erected the long *aggeres* by which his engines were brought close to the wall, and there his soldiers threw down several hundred yards of the city ramparts, which were formed of sun-baked bricks. Hence a vast mass of ruin which completely overwhelmed and buried the lines of tombs immediately without the gate, and preserved them almost uninjured until one day when they were once more brought to the light by a French archæological expedition in the year 1863. The suddenness with which these monuments were overwhelmed is indicated by the fact that

¹ See F. Lenormant's "*Voie Eleusinienne*," vol. i.

some of them were and remained unfinished; the completeness of their disappearance is proved by the silence of Pausanias the traveler, who, passing through all quarters of Athens in the time of the Antonines, would appear to have seen no trace of them. All of the monuments in this group are of course indubitably Athenian, and furnish the best materials for the present paper. Of the stones in the museum it is sometimes impossible to trace the find-spot; some are Boeotian, some from Peloponnesus, some from the islands. But this uncertainty need not debar us from freely referring to almost any as instances, for there is no great or essential difference between Athenian and other gravestones. It will be quite fair to treat, for the present purpose, all monuments preserved at Athens as Athenian, unless they be known to have come from a distance. Of the longer inscriptions a large proportion are from the tombs of foreign residents at Athens.

To the readers who are likely to peruse these pages, there are but two points in gravestones likely to prove very interesting: 1. The reliefs which they bear;¹ 2. The inscriptions engraven on them.

The earliest of Athenian sepulchral monuments, if we leave out of account buildings like the Cyclopean tombs of Mycenæ, or mounds like those recently opened with such splendid results at Spata, in Attica, is the often-cited stêlê of Aristion. It represents the deceased on a scale somewhat larger than life, as standing clad in full armor, spear in hand. The ground of the relief is red; traces of color may be seen, or rather might at the time of discovery be seen, on many parts of the body, and holes may be observed made by the pegs which fastened armor of bronze on to the body. The design or idea of this slab differs not much from that of a portrait statue. Clearly in early Greek times, for this statue is given to the very beginning of the fifth century *n. c.*, the survivors wished to see in the monument the dead, as it were, still living among them, still to be seen in his daily dress, and about his daily business.

But it is from the fourth and succeeding centuries before the Christian era, that we inherit the great mass of the sculptured tombstones which crowd the museums. No one can spend a few hours among these without perceiving that the

representations fall naturally into four or five classes.

The first class and the most extensive consists of formal groups wanting in distinctive character, which display the dead either alone or in company with others. The companions, where there are such, are sometimes other members of the family, sometimes slaves or attendants, who, in accordance with the well-known canon of Greek art, which gives larger stature to the person of more importance, are always represented as of diminutive size. Sometimes the companion is not a person at all, but a favorite animal, a pet dog or bird. Such subjects are common in Macedonian times. The grouping is usually simple and graceful, the attitudes natural and unforced, the movements, if movement there be, measured. But the execution is not of the best, save in a few remarkable cases, and there is a want of invention, nay, there is even vulgarity, in the designs. Like our modern photographers, the inferior Greek artists who condescended to this kind of work had a few cardinal notions as to possibilities of arrangement, and could not easily be induced to depart from them. I will give the details of a few reliefs of this class: 1. A seated lady, who with her left hand holds the end of the veil which covers her face; before her stands a man, facing her. 2. A pair of sisters, Demetria and Pamphile. Pamphile is seated, and turns her head toward the spectator; with her right hand she grasps the end of her veil. Demetria stands over against her, her right hand folded across her breast, and grasps her veil with her left hand. 3. A man clad in long *himation* stands, in his hand a scroll. In front of him stands a small male figure, naked, holding a vessel, perhaps an oil-flask. The scroll which the master holds and the flask of the slave seem here to have as little meaning as the books and the flower-baskets of photographic rooms. 4. A mother clad in flowing Ionian drapery is seated to left. Her left hand rests on the seat; with her right she lifts something from a little toilet-box which a servant holds out. Round her knees clings a little girl. 5. A lad stands clasping to his breast a bird which a snake at his feet threatens and springs upward to reach. In other reliefs we find a dog in the place of the snake; sometimes a dog is standing elsewhere in the picture. Tame birds would seem to have been the usual playmates of Athenian children, and tame dogs the constant companions of young men, while in many houses a favorite which would be rarely appreciated in England, a snake, was nurtured.

¹ On the subject of these reliefs there is no complete work, but several monographs, the best of which are those of Friedländer and Pervanoglu. Where my own notes fail I have quoted the descriptions of the latter writer.

As this is the commonest class of reliefs, so evidently it is the least original and interesting. Here most is left to the sorry invention and feeble sympathy of the sculptor, who knew naught of the deceased, and allows us to know no more than could be ascertained from the sources of information which among the old Greeks corresponded to the first column of the *Times* or the pages of Burke with us. But it is by no means rare to find on sepulchral slabs a more exact reference to the past life or the habits of the dead. Sometimes we are told more than the bare fact that the departed was father, mother, wife, or sister—was young, old, or in the prime of life. I select the following: 1. A youth, naked, or wearing the light chlamys only, stands holding in his hand the strigil and oil-flask, those invariable accompaniments of gymnastic exercises among the Greeks. No doubt the survivors, who chose the design, wished to indicate that their friend was prominent in manly sports and labors. In this, the field of his best energies, they wished him still to seem to live. 2. A young man, clad in a chlamys, charges with spear advanced a wild-boar, which is coming out of its lair; at his side is a dog, which leaps forward at the quarry. Above, on a rock, stands a deer. We see at a glance that this is the tomb of one who loved the chase. 3. On a rock sits a man in an attitude of grief; beneath is the sea, and on it a boat with or without sailors. It is a generally-received opinion that monuments of this character were set up over those who had been wrecked at sea. 4. A young rider, clad in the light chlamys of the Athenian cavalry, charges, at once trampling beneath his horse's hoofs and transfixing with his spear a fallen foe, who tries in vain with his shield to ward off the attack of his triumphant enemy. From the accompanying inscription we know that this monument was erected in honor of Dexilaus, one of the five horsemen at Corinth—that is to say, as is supposed, one of the five horsemen who fell in the battle under the walls of Corinth, in which the Athenians were engaged in the year B. C. 394. The relief thus dates almost from the best time of Attic art, and it is worthy of its time. It does not, of course, represent the moment of the death of the young warrior; we see him strong and triumphant, such as his friends would fain have seen him always; to show him fallen would have suited an enemy rather than a friend. 5. Another relief, although set up in honor of a man of Ascalon, is clearly of Athenian handiwork and design. A sleeping man rests on a couch. Close to his head rises on its hind-paws a lion, who is

clearly ready to slay or carry him off. On the other side of the couch is a warrior who attacks and repels the beast. In the background appears the prow of a ship. From a Greek metrical inscription which accompanies this relief, it would appear that the Phœnician stranger here buried had incurred great peril at some previous period of his life from the attack of a lion, who seems to have surprised him resting on the shore, but who was driven off by the timely arrival of friends just landed from their ship. 6. A man and his wife, both muffled in ample garments, advance toward the spectator. Between them advances a priestess of Isis, clad in the dress of her calling, holding in her right hand the sistrum, in her left the vessel of sacred water. It is possible, the inscriptions which accompany this representation being illegible, that the monument was erected to a father and mother, and to their daughter devoted to Isis. Or it is possible that we have here expressed in a symbolical form the devotion of a man and woman to that mysterious worship which spread in Ptolemaic times from the bank of the Nile over all lands, and their firm trust that in the next world Isis would recognize and protect her worshippers.

Such are a few specimens of the reliefs which give us more precise information with regard to the lives and habits of the dead. In the same way, those who had devoted themselves to a profession appear on their tombs with the badges of that profession; physicians, for instance, with the cupping-glass and other instruments of their daily use. So the priestesses of Apollo and Aphrodite appear with the symbols of their guardian deities. And in this matter it is clear that the Athenians merely followed one of the most natural of all instincts leading to a custom common among all nations. Thus in the "Odyssey," the ghost of the drowned oarsman, Elpenor, begs Ulysses, when he reaches the island of *Ææa* :

"Raise thou a tomb upon the shore beside the hoary sea,
Memorial of my blighted life for future times to be;
Make thou my tomb beside the sea, and on it fix the oar,
Which once among my comrades dear, while yet I lived, I bore."

And thus, even in our own day, what device is commoner on a soldier's grave than sword and cannon, or on a painter's than palette and brush?

But although the sculptors of tombs usually designed references to the past life of those they commemorated, such was not always the case. After all, past was past, and it were idle to deny

that the moment of death brought a vast change over everything. The next class of reliefs have reference to the fact and the moment of death. Among the Romans that fact was symbolized in art frequently by sleep; and among all Christian nations it has become usual to speak of death in metaphorical language borrowed from the rest of night. But it was not usually merely as a deeper sleep that death presented itself to the imagination of Athenian sculptors. They considered death rather as a departure, a going far away from and losing sight of one's family and friends. Scenes of leave-taking are among the most frequent of all sepulchral reliefs. I am not, however, sure that this leave-taking is quite consciously adopted as the image of death. Indeed, all images of death were somewhat distasteful to the joyous sensuousness of Athenian taste. But when an artist had to represent the dead and the surviving friends of the dead in a group, this posture of farewell, which must have been one of the most usual and natural to think of, seems to have frequently suggested itself, and, in virtue of its inherent appropriateness to the occasion, to have become more and more common. This leave-taking presents itself in the least intrusive and gentlest form in those representations where a lady appears dressing herself with the assistance of her maids for an out-door journey, throwing over her head the ample veil, and perhaps handing to an attendant nurse the babe whom she cannot take out into the open air with her. Sometimes the preparations are more advanced; the lady sits or stands veiled and prepared for a journey, and gives her hand to husband or father who stands opposite. Sometimes two men grasp hands as if about to travel in different directions. Occasionally a horse appears in the background, or the head of a horse is seen through a window, which is destined to carry away the master of the house. In this very introduction of the horse we see how much the notion of travel preponderates in those scenes over that of death. For the horse was in no way connected by the Greeks with death. The rider on the pale horse had yet to be introduced to the popular imagination by the writer of the Apocalypse, who must have borrowed from a non-Hellenic source. Dwelling closely hemmed in by the sea, they never thought of the dead as traveling to other worlds by land, but usually as going over the waves mysterious and vast to some distant island, or perhaps as penetrating into deep abysses of the land. But, for journeys from town to town in Hellas, the horse was the appropriate conveyer, from which

fact he becomes the symbol of all moving and journeying.

The old opinion of archæologists with regard to these scenes of farewell, an opinion grounded on insufficient induction, was that in them the dead were represented as seated, the survivors as standing and taking leave of them. It is now acknowledged that this is not the case. It is true that most commonly in the groups one is seated, while of the standing figures one grasps his or her hand. But a careful study of the accompanying inscriptions proves that it is sometimes the dead person who stands while the survivor sits; and, again, in other cases both the dead and the living stand, while sometimes, again, of the several dead persons commemorated some stand and some are seated. The fact is that any pedantic rule of uniformity is put out of the question by the circumstances under which sepulchral reliefs were designed and executed. It was essential to the composition of a group, thought the artists, that some of the figures should stand and others sit; but the question which should do each was settled, not by a desire to convey a careful meaning to the eyes of beholders, but by the study of a little graceful variety, within somewhat narrow limits, and the influence of every-day custom which made it far more natural and usual that a woman should be seated when taking leave of a man, than a man when taking leave of a woman. Sometimes a little life breaks in on the cold formality of the group. Children cling about their mother's knee, or daughters stand by in an attitude betokening their grief; but those circumstances which might move emotion in the spectator are quite banished or kept sedulously in the background. Here, as ever, the Greek abode by that motto, "Nothing in extremes," which expresses the ultimate law of all his art.

Another set of representations introduce us to a scene of banqueting.¹ 1. A man reclines on a couch in the posture adopted by the Greeks at their meals—before him a three-legged table. Near his head sits a woman on a chair, holding in her hand the end of her veil. 2. Similar two figures appear to those in the last relief, but in addition there is in the foreground a slave pouring wine from a larger into a smaller vessel. 3. A man reclining at table holds a cup in his right hand; near him sits his wife, behind whom is a slave pouring wine from an amphora. Behind the

¹ M. Albert Dumont has published a volume on this class of monuments. The work has been crowned by the French Institute, but I have been unable to find a copy in English libraries.

couch stands a draped bearded figure; beneath it is a dog gnawing at some fragment of food. In the place of this dog we elsewhere find a snake.

4. Two men recline side by side on a couch; in front of one is a three-legged table laden with food. At the two extremities of the couch sit two women. In the foreground is a galley, of which the oars, but not the rowers, are visible, in which is seated a weird figure with matted locks, clad in a short, rough cloak, who stretches his hand toward one of the reclining banqueters. This latter figure has usually been taken for the ferryman of the dead, Charon, come to claim the feasters as his passengers into the next world. In scenes of this character, also, it is not unusual to find in the background a horse, or at least the head of one; here, too, the coming journey throws its shadow over the group.

With the sculptures of this class are frequently associated a set of representations, which would seem to have something more than a casual connection with them, though the exact nature of such connection is very obscure. I refer to the *ex voto* tablets commonly set up in Greek temples by those who had escaped from disease, peril, or death, in honor of the deity to whom they attributed their deliverance, and for a lasting memorial of their gratitude. Such tablets have been found in special abundance in the *temen*i, sacred to Hades or Sarapis, as god of the nether world, and of Asklepius and Hygieia. When Sarapis is the deity thus honored, he appears on the tablet as reclining on a couch, on his head the *modius*, which is the symbol of his dominion in realms below, and sometimes as accompanied by his bride Isis or Persephone. A train of worshipers approaches from the side of the tablet, bringing in animals for sacrifice. Of the *ex voto* tablets dedicated to the deities of healing, perhaps the clearest specimen appears copied on certain coins of the city of Perinthus, in Thraee. On these we see Asklepius reclining on a couch. Beside him sits his daughter Hygieia, and in front is a three-legged table laden with food, at the feet of which is a serpent. From the side enters a train of votaries dragging in a sacrificial pig. Above, a cluster of arms hangs on a peg, and through a window appears the head of a horse who stands without. It is not easy to understand the symbolism of all parts of these pictures, but the general meaning cannot be doubtful. We see in them representations of the gratitude of those whose health was restored in the temples of the deity Asklepius, the hospitals of antiquity. The train of worshipers represents their family, and

the pig of the reliefs had, doubtless, his original in an animal actually sacrificed to the god. Why the horse and the arms appear in the background we need not try to ascertain.

It will be easily understood how difficult it sometimes becomes, in the absence of inscriptions, to tell whether a relief is to be classed among the *ex voto* tablets of deities or among sepulchral scenes. In many cases we seem to be near the border-line between the two classes of monuments, as in the following: Two men recline on a couch, each of them holding a drinking-horn. By them sits a woman, while a slave in the foreground is engaged in pouring wine into a vessel. In front appears a three-legged table, beneath which is a snake; in the corner is seen a horse's head. Here horse's head and snake remind us of the *ex voto* tablets, although there can be little doubt that the subject is from a tomb. Both horse's head and snake reappear in the following, which seems to belong to the *ex voto* class of monuments: Two men recline on a couch, one holding a drinking-horn. On either side a woman is seated. Three figures approach in the attitude of worshipers.

Now, the greatest perplexity has arisen from the confusion of two classes of reliefs, which may, indeed, have something in common, but are widely different in meaning. To separate finally the classes, and to trace out their ultimate connection with each other, is a work still to be done, and one which will require patience and judgment. Meantime we may perhaps be permitted to express doubt whether there is a single relief proved by inscription or other circumstance to be from a tomb in which worshipers appear in the act of sacrifice or adoration. Wherever these are seen it seems reasonable, in the absence of evidence to the contrary, to assume that the monument is erected in honor of a deity, not in memory of a man. But all the scenes where simple feasting is going on, where servants are decanting wine, and wives seated, according to the Greek custom, near the couch on which their feasting husbands recline, may be presumed to be sepulchral until proved to be otherwise.

There are three theories, all well supported by the voice of learned men, as to the meaning of these scenes of feasting on tombs. According to the first view, what is represented is the dead supping in Hades. This theory was mainly based upon the confusion above pointed out. The person reclining on the couch was thought to be frequently receiving worship and sacrifice. Sometimes on his head he was supposed to bear the *modius*, the emblem worn by Sarapis in his char-

acter of deity of the lower world. Therefore it was assumed that the dead man was deified and represented as receiving high honor from the living. If, however, we allow as sepulchral only the scenes whence worshipers are excluded, then there remains nothing godlike or manes-like in the banqueting figure; we lose all reason for supposing the scene of the banquet to be Hades. Moreover, where the husband reclines there sits the wife; if this be in Hades, how is it that the wife was usually surviving, in fact often erected the tomb to the husband's memory? And, indeed, nothing could be more dissonant with Greek ideas than to ascribe a glorified existence after death to mortals indiscriminately; at the best Hades was shadowy and cold, and a banquet there would be but a faint and feeble echo of earthly banquets, quite untouched by any high exaltation or any worship from the happier living.

The second theory is that we have in these scenes, in emblematic form, pictures of those feasts at the tomb which the Greeks in ancient, as in modern days, spread from time to time, lest the departed should suffer hunger in the next world. That the dead have the same needs as the living is a notion widely spread among barbarians and semi-civilized peoples. For this reason the savage buries with the dead chief his horse, perhaps his wife; for this reason many of the nations of antiquity stored bread and wine in the tombs with the corpse. The early Greeks not only buried weapons with the dead, but even whetstones to keep the edges of those weapons bright; and commonly placed in the mouth of each corpse a piece of money to defray the expenses of his journey to the next world. Thus, too, on certain days the survivors held a feast at the tomb of a departed friend, leaving place for the dead and supposing him to partake in the spirit.

It is quite possible that this may be the true account of the matter. Nevertheless, I am more inclined to accept the third of the suggested explanations, namely, that what we see before us on these reliefs is neither more nor less than a daily scene from the ordinary life of the dead person. If the toilet be represented on the tomb, why should not the family meal, that most charming and most characteristic of all daily scenes? How could husband and wife be shown us in more close and amiable proximity than when feasting together, and feeling the same thrill of pleasure from the enjoyment of earthly good? *A priori* we should have expected eating to be a favorite

subject with the composers of sepulchral groups, and should beware of seeking a far-off explanation of our scenes when a nearer one will suffice. It is true that there are, even in the scenes undoubtedly sepulchral, some adjuncts which seem scarcely in keeping with the ordinary dinner-table—the snake, for instance, in the foreground and the horse in the background; but of these an explanation is possible. The snake was commonly domesticated among the Greeks, and so may appear only as a domestic animal. But I prefer the explanation which is ready to see in it an allusion to the future death of the banqueting master of the house, the snake being in many countries, on account of its habit of living in the ground, looked upon as the companion and representative of the dead. In the same way the horse may only convey a delicate allusion to future departure on a long journey. Such slight allusions would seem to suit Greek taste better than more direct references. More direct references, however, do sometimes appear, as in the relief mentioned above as No. 4, where Charon in his bark appears to summon the feasters from their wine.

There are still other ways in which, on the sepulchral reliefs which, so to speak, introduce us into the midst of life, a faint allusion to death, a slight flavor of mortality, is introduced. We often see an urn placed in a corner, such an urn as when a body was burned received its ashes, or such as was set up, as we learn from Demosthenes, over those who died unmarried. Like the skeleton at an Egyptian feast, this urn would seem meant to show that in the gayest moment of life death hovers near, waiting to strike. The same moral is conveyed in other cases, by the appearance at the side or in the foreground of a snake entwined round a tree; the snake being, as I have already remarked, the companion of the dead, sometimes even the embodiment of the dead man's spirit or ghost. And in scenes where there is no allusion to death so concrete or conventional as the above, there is over all an aspect of grief and dissatisfaction. Children or slaves are weeping without apparent cause, or women stand with an arm folded across their breasts, their head resting on a hand, in an attitude consecrated by the Greeks to sorrow, not as among us to mere reflection.

All the scenes of which I have spoken have this in common, that they represent to us the deceased, with or without the living. But sometimes, though rarely, the Greeks substituted for these groups a merely symbolical figure of an

animal or some fabulous creature. On a tomb at Athens, erected in memory of one Leon, stands a marble lion, evidently in punning allusion to his name. Over the tomb of the celebrated courtesan Laïs, in the suburbs of Corinth, was a group representing a lioness standing over a prostrate ram—a symbol the reference of which to the extraordinary career and splendid success of the woman is evidently appropriate. Stone snakes often guarded a tomb, in imitation of the living snakes sure soon to glide about it, on the same principle on which, when the Athenians sought a floral decoration for a stêlê, they selected the acanthus, which is notorious for freely growing among stones. But it was especially the forms of female monsters—sirens, sphinxes, and harpies—which were selected for the adornment of tombs. All these were spoken of in legend as fatal evils, carrying off to death young men and maidens. The sirens especially slew the young after attracting them by the sweetness of their singing, and so well became the graves of those who were lost in the mid ardor of their pursuit of the delights of youth.

Battles of heroes and Amazons, Dionysiac revels, and mythological scenes, occurring on sarcophagi, belong invariably to Roman times, and represent phases of thought quite other than those suggested by the reliefs inspired by genuine Greek feeling. It is extremely seldom that any mythological subject is found on Greek tombs at all. Indeed, I am aware but of two instances. Charon is allowed, by the general consent of archæologists, to be represented in a scene above described. And in another very interesting representation—which, however, is not Athenian—Hermes appears as the conductor of souls, leading gently by the hand a young girl to the future world. So small is the part played by the gods in sepulchral scenes. Not a trace appears of scenes of future happiness or misery, no allusion to that future judgment of souls which is so prominently brought before us in Egyptian pictures. Only, in times when the Egyptian worship of Sarapis and Isis had penetrated to Athens, and served there to impart purer and higher views as to future punishment and reward, we do sometimes find the priestess of Isis going before the departed with all pomp of worship to guide them through the perils of the last journey, and lead them to a safe resting-place. But these scenes only illustrate the triumph of the religious notions of the Egyptians over the susceptible Greeks at a time when their national city life was extinct, and they were driven by the fewer attrac-

tions of the present life to think more about the possibilities of the next.

It seems to be desirable, in view of the unfounded assertions so frequently set forth on the subject of Greek art, to gather what light we can on that most interesting subject from the facts above summarized. In doing so, however, it is above all things necessary to bear in mind the conditions under which sepulchral monuments were designed and executed. And, first, it is quite clear that, where several persons who died at intervals are buried in one tomb, they cannot all have been adequately represented in the relief which would naturally be the production of a single time. A citizen dies, and a relief is erected over his body, perhaps representing him as taking a farewell of his wife, while his infant son stands by. This same son, maybe, dies in middle life and is buried with his father, and an epigram is inserted on the monument stating the fact. It may thus happen that a man of thirty or forty may appear in the sepulchral relief as an infant. Such slight inconsistencies are inseparable from the nature of these monuments. But it must be confessed that sometimes between inscription and sculpture there are contradictions which cannot be thus easily explained, and which raise serious reflections. The fact is that the conviction is forced upon us, by the comparison of a multitude of instances, that very often the relief placed on a tomb did not possess much reference to its contents. There can be no doubt that the more ordinary sorts of representations were made in numbers by the sculptors, and, as we should phrase it, kept in stock by them for customers to choose from. And, if the would-be buyer found a group of which the general outline and arrangement suited him, he would scarcely decline to purchase it because it was not entirely appropriate, because it made his wife look twenty years too young, or even turned the boys of his family into girls. Like a true Athenian he would probably be more disposed to make use of such a discrepancy as an argument to induce the seller to lower his price than to incur the expense of having a new slab executed on purpose for him. Those who are let into this secret will not be surprised if they occasionally find a subject repeated exactly on two tombs without variation, nor if a sculptured group is little in harmony with the inscribed list of the dead.

Even in those cases in which a relief was executed by special order on the death of a person, a relief adapted in plan and intended in details to represent the deceased happy amid his

family or pursuing his favorite avocation, we must not expect too much. Even here, the sculptor confines himself to a generalized or idealized representation. Probably he knew naught of the dead, almost certainly he took no pains to exactly imitate the living. Hence the same conventional types, the bearded man, the veiled woman, the girl, the infant, repeat themselves almost without variety, through all the Macedonian period of Athenian graves. The men who appear on sepulchral reliefs of the same period are as much alike one to another as the horsemen of the frieze of the Parthenon, or the fighting heroes of the Ægina pediments. In Roman times this is far less the case; but, among the Greeks of the fourth and third centuries B. C., the artist was careful only of the type, and careless of the individual peculiarities; so far at least as existing remains enable us to judge.

Nevertheless, it is quite an error to suppose that the Athenians were all cast in one mould. They differed one from another quite as much as an equal number of Englishmen taken at random. And of this the proof is conclusive. For there still exists at Athens a remarkable series of portraits of those citizens who in succeeding years undertook the office of gymnasiarch. This series stretches over a long period, and while it is true that that period belongs to the decline, not the flourishing greatness of the city, yet there is no reason to believe that at the time Athenian blood had been very much mixed with that of other races, or the type deteriorated. Taking these statues, then, as portraits of some of the most prominent Athenian citizens, and probably some of the purest-blooded, what do we find? One head is almost African in type, with thick lips and woolly hair; one might be taken for that of an English judge; one for that of an Italian street-musician. Looking on these faces, one can scarcely believe that the artists did not grossly exaggerate the salient characteristics of the faces of those they had to portray. And even if it were so, we may safely affirm that an Athenian crowd of the period must have contained as many widely-divergent types as an English or French one. So of the Greek princes who reigned during the third and second centuries before the Christian era over the *disjecta membra*, the fragments of the empire of the Great Alexander, we possess quite a portrait-gallery in their numerous and excellent coins. Here, too, we find the widest variety of type, many coins presenting to us heads which no one, whose knowledge of Greek art was superficial, would suppose to be Greek at all.

But although individual Greeks differed thus widely one from another, and although, in the Alexandrine times of Greek art, artists quite understood the art of taking portraits, yet throughout the forms and features of those sculptured on tombs are quite conventionally rendered. And in nothing does one see more clearly than here the blending of Attic good taste with Attic superficiality, and dislike of too deep or too persistent emotion. For a tombstone calling up in a general way past life and past happiness would be a constant source of emotion, gentle and melancholy, but not too intense in degree; while the sight of the very features of dead father, mother, wife, or child, would be too startling, and cause far more pain than pleasure. We moderns are less afraid of pain, and, when we place on tombs any representation of the dead at all, make it as exact a likeness as we can. But most, even now, prefer a mere slab in the graveyard, and a portrait in the family-room or the bedroom.

The sources of these generalized types of man, youth, woman, and child, are of course to be found in the common feeling of the Hellenic nation, working through the brains and hands of the ablest statuary. As in the accepted type of Zeus, the Greek sculptures embodied all that seemed to them most venerable, wise, and majestic; as in the accepted type of Apollo, they combined youthful beauty with supreme dignity; so in the accepted type of matron they strove to embody all the matronly virtues, in the young girl all childish grace and promise, in the bearded man the dignity and self-control of a worthy citizen, such as Aristides or Epaminondas. The type was fixed in the case of human beings, as in the case of the Hellenic deities, by the sculptures of the generation which succeeded those who had fought at Marathon and Plataeæ, and altered but little after that until the collapse of Hellenic independence and Hellenic art.

Goethe has expressed, in a passage which cannot be too often quoted, the ultimate truth about Greek sepulchral reliefs:

"The wind which blows from the tombs of the ancients comes with gentle breath as over a mound of roses. The reliefs are touching and pathetic, and always represent life. There stand father and mother, their son between them, gazing at one another with unspeakable truth to nature. Here a pair clasp hands. Here a father seems to rest on his couch and wait to be entertained by his family. To me, the presence of these scenes was very touching. Their art is of a late period, yet are they simple, natural, and of universal interest.

Here there is no knight in harness on his knees awaiting a joyful resurrection. The artist has with more or less skill presented to us only the persons themselves, and so made their existence lasting and perpetual. They fold not their hands, gaze not into heaven; they are on earth, what they were, and what they are. They stand side by side, take interest in one another, love one another; and that is what is in the stone, even though somewhat unskillfully, yet most pleasingly depicted."¹

It is a proof at once of the genius of Goethe, and of his keen sympathy with all that is truly Greek, that, at a time before Greek art was half understood, he was able to judge from the few inferior specimens known to him of the general character of these sculphral reliefs. That on which he lays his master-hand is certainly their most essential character. Their whole aspect is turned, so to speak, from the future to the past, and from heaven to earth. We whose ancestors have been, for some twelve hundred years, taught constantly that death is but the entrance to wider life, that the world is a place of probation and preparation for eternity, can scarcely place ourselves in thought in the position of men who seemed to have found the world charming and delightful, and to have been well satisfied with it, preferring to let their minds dwell on the enjoyments of the past, rather than on a future which at best was a cold and gloomy echo of the present world. It is not that they disbelieved in the unseen world, or thought that the soul died with the body; such skepticism was perhaps rarer in antiquity than in modern times, and confined in antiquity as in modern times to a few of the highly-educated. But that inevitable future occupied comparatively very little of their time and thought; it was a cold shadow to be kept out of sunny life as much as might be. And when it was thought of, it was thought of without very much either of hope or fear. Terrible punishments in it were reserved for terrible criminals, supreme pleasures for the supremely good, but for ordinary mortals an ordinary fate was reserved, a sort of ghost or echo of their mortal life, made up, like that, of pleasure and pain, but with both pleasure and pain diluted and made ghostly. From discontent with life and repining at the lot assigned by Fate, the Greeks would seem to have been singularly free, and no nation ever thought life better worth living. I shall have more to say on this subject further on.

It remains to speak of the inscriptions which

accompany, or even take the place of, the reliefs, and which have sometimes a considerable interest for us. It will be convenient to quote these inscriptions in English; those who wish to compare the original Greek can easily do so in the complete work of Kumanudes.¹

There are in the British Museum two sculphral inscriptions on public tombs² of considerable interest. Of these one contains lists of all the citizens who fell in a single year at the various places where Athens was carrying on war. We learn from Thucydides and Pausanias that it was the Athenian custom thus annually to honor with a public monument all those who had in the previous year fallen in the battles of their country—a custom which must have nerved for death many a soldier's heart, as he reflected that he was sure, if he fell, of a sort of immortality before the eyes and in the memory of his countrymen. The other inscription, which was written under a relief representing three warriors, commemorates those Athenians who fell before Potidæa, in the year B. C. 432. It runs thus:

"Thus to the dead is deathless honor paid,
Who, fired with valor hot, in arms arrayed,
Felt each our fathers' valor in him glow,
And won long fame and victory o'er the foe.

"Heaven claimed their spirits, earth their bodies took,
The foemen's gate their conquering onslaught shook;
Of those they roared some in earth abide,
Some in strong walls their lives in terror hide.

"Erechtheus' city mourns her children's fall,
Who fought and died by Potidæa's wall,
True sons of Athens, for a virtuous name
They changed their lives, and swelled their country's fame."

The smallness of the number of public epitaphs at Athens is well compensated by the abundance of private ones, of which upward of 4,000 have been already published, while every year brings a multitude of fresh ones to light. I will attempt to class these, as I did the reliefs. The commonest inscriptions by far are those which simply record, in the case of a man, his name, his father's name, and his *deme* or clan; in the case of a woman, her name, that of her father, husband, or husband and father, with their respective demes. Of the numerous epitaphs which remain, perhaps nine out of ten are of this simple character. Probably in most cases they are

¹ Ἀττικῆς Ἐπιγραφαὶ Ἐπιτύμβιοι. Athens, 1871.

² "Corpus of British Museum Inscriptions," i., pp. 102-107. The reading of the first few lines is very doubtful. I follow Messrs. Newton and Hicks.

of the poor, but not in all, for sometimes they accompany reliefs of an elaborate character, or are placed on tombs of great size and pretensions. Than such an epitaph nothing could possibly offend less against good taste, and it was probably thought somewhat sentimental and *gushing* at Athens to indulge in a longer metrical sepulchral inscription. When longer inscriptions occur, they seldom bear much sign either of taste or education. Their grammar is often doubtful, and, when in metre, they halt terribly. They clearly belong to the same class of compositions as the lame verses which abound in English graveyards. It would seem that the swans who sang thus only found their voice at death, but the death of friends, not their own. The chance of such publicity for one's verses as may be gained by placing them on a tomb proved too attractive for them to forego.

In the case of early reliefs we find usually not only the name of the dead, but also of the artist who did the work. In later times this custom dropped, and we have scarcely in any case a clue to the name of the sculptor. This fact is the more curious, inasmuch as in other remains of antiquity, vases, gems, and coins, to insert the artist's name becomes more usual as we approach the best time of art. Not many epitaphs of an earlier period than the year B. C. 400 are preserved, nor are these, except in the case of public tombs, of special importance. One is interesting to students of epigraphy, as it bears an exact date, the year B. C. 430, when the plague, following in the wake of the Peloponnesian army, invaded Attica: "I am the tomb of Myrinê, who died of the plague." Another, of an ordinary Attic type, has a grace and charm which is seldom absent from the productions of Attica while yet unsubdued:

"Let the reader pass on, be he citizen or stranger from afar, having pitied for a moment a brave man who fell in battle, and lost his young prime. Having shed a tear here, go by, and good bye with you."

To the period between the falling of Athens into Lysander's hands and the times of the Roman Antonines belongs the vast body of the epitaphs. For a more exact chronological classification the materials at present scarcely exist, it being especially hard to determine the period of those inscriptions which are not accompanied by reliefs. It is best, therefore, to divide them into classes, not by a determination of date, but rather by a consideration of drift and content, and to con-

sider all as belonging to one long period, a period when the Athenian Empire had indeed passed away, and external conquests were not to be hoped for; but when Athens still ruled in the realm of mind, and attracted to herself the flower of the culture of Hellas and the world. I have already said that the commonest sort of inscriptions comprised only the name of the dead, his father's name, and that of his *deme*. But not unfrequently a few words of comment were added. The person who paid for the erection of the tomb liked to see some record of his liberality. Thus, a stone marks the spot where "His sons buried Julius Zosimianus, the head of the School of Zeno," that is, the head of the Stoics of Athens. Another records that "Polystratus set up this portrait in memory of his brother." We frequently find the trade or calling of the deceased mentioned in his epitaph. One Herakleides is stated to have been the greatest master of the catapult, a warlike machine, which seems to have required some skill in the handling. Many other trades are mentioned in connection with the dead. One was a bathing-man, another a midwife and physician, another a priestess of the all-producing Mother, probably Kybele, another second in rank in joyous comedy, another a bull-fighter. On one tomb the record ends quaintly, after mentioning that the grave contained one or two named persons, with the phrase, "also the others who are represented in the relief," where the stone-mason or his instructor seems to have grown tired of a bare list of names, and stopped short in the midst.

All the longer inscriptions which are found on Attic gravestones, if we except only the class of minatory or deprecatory epitaphs, which I reserve to the last, are in metre. To this rule there are few, if any, exceptions, so that the ancient epitaph-writer could, at least, unlike the modern, claim the *dura necessitas* as a reason for attempting a metrical composition. I shall, however, render into English prose rather than verse the specimens of these selected for purposes of illustration, as it would convey quite a false impression if I were to disguise their oddities and crudities under the smooth mantle of the English heroic verse.

The metrical epitaphs are of four kinds. Those of the first kind are in the form of a dialogue between the dead and the surviving friend, or in some cases of a mere direct address to the dead. The simplest form which such an address can take is the *χρηστὴ χαιρε*—"Farewell, lost friend"—which is so usual on tombs of a certain period, but which does not, apparently, appear on

any which belongs certainly to an Athenian. Of this simple and touching phrase we find a number of metrical amplifications :

"Farewell, tomb of Melité; the best of women lies here, who loved her loving husband, Onesimus; thou wert most excellent, wherefore he longs for thee after thy death, for thou wert the best of wives. Farewell, thou too, dearest husband, only love my children."

But an inscription of this kind is necessarily of a late period, and but little in accord with the canon of Greek taste. No doubt, when it was set up, it was at once condemned as vulgar by people of culture.

Far more usual and less extravagant is the following, which details a conversation, not with the dead, but with his tomb: "Whose tomb are we to call thee? That of famous Nepos. And who of the children of Cecrops begat him? say. He was not of the land of Cecrops, but from Thrace." Another epitaph, after proceeding in verse, suddenly breaks into prose: "And if you seek my name, I am Theogeiton, son of Thymochus of Thebes." Of course, it is quite natural that the tombstone should thus speak in the first person in the name and on behalf of the deceased. In some of our commonest English epitaphs, such as "Affliction sore long time I bore," we find the same peculiarity; but that a gravestone should give information in reply to cross-questioning is less usual.

The second kind of metrical inscriptions, which is by far the most numerous, speaks of the past life and history of the deceased. Thus, over the grave of a soldier we find :

"Of thy valor stands many a trophy in Greece and in the souls of men; such wert thou, Nieobolus, when thou leftest the bright light of the sun and passedst, beloved of thy friends, to the dwelling of Persephone."

Other triumphs, besides warlike ones, are elsewhere recorded; on the tomb of one Praxinus, *the doer*, we read the punning epitaph :

"My name and my father's this stone proclaims, and my country; but by my worthy deeds I attained such a name as few may obtain."

We are not aware in this ease to what special kind of deeds the inscription refers; often it is more explicit, as in the following, erected over a young statuary :

"I began to flourish as a statuary not inferior to Praxiteles, and came to twice eight years of age.

My name was Eutyehides,¹ but that name fate mocked, tearing me so early away to Hades."

On the tomb of one Plutarchus, who seems to have been a merchant, we find a brief history of his life :

"This is the tomb of the discreet Plutarchus, who, desiring fame which comes of many toils, came to Ausonia. There he endured toils on toils far from his country, although an only child and dear to his parents. Yet gained he not his desire, though longing much, for first the fate of unlovely death reached him."

Sometimes out of a whole life one event or circumstance of peculiar interest was taken, and commemorated as well by inscription as relief, as in the case of that Phœnician stranger, already mentioned, who narrowly escaped the jaws of a lion. The inscription on his tomb describes that escape, and explains the meaning of the representation it accompanies.

The virtues of the dead must always in all countries form the most frequent and suitable subject of sepulchral inscriptions. Athens is no exception to the rule. We find on the grave of a young man :

"Here Euthyeritus, having reached the goal of every virtue, lies entombed in his native soil, dear to father and mother, and loved by his sisters and all his companions, in the prime of his life."

A copper-smelter from Crete has the simple and pleasing epitaph :

"This memorial to Sosinus, of his justice, his prudence, and his virtue, his sons erected on his death."

The following is from the tomb of one Sotius :

"Here in earth lies Sotius, superior to all in the art he practised, virtuous of soul, and dear to his fellow-citizens; for ever he studied to please all, and his heart was most just toward his friends."

Such are a few of the panegyrics bestowed on men after their death; those bestowed on women are fewer in number, but not less interesting. A young girl is commended for her serious and staid disposition :

"She who lies here coveted not, while alive, garments or gold, but desired discretion and virtue. But now, Dionysia, in place of youth and bloom, the Fates have awarded thee this sepulchre."

More than once we find epitaphs which speak of the virtue and kindness of nurses, evidently set up by young men who had never ceased to care

¹ Child of good luck.

for and respect them. The ancients evidently felt for the wet-nurse who cherished their infancy, slave as she might be, something of lasting and filial affection :

"Here is laid in earth the best of nurses, whose foster-child still misses her. I loved thee, nurse, when alive, and still I honor thee though thou art laid in the ground, and shall honor as long as I live."

More characteristic of the Greek disposition than mere praise of the dead are those praises of the good-fortune of the departed, which sound almost mocking to modern ears, and yet on a little reflection do not displease. Of one, Symmachus, of Chios, we read on his tomb that through life his joys were many and his sorrows few, that he reached the extreme limit of old age, and lies in Athens, the city dear to gods and men. On the tombs of women it is often stated that they were in comfortable circumstances, and that they lived to see children's children. All the happiness of past life seemed to the Greeks a gain, and even when it was over was to be regarded, not with bitter regret, but gentle sympathy. In one inscription, though a late one, we find an elaborate description of the beauty of the young wife buried below—of her yellow hair, her bright eyes, her snow-white forehead, the ruddy lips and ivory teeth of her lovely mouth. These things were past, it is true, but even so they were something better to look back upon than ugliness.

Sometimes, however, through the general level of cheeriness a sadder note breaks :

"My name is Athenaïs, and with grief I go to my place among the dead, leaving my husband and my darling children. A grudging web the Fates spun for me."

When youthful promise is early cut off it is scarcely possible that it should be spoken of without a sound of sad regret. Even the statement of the fact produces this impression :

"If fortune had continued thy life, Macareus, and brought thee to manhood, strong wert thou in the hope that thou wouldst become the guiding spirit of tragic art among the Hellenes. But thou diest not without fame for discretion and virtue."

Even here consolation comes in to modify regret, so true to the happy disposition of the Greeks was the charming saying of Spenser—

"A dram of sweete is worth a pound of sowre!"

As in sepulchral reliefs, so in epitaphs, the Greek mourner usually turns his thought to the

past, and dwells on the life which is over rather than on any which may be beginning. Nevertheless we do find, here and there, some allusions to the state of the departed which are of great interest, and which furnish us with evidence on a subject still obscure and much discussed, the beliefs of the ordinary minds among the Greeks as to the future life, and as to reward and punishment in it. The small space which these allusions occupy, compared with the whole body of epitaphs, shows how small a corner of the Greek thought was taken up with meditation on matters outside the present life. But the materialism of the Greeks was rather natural and practical than speculative, and we nowhere find any positive denial of future existence. In one or two epitaphs there is an appearance of such denial, but its meaning must not be pressed. Thus, in one case, we find the phrase, "Rising out of earth I am become earth again," and in another epitaph, one Nicomedes, who calls himself the servant of the Muses, says that he is "clad in wakeless sleep." Here we probably only have popular phrases used in a vague and indefinite sense, and without the least intention of theorizing on the nature of the soul. Commoner still are even more vague phrases as to the destination of the soul, which is said to fly to heaven, to air, or to ether.¹ It is ether which is said in the metrical inscription first quoted to receive the souls of the slain Athenian warriors. So in the following :

"Here Dialogus, student of wisdom, his limbs purged with pure fire, is gone to the immortals. Here lie naked the bones of Dialogus the discreet, who practised virtue and wisdom; them a little dust hides sprinkled over them; but the spirit from his limbs the broad heaven has received."

Dialogus was presumably a philosopher, and had learned the difference between soul and body. The words "heaven and the immortals" have to him a somewhat vague meaning, representing rather something hoped for than believed in and expected. There is a stronger flavor of philosophic materialism in the following: "Damp ether holds the soul and mighty intellect of Eurymachus, but his body is in this tomb." The word *αἰθήρ*, ether, is certainly used by Homer to signify the abode of the gods, and no doubt the poet of our metrical inscription had Homer in his mind, but here the word "damp" (*ὕγρος*) seems to point to some materialist notion as to the nature of spirit and its affinity to the upper air. A more popular interpretation must be accepted

¹ οὐρανός, αἰθήρ.

in other cases, such as : "Earth sent thee forth to light, Sisyrtius, and earth holds thy remains, but ether, the source of thy soul, has received it again."

But the vulgar notions with regard to the future state were certainly borrowed from Homer, sucked in by the many with their mothers' milk, or at least imbibed at school, where Homer occupied the place taken by the Bible in our church-schools. The Greeks generally were inclined to regard Homer as infallible, and so, when they thought of the future state at all, pictured it according to his teaching. Hence they made it a shadowy realm under the government of Hades and Persephone, a poor, washed-out copy of the brilliant life on earth. The dead go to the chamber of Persephone, or, as it is sometimes phrased, the chamber of the blessed. "The bones and the flesh of our sweet son lie in earth, but his soul is gone to the chamber of the holy." It is clear, from some other inscriptions, that in that chamber rewards were supposed to await the good, and punishments the bad. Thus one man writes on the grave of his nurse : "And I know that, if below the earth there be rewards for the good, for thee, nurse, more than for any, is honor waiting in the abode of Persephone and Pluto." The suggestive *if* is again repeated elsewhere. "If there is with Persephone any reward for piety, a share of that was bestowed on thee in death by Fate." The expression in both instances seems to be rather of a wish or longing than of a sure and certain hope.

Indeed, this wavering tone never becomes full and confident until we come down to the times of Christian inscriptions, when a sudden and marvelous change takes place. To the Christian the place of interment is no longer a tomb, but a sleeping-place. When he speaks of ether and heaven as receiving the soul, the words have quite another ring. Though Christian epitaphs at Athens be somewhat beyond my province, I cannot avoid introducing one or two, if merely for the sake of contrast. The following charmingly combines the genial backward glance of the Greek with the forward glance of the believer :

"Look, friend, on the sacred beauty of Asklepiodote, of her immortal soul and body, for to both Nature gave one undefiled beauty, and, if Fate seized her, it vanquished her not; in her death she was not forsaken, nor did she abandon her husband though she left him, but now more than ever watches him out of heaven, and rejoices in him and guards him."

Or take another :

"His body is hidden here in earth, but his soul is escaped to heaven (*αιθήρ*) and returned to its source, for he has obtained the reward of the best of lives.

Sometimes one catches a note of a still higher strain : "There, whence pain and moans are banished, take thy rest." I think no one can deny that these epitaphs are quite equal to the pagan ones in literary taste and felicity of language, while in sentiment they mark a striking advance.

It would have been natural to expect that the religion of Isis, which, among all ancient faiths, clung most closely to the belief in a future life, and which owed to that circumstance its great influence among the later Greeks, would have left in the epitaphs some traces of a surer hope and trust in what was beyond the grave. But such is not the case, and a still more remarkable omission is to be noticed. The great Eleusinian mysteries were celebrated annually, within a few miles of Athens. The whole population must have known more or less of the meaning of the ceremonies; and there were probably few adult Athenians who had not been initiated. But it has always been supposed that the resurrection of the dead and the life to come were the chief matters on which light was thrown during the celebration. It has been thought that the analogy between the sowing of wheat and the burying of the dead, that analogy which the Apostle Paul works out in full detail, was then insisted on. Cicero speaks of the mysteries of Eleusis as some of the noblest productions of Attic soil, and declares that they impart not only directions for leading a better life, but also a better hope in death. Polygnotus painted on the walls of the *Leseche* at Delphi the punishments suffered in Hades by those who neglected to have themselves initiated in the mysteries. Yet in all the Attic epitaphs which have come down to us we discern not a trace of any such doctrine as we should have been disposed, from such indications, to attribute to the college of priests who conducted the mysteries. When the next world is at all spoken of, it either appears as the Homeric realm of Hades and his bride Persephone, or else is mentioned in the vague language of the philosophers as ether and heaven. The conclusion seems inevitable. We are strongly warned against attributing too much influence over the ordinary mind, or any very lofty and spiritual teaching, to the mysteries. The wise men, like Cicero and Plutarch, may have found in them deep meaning and profound consolation, reading into them the results of their own philosophy and faith; just as

able men of recent times have read into them most of the doctrines of Christianity. But to the common people they were probably a string of outward observances with little inner meaning. Like the sacraments of Christianity, to which in many respects they were parallel, they had a strong tendency to lose all life and become mere form. That their secret was so well preserved can be attributed to but one cause—that their secret, such as it was, was not of a kind that could be communicated. It is certain that throughout Greece, in antiquity, the future life was by the common people looked upon with distaste, if not with dread; and that they had no doctrine tending to soften its repulsion.

Moral reflections and words of advice form a not unfrequent ending to Athenian epitaphs. Sometimes in these nothing more is expressed than a kindly wish for the reader. Thus one stranger, after stating that he was shipwrecked, adds in genial spirit, "May every sailor safely reach his home!" Another wishes for all wayfarers who read the stone a prosperous journey. Sometimes there is a general observation: "It is rare for a woman to be at once noble and discreet;" or a quotation from a poet, as in the case of the well-known line of Menander, "Those whom the gods love die early." Sometimes the occasion is improved, as a Scotch minister would say, and a little sermon read to the passer-by, who is advised to live virtuously, "knowing that the abode of Pluto beneath is full of wealth and has need of nothing"—virtues, that is to say, and not riches, are the only things which will avail after death.

So far with regard to metrical inscriptions. The long inscriptions which are not metrical are nearly always of the same kind as the well-known epitaph of Shakespeare—curses pronounced against those who shall in future time attempt to move or destroy the grave, curses of which the modern explorer makes very light, apparently supposing that their virtue has in the course of centuries departed. But in ancient time they might be more effectual. They are always of a very late date; so long as the people of Athens had a common feeling and a common pride in their city, there was small fear of the violation of the grave of a citizen, but under the Roman emperors the Athenian citizenship and Greek nationality fell to pieces, and no one felt sure of the future. Herodes Atticus, the wealthiest citizen of Athens in the reign of Hadrian, who built the Athenians a splendid marble Odeum, set up a monument to his wife

Appia Annia Regilla, "the light of the house," which he thought it necessary to fence by a very unpleasant string of threats:

"By the gods and heroes I charge any who hold this place not to move aught of this: and if any destroy or alter these statues and honors (*τιμὰς*), for him may earth refuse to bear fruit, and sea become unsailable, and may he and his race perish miserably!"

The inscription goes on to heap blessings on those who keep the tomb in its place and pay it honor. A lady who bears the Roman name of Antonia hands over, in her epitaph, her tomb to keep, to Pluto, and Demeter, and Persephone, and all the nether gods, calling down a curse on all who violate it. In another epitaph we find a formidable list of diseases which are likely to seize the violator—palsy, fever, ague, elephantiasis, and the rest. In another instance the dimensions of the curse are curtailed, and it is put neatly into two hexameter verses: "Move not the stone from the earth, villain, lest after *thy* death, wretch, dogs mangle thy unburied body!"

In the last-quoted epitaph it is evidently the writer's intention to threaten a punishment according to the *lex talionis*. To move a tomb-stone was an offense of the same class, though in degree of course slighter, as to leave the body of a dead man unburied. It is well known how keenly every Greek dreaded that his body should after his death be deprived of burial-rites, and how bitterly he condemned all who through fear or carelessness abandoned dead friends to dogs and vultures. No doubt this dread was connected with the very ancient and wide-spread notion that those who remained unburied could not rest in the grave, were repelled from the gates of the world of spirits, and hovered as unhappy ghosts in the vicinity of their corpses. As the first step toward exposing a dead body was the tearing down of the stone which covered it, and as the stone was, moreover, closely associated with the dead, some of the mysterious horror which guarded the corpse was transferred to the grave-stone above it. We may consider ourselves happy that among us gravestones are protected not by curses but by blessings, by cherished memories and associations; and so, perhaps, it was in the better times at Athens, only when the old civilization was falling into corruption, all gentler ties were loosed, and every man fought for himself and his, with any weapons which came nearest.

One closes the "Corpus of the Sepulchral Inscriptions" with a feeling of surprise—surprise

that a people so gifted as the Athenians should be so helpless and tongue-tied in the presence of death. The reliefs do not disappoint a reasonable expectation; in execution, at least, they put our modern cemeteries to shame, if the range of ideas expressed is somewhat narrow. But the inscriptions are at a far greater depth below Greek poetry and oratory than the reliefs are below the best Greek sculpture. The reason may partly be that the reliefs are the work of professionals, the inscriptions of amateurs. But there are two other reasons of a more satisfactory character. The first of these I have already mentioned, that except in the case of soldiers and of public characters, such as eminent poets,

it was considered bad taste at Athens to have an epitaph at all; those, therefore, which we find are mostly written by persons of the less respectable classes, and in the later and worse times of the city. But the deepest reason, at least from the modern point of view, is that the Greek mind found in death no inspiring power; they might regard its inevitable power with equanimity and even cheerfulness, but in any way to rejoice in its presence, to look upon it with hope and warmth of heart, did not consist with the point of view of their religion. Such feelings at such a time are inspired only by one or two religions of the world, among which there is no place for naturalism.—*Contemporary Review*.

JOHN STUART MILL'S PHILOSOPHY TESTED.

By W. STANLEY JEVONS, F. R. S.

DURING the last few weeks the correspondence columns of the *Spectator* have contained letters on the subject of the late Mr. Mill's opinions about the immortality of the soul. The discussion began with a letter, in which an anonymous writer, G. S. B., asserted that Mill spoke of immortality as *probably an illusion*, although morally so valuable an illusion that it is better to retain it. He went on to say, "It is surely time that all this scientific shuffling and intellectual dishonesty—for it is nothing else—should be exposed and exploded."

An ardent admirer of Mill was not unnaturally stung by this remark, and replied in a letter, ably and warmly vindicating Mill's truthfulness and "scrupulous accurateness." After showing, as he thinks, that Mill never tried to uphold any illusion, he thus concludes:

"It is very difficult to misunderstand Mr. Mill, so anxious was he always to be clear, to be just, to keep back nothing, to examine both sides, to overstate nothing, and to understate nothing, so sensitively honorable was his mind, so transparently honest his style. But these are commonplaces with respect to him. I am content to contrast the scrupulous accurateness of Mr. Mill with what appears of that quality in 'G. S. B.'"

In the *Spectator* of the following week (October 27th), I took the opportunity to express my dissent from both the correspondents, saying:

"I do not like the expression 'scientific shuffling and intellectual dishonesty' which G. S. B. has used, for fear it should imply that Mill know-

ingly misled his readers. It is impossible to doubt that Mill's mind was 'sensitively honorable,' and, whatever may be his errors of judgment, we cannot call in question the perfect good faith and loftiness of his intentions. On the other hand, it is equally difficult to accept what Mr. Malleston says as to the 'scrupulous accurateness' of Mill's 'Essays on Religion.' He was scrupulous, but the term 'accurateness,' if it means 'logical accurateness,' cannot be applied to his works by any one who has subjected them to minute logical criticism."

I then pointed out that, in pages 103 and 109 of his "Essays on Religion," Mill gives two different definitions or descriptions of religion. In the first he says that

"the essence of religion is the strong and earnest direction of the emotions and desires toward an ideal object, recognized as of the highest excellence, and as rightfully paramount over all selfish objects of desire."

In the second statement he says:

"Religion, as distinguished from poetry, is the product of the craving to know whether these imaginative conceptions have realities answering to them in some other world than ours."

A week afterward Mr. Malleston made an ingenious attempt to explain away or to palliate the obvious discrepancy by reference to the context. I do not think that any context can remove the discrepancy; in the one case the object of desire is an *ideal* object; in the other case the *craving*, which I presume means a strong desire, is toward

realities in some other world; and the difference between ideal and real is too wide for any context to bridge over. Besides, I will ultimately give reasons for holding that Mill's text cannot be safely interpreted by the context, because there is no certainty that in his writings the same line of thought is steadily maintained for two sentences in succession.

Mill's "Essays on Religion" have been the source of perplexity to numberless readers. His greatest admirers have been compelled to admit that in these essays even Mill seems now and then to play with a word, or unconsciously to mix up two views of the same subject. It has been urged, indeed, by many apologists, including Miss Helen Taylor, their editor, that Mill wrote these essays at wide intervals of time, and was deprived, by death, of the opportunity of giving them his usual careful revision. This absence of revision, however, applies mainly to the third essay, while the discrepant definitions of religion were quoted from the second essay. Moreover, lapse of time will not account for inconsistency occurring between pages 103 and 109 of the same essay. The fact simply is, that these essays, owing to the exciting nature of their subjects, have received a far more searching and hostile criticism than any of his other writings. Thus inherent defects in his intellectual character, which it was a matter of great difficulty to expose in so large a work as the "System of Logic," were readily detected in these brief, candid, but most ill-judged essays.

But, for my part, I will no longer consent to live silently under the incubus of bad logic and bad philosophy, which Mill's works have laid upon us. On almost every subject of social importance—religion, morals, political philosophy, political economy, metaphysics, logic—he has expressed unhesitating opinions, and his sayings are quoted by his admirers as if they were the oracles of a perfectly wise and logical mind. Nobody questions, or at least ought to question, the force of Mill's style, the persuasive power of his words, the candor of his discussions, and the perfect goodness of his motives. If to all his other great qualities had been happily added logical accuracy, his writings would indeed have been a source of light for generations to come. But in one way or another Mill's intellect was wrecked. The cause of injury may have been the ruthless training which his father imposed upon him in tender years; it may have been Mill's own life-long attempt to reconcile a false empirical philosophy with conflicting truth. But, how-

ever it arose, Mill's mind was essentially illogical.

Such, indeed, is the intricate sophistry of Mill's principal writings, that it is a work of much mental effort to trace out the course of his fallacies. For about twenty years past I have been a more or less constant student of his books: during the last fourteen years I have been compelled, by the traditional requirements of the University of London, to make those works at least partially my text-books in lecturing. Some ten years of study passed before I began to detect their fundamental unsoundness. During the last ten years the conviction has gradually grown upon my mind that Mill's authority is doing immense injury to the cause of philosophy and good intellectual training in England. Nothing, surely, can do so much intellectual harm as a body of thoroughly illogical writings, which are forced upon students and teachers by the weight of Mill's reputation, and the hold which his school has obtained upon the universities. If, as I am certain, Mill's philosophy is sophistical and false, it must be an indispensable service to truth to show that it is so. This weighty task I at length feel bound to undertake.

The mode of criticism to be adopted is one which has not been sufficiently used by any of his previous critics. Many able writers have defended what they thought the truth against Mill's errors; but they confined themselves for the most part to skirmishing round the outworks of the Associationist Philosophy, firing in every here and there a well-aimed shot. But their shots have sunk harmlessly into the sand of his foundations. In order to have a fair chance of success, different tactics must be adopted; the assault must be made directly against the citadel of his logical reputation. His magazines must be reached and exploded; he must be hoist, like the engineer, with his own petard. Thus only can the disconnected and worthless character of his philosophy be exposed.

I undertake to show that there is hardly one of his more important and peculiar doctrines which he has not himself amply refuted. It will be shown that in many cases it is impossible to state what his doctrine is, because he mixes up two or three, and, in one extreme case, as many as six different and inconsistent opinions. In several important cases, the view which he professes to uphold is the direct opposite of what he really upholds. Thus, he clearly reprobates the doctrine of Free-Will, and expressly places himself in the camp of Liberty; but he objects to

the name Necessity, and explains it away so ingeniously that he unintentionally converts it into Free-Will. Again, there is no doubt that Mill wished and believed himself to be a bulwark of the Utilitarian Morality; he prided himself on the invention, or at least the promulgation, of the name Utilitarianism; but he expounded the doctrines of the school with such admirable candor, that he converted them unconsciously into anything rather than the doctrines of Paley and Bentham.

As regards logic, the case is much worse. He affected to get rid of universal reasoning, which, if accomplished, would be to get rid of science and logic altogether; of course, he employed or implied the use of universals in almost every sentence of his treatise. He overthrew the syllogism on the ground of *petitio principii*, and then immediately set it up again as an indispensable test of good reasoning. He defined logic as the Science of Proof, and then recommended a loose kind of inference from particulars to particulars, which he allowed was not conclusive, that is, could prove nothing. Though inconclusive, this loose kind of inference was really the basis of conclusive reasoning. Then, again, he founded induction upon the law of causation, and at the same time it was his express doctrine that the law of causation was learned by induction. What he meant exactly by this law of causation it is impossible to say. He affirms and denies the plurality of causes. Sometimes the sequence of causation is absolutely invariable, sometimes it is conditional. Generally, the law of causation is spoken of as Universal, or as universal throughout Nature; yet in one passage (at the end of Book III., chapter xxi.) he makes a careful statement to the opposite effect, and this statement, subversive as it is of his whole system of induction, has appeared in all editions from the first to the last. On such fundamental questions as the meaning of propositions, the nature of a class, the theory of probability, etc., he is in error where he is not in direct conflict with himself. But the indictment is long enough already; there is not space in this article to complete it in detail. To sum up, there is nothing in logic which he has not touched, and he has touched nothing without confounding it.

To establish charges of this all-comprehensive character will, of course, require a large body of proof. It will not be sufficient to take a few of Mill's statements and show that they are mistaken or self-inconsistent. Any writer may now and then fall into oversights, and it

would be manifestly unfair to pick a few unfortunate passages out of a work of considerable extent, and then hold them up as specimens of the whole. On the other hand, in order to overthrow a philosopher's system, it is not requisite to prove his every statement false. If this were so, one large treatise would require ten large ones to refute it. What is necessary is to select a certain number of his more prominent and peculiar doctrines, and to show that, in their treatment, he is illogical. In this article I am, of course, limited in space, and can apply only one test, and the subject which I select for treatment is Mill's doctrines concerning geometrical reasoning.

The science of geometry is specially suited to form a test of the empirical philosophy. Mill certainly regarded it as a crucial instance, and devoted a considerable part of his "System of Logic" to proving that geometry is a *strictly physical science*, and can be learned by direct observation and induction. The particular nature of his doctrine, or rather *doctrines*, on this subject will be gathered as we proceed. Of course, in this inquiry I must not abstain from a searching or even a tedious analysis, when it is requisite for the due investigation of Mill's logical method; but it will rarely be found necessary to go beyond elementary mathematical knowledge, which almost all readers of the *Contemporary Review* will possess.

As a first test of Mill's philosophy, I propose this simple question of fact: Are there in the material universe such things as perfectly straight lines? We shall find that Mill returns to this question a categorical negative answer. There exist no such things as perfectly straight lines. How then can geometry exist, if the things about which it is conversant do not exist? Mill's ingenuity seldom fails him. Geometry, in his opinion, treats not of things as they are in reality, but as we suppose them to be. Though straight lines do not exist, we can experiment in our minds upon straight lines, as if they did exist. It is a peculiarity of geometrical science, he thinks, thus to allow of *mental experimentation*. Moreover, these mental experiments are just as good as real experiments, because we know that the imaginary lines exactly resemble real ones, and that we can conclude from them to real ones with quite as much certainty as we conclude from one real line to another. If such be Mill's doctrines, we are brought into the following position:

1. Perfectly straight lines do not really exist.

2. We experiment in our minds upon imaginary straight lines.

3. These imaginary straight lines exactly resemble the real ones.

4. If these imaginary straight lines are not perfectly straight, they will not enable us to prove the truths of geometry.

5. If they are perfectly straight, then the real ones, which *exactly* resemble them, must be perfectly straight: *ergo*, perfectly straight lines do exist.

It would not be right to attribute such reasoning to Mill without fully substantiating the statements. I must, therefore, ask the reader to bear with me while I give somewhat full extracts from the fifth chapter of the second book of the "System of Logic."

Previous to the publication of this "system," it had been generally thought that the certainty of geometrical and other mathematical truths was a property not exclusively confined to these truths, but nevertheless existent. Mill, however, at the commencement of the chapter, altogether calls in question this supposed certainty, and describes it as an *illusion*, in order to sustain which it is necessary to suppose that those truths relate to, and express the properties of, purely imaginary objects. He proceeds:¹

"It is acknowledged that the conclusions of geometry are deduced, partly at least, from the so-called definitions, and that those definitions are assumed to be correct descriptions, as far as they go, of the objects with which geometry is conversant. Now, we have pointed out that, from a definition as such, no proposition, unless it be one concerning the meaning of a word, can ever follow, and that what apparently follows from a definition, follows in reality from an implied assumption that there exists a real thing conformable thereto. This assumption, in the case of the definitions of geometry, is false:² there exist no real things exactly conformable to the definitions. There exist no points without magnitude; no lines without breadth, nor perfectly straight; no circles with all their radii exactly equal, nor squares with all their angles perfectly right. It will, perhaps, be said that the assumption does not extend to the actual, but only to the possible, existence of such things. I answer that, according to any test we have of possibility, they are not even possible. Their existence, as far as we can form any judgment, would seem to be incon-

sistent with the physical constitution of our planet at least, if not of the universe."

About the meaning of this statement no doubt can arise. In the clearest possible language Mill denies the existence of perfectly straight lines, so far as any judgment can be formed, and this denial extends, not only to the actual, but the possible, existence of such lines. He thinks that they *seem to be inconsistent with the physical constitution of our planet, if not of the universe*. Under these circumstances, there naturally arises the question, What does geometry treat? A science, as Mill goes on to remark, cannot be conversant with nonentities; and as perfectly straight lines and perfect circles, squares, and other figures, do not exist, geometry must treat such lines, angles, and figures, as do exist, these apparently being imperfect ones. The definitions of such objects given by Euclid, and adopted by later geometers, must be regarded as some of our first and most obvious generalizations concerning those natural objects. But, then, as the lines are never perfectly straight nor parallel, in reality, the circles not perfectly round, and so on, the truths deduced in geometry cannot accurately apply to such existing things. Thus we arrive at the necessary conclusion that the peculiar accuracy attributed to geometrical truths is an *illusion*. Mill himself clearly expresses this result:¹

"The peculiar accuracy, supposed to be characteristic of the first principles of geometry, thus appears to be fictitious. The assertions on which the reasonings of the science are founded, do not, any more than in other sciences, exactly correspond with the fact; but we *suppose* that they do so, for the sake of tracing the consequences which follow from the supposition."

So far Mill's statements are consistent enough. He gives no evidence to support his confident assertion that perfectly straight lines do not exist; but with the actual truth of his opinion I am not concerned. All that would be requisite to the logician, as such, is that, having once adopted the opinion, he should adhere to it, and admit nothing which leads to an opposite conclusion.

The question now arises in what way we obtain our knowledge of the truths of geometry, especially those very general truths called axioms. Mill has no doubt whatever about the answer. He says:²

"It remains to inquire, What is the ground of our belief in axioms—what is the evidence on

¹ Book II., chapter v., section 1, near the commencement of the second paragraph.

² The word *false* occurs in the editions up to at least the fifth edition. In the latest, or ninth edition, I find the words, *not strictly true*, substituted for false.

¹ Book II., chapter v., section 1, at the beginning of the fourth paragraph.

² Same chapter, at the beginning of section 4.

which they rest? I answer, they are experimental truths; generalizations from observation. The proposition, two straight lines cannot inclose a space—or, in other words, two straight lines which have once met, do not meet again, but continue to diverge—is an induction from the evidence of our senses.¹

This opinion, as Mill goes on to remark, runs counter to a scientific prejudice of long standing and great force, and there is probably no proposition enunciated in the whole treatise for which a more unfavorable reception was to be expected. I think that the “scientific prejudice” still prevails, but I am perfectly willing to agree with Mill’s demand that the opinion is entitled to be judged, not by its novelty, but by the strength of the arguments which are adduced in support of it. These arguments are the subject of our inquiry. Mill proceeds to point out that the properties of parallel or intersecting straight lines are apparent to us in almost every instant of our lives. “We cannot look at any two straight lines which intersect one another, without seeing that from that point they continue to diverge more and more.”¹ Even Whewell, the chief opponent of Mill’s views, allowed that observation *suggests* the properties of geometrical figures; but Mill is not satisfied with this, and proceeds to controvert the arguments by which Whewell and others have attempted to show that experience cannot *prove* the axiom.

The chief difficulty is this: before we can assure ourselves that two straight lines do not inclose space, we must follow them to infinity. Mill faces the difficulty with boldness and candor:

“What says the axiom? That two straight lines *cannot* inclose a space; that after having once intersected, if they are prolonged to infinity they do not meet, but continue to diverge from one another. How can this, in any single case, be proved by actual observation? We may follow the lines to any distance we please; but we cannot follow them to infinity; for aught our senses can testify, they may, immediately beyond the farthest point to which we have traced them, begin to approach, and at last meet. Unless, therefore, we had some other proof of the impossibility than observation affords us, we should have no ground for believing the axiom at all.

“To these arguments, which I trust I cannot be accused of understating, a satisfactory answer will, I conceive, be found, if we advert to one of the characteristic properties of geometrical forms—their capacity of being painted in the imagination with a distinctness equal to reality: in other

words, the exact resemblance of our ideas of form to the sensations which suggest them. This, in the first place, enables us to make (at least with a little practice) mental pictures of all possible combinations of lines and angles, which resemble the realities quite as well as any which we could make on paper; and in the next place, make those pictures just as fit subjects of geometrical experimentation as the realities themselves; inasmuch as pictures, if sufficiently accurate, exhibit of course all the properties which would be manifested by the realities at one given instant, and on simple inspection; and in geometry we are concerned only with such properties, and not with that which pictures could not exhibit, the mutual action of bodies one upon another. The foundations of geometry would therefore be laid in direct experience, even if the experiments (which in this case consist merely in attentive contemplation) were practised solely upon what we call our ideas, that is, upon the diagrams in our minds, and not upon outward objects. For in all systems of experimentation we take some objects to serve as representatives of all which resemble them; and in the present case the conditions which qualify a real object to be the representative of its class, are completely fulfilled by an object existing only in our fancy. Without denying, therefore, the possibility of satisfying ourselves that two straight lines cannot inclose a space, by merely thinking of straight lines without actually looking at them—I contend, that we do not believe this truth on the ground of the imaginary intuition simply, but because we know that the imaginary lines exactly resemble real ones, and that we may conclude from them to real ones with quite as much certainty as we could conclude from one real line to another. The conclusion, therefore, is still an induction from observation.”¹

I have been obliged to give this long extract in full, because, unless the reader has it all freshly before him, he will scarcely accept my analysis. In the first place, what are we to make of Mill’s previous statement that the axioms are *inductions from the evidence of our senses*? Mill admits that, for aught our senses can testify, two straight lines, although they have once met, may again approach and intersect beyond the range of our vision. “Unless, therefore, we had some other proof of the impossibility than observation affords us, we should have no ground for believing the axiom at all.”² Probably it would not occur to most readers to inquire whether such a statement is consistent with that made two or three pages before, but on examination we find it entirely inconsistent. Before, the axioms were

¹ Book II., chapter v., section 5. The passage occurs in the second and third paragraphs.

² End of the second paragraph.

¹ Same section, near the beginning of fourth paragraph.

inductions from *the evidence of our senses*; now, we must have "some other proof of the impossibility than *observation* affords us."

This further proof, it appears, consists in the attentive contemplation of mental pictures of straight lines and other geometrical figures. Such pictures, if sufficiently accurate, exhibit, of course, all the properties of the real objects, and in the present case the conditions which qualify a real object to be the representative of its class are completely fulfilled. Such pictures, Mill admits, must be *sufficiently accurate*; but what, in geometry, is sufficient accuracy? The expression is, to my mind, a new and puzzling one. Imagine, since Mill allows us to do so, two parallel straight lines. What is the sufficient accuracy with which we must frame our mental pictures of such lines, in order that they shall not meet? If one of the lines, instead of being really straight, is a portion of a circle having a radius of a hundred miles, then the divergence from perfect straightness within the length of one foot would be of an order of magnitude altogether imperceptible to our senses. Can we, then, detect in the mental picture that which cannot be detected in the sensible object? This can hardly be held by Mill, because he says, further on, that we are only warranted in substituting observation of the image in our mind for observation of the reality by long-continued experience that the properties of the reality are faithfully represented in the image.

Now, since we may (at least with a little practice) form mental pictures of all possible combinations of lines and angles, we may, I presume, form a picture of lines which are so nearly parallel that they will only meet at a distance of 100,000 miles. If we cannot do so, how can we detect the difference between such lines and those that are actually parallel? Mill meets this difficulty. If two lines meet at a great distance,

"we can transport ourselves thither in imagination, and can frame a mental image of the appearance which one or both of the lines must present at that point, which we may rely on as being precisely similar to the reality. Now, whether we fix our contemplation upon this imaginary picture, or call to mind the generalizations we have had occasion to make from former ocular observation, we learn by the evidence of experience, that a line which, after diverging from another straight line, begins to approach to it, produces the impression on our senses which we describe by the expression, 'a bent line,' not by the expression, 'a straight line.'"¹

¹ Book II., chapter v., section 5, end of fourth paragraph.

In this passage we have somewhat unexpectedly got back to *the senses*. We may call to mind the generalizations from former ocular observation, and we have the evidence of experience to distinguish between the impressions made on our senses by a bent line and a straight line. But what will happen if the bent line be a circle with a radius of a million miles? Have we the evidence of experience that two such lines, which seem to be parallel for the first hundred miles, afterward begin to approach, and finally intersect? If so, our senses must enable us to see clearly and to exactly measure quantities a hundred miles away. Or again, if there be two lines which close in front of me are one foot apart, but which a hundred miles away are one foot *plus* the thousandth of an inch apart, they are not parallel. Will my senses enable me to perceive the magnitude of the thousandth part of an inch placed a hundred miles off?

But we have had enough of this trifling. Any one who has the least knowledge of geometry must know that a straight line means a *perfectly* straight line: the slightest curvature renders it not straight. Parallel straight lines mean *perfectly* parallel straight lines; if they be in the least degree not parallel, they will, of course, meet sooner or later, provided that they be in the same plane. Now, Mill said that we get an impression on our senses of a straight line; it is through this impression that we are enabled to form images of straight lines in the mind. We are told,¹ moreover, that *the imaginary lines exactly resemble real ones*, and that it is long-continued observation which teaches us this. It follows most plainly, then, that the impressions on our senses must have been derived from really straight lines. Mill's philosophy is essentially and directly empirical; he holds that we learn the principles of geometry by direct ocular perception, either of lines in Nature, or their images in the mind. Now, if our observations had been confined to lines which are not parallel, we could by no possibility have perceived, directly and ocularly, the character of lines which are parallel. It follows, that *we must have perceived perfectly parallel lines and perfectly straight lines, although Mill previously told us that he considered the existence of such things to be "inconsistent with the physical constitution of our planet, at least, if not of the universe."*

Perhaps it may be replied that Mill simply made a mistake in saying that no really straight

¹ Same section, about thirteen lines from the end of the third paragraph.

lines exist, and, correcting this blunder of fact, the logical contradiction vanishes. Certainly he gives no proper reason for his confident denial of their existence. But merely to strike out a page of Mill's Logic will not vindicate his logical character. How came he to put a statement there which is in absolute conflict with the rest of his arguments? No interval of time, no want of revision, can excuse this inconsistency, for the passage occurs in the first edition of the "System of Logic" (vol. i., p. 297), and reappears unchanged (except as regards one word) in the last and ninth edition. The curious substitution of the words "not strictly true" for the word "false" shows that Mill's attention had been directed to the paragraph; and a good many remarks might be made upon this little change of words, were there not other matters claiming prior attention.

We have seen that Mill considers our knowledge of geometry to be founded to a great extent on *mental experimentation*. I am not aware that any philosopher ever previously asserted, with the same distinctness and consciousness of his meaning, that the observation of our own ideas might be substituted for the observation of things. Philosophers have frequently spoken of their ideas or notions, but it was usually a mere form of speech, and their ideas meant their direct knowledge of things. Certainly this was the case with Locke, who was always talking about ideas. Descartes, no doubt, held that whatever we can clearly perceive is true; but he probably meant that it would be logically possible. I do not think that Descartes in his geometry ever got to *mental experimentation*. But, however, this may be, Mill, of all men, ought not to have recommended such a questionable scientific process, if we may judge from his statements in other parts of the "System of Logic." The fact is that Mill, before coming to the subject of Geometry, had denounced the *handling of ideas instead of things* as one of the most fatal errors—indeed, as the *cardinal error of logical philosophy*. In the chapter upon the "Nature and Import of Propositions,"¹ he says:

"The notion that what is of primary importance to the logician in a proposition, is the relation between the two *ideas* corresponding to the subject and predicate (instead of the relation between the two *phenomena* which they respectively express), seems to me one of the most fatal errors ever introduced into the philosophy of Logic; and the principal cause why the theory of the science has made such inconsiderable progress during the

last two centuries. The treatises on Logic, and on the branches of Mental Philosophy connected with Logic, which have been produced since the intrusion of this cardinal error, though sometimes written by men of extraordinary abilities and attainments, almost always tacitly imply a theory that the investigation of truth consists in contemplating and handling our ideas, or conceptions of things, instead of the things themselves: a doctrine tantamount to the assertion that the only mode of acquiring knowledge of Nature is to study it at second hand, as represented in our own minds."

Mill here denounces the *cardinal error* of investigating Nature at second hand, as represented in our own minds. Yet his words exactly describe that process of mental experimentation which he has unquestionably advocated in geometry, the most perfect and certain of the sciences.

It may be urged, indeed, with some show of reason, that the method which might be erroneous in one science might be correct in another. The mathematical sciences are called the exact sciences, and they may be of peculiar character. But, in the first place, Mill's denunciation of the handling of ideas is not limited by any exceptions; it is applied in the most general way, and arises upon the general question of the Import of Propositions. It is, therefore, in distinct conflict with Mill's subsequent advocacy of mental experimentation.

In the second place, Mill is entirely precluded from claiming the mathematical sciences as peculiar in their method, because one of the principal points of his philosophy is to show that they are not peculiar. It is the outcome of his philosophy to show that they are founded on a directly empirical basis, like the rest of the sciences. He speaks¹ of geometry as a "strictly physical science," and asserts that every theorem of geometry is a law of external Nature, and might have been ascertained by generalizing from observation and experiment.² What will our physicists say to a *strictly physical science*, which can be experimented on in the private laboratory of the philosopher's mind? What a convenient science! What a saving of expense in regard of apparatus, and materials, and specimens!³

¹ Book III., chapter xxiv., section 7, about the tenth line.

² Same section, beginning of second paragraph.

³ Since writing the above, I have made the significant discovery that in the first and second editions a clause follows the passage quoted from Book I., chapter v., section 1, paragraph 5 (vol. i., middle of page

¹ Book I., chapter v., section 1, fifth paragraph.

Incidentally, it occurs to me to ask whether Mill, in treating geometry, had not forgotten a little sentence which sums up the conclusion of the first section of his chapter on Names?¹ Here he luminously discusses the question whether names are more properly said to be the names of things, or of our ideas of things. After giving some reasons of apparent cogency, he concludes emphatically in these words: "Names¹ therefore, shall always be spoken of in this work as the names of things themselves, and not merely of our ideas of things." Here is really a difficulty. *Straight line* is certainly a name, and yet it can hardly be the name of a thing which is not a straight line. It must then be the name either of a real straight line, or of our idea of a straight line. But Mill distinctly denied that there were such things as straight lines, "in our planet at least;" hence the name (unless, indeed, it be the name of lines in other planets) must be the name of our ideas of straight lines. He promised expressly that names "in this work," that is, in the "System of Logic," should *always* be spoken of as the names of things themselves. It must have been by oversight, then, that he forgot this emphatic promise in a later chapter of the same volume. We may excuse an accidental *lapsus memoriae*, but a philosopher is unfortunate who makes many such lapses in regard to the fundamental principles of his system.

But let us overlook Mill's breach of promise, and assume that we may properly employ ideal experiments. We are told² that, though it is impossible ocularly to follow lines "in their prolongation to infinity," yet this is not necessary. "Without doing so we may know that if they ever do meet, or if, after diverging from one another, they begin again to approach, this must

119), in the following words: "A process by which, I will venture to affirm, not a single truth ever was arrived at, except truths of psychology, a science of which Ideas or Conceptions are avowedly (along with other mental phenomena) the subject-matter." These words do not appear in the fifth and ninth editions. Now, as Mill could not possibly pretend to include geometry, a *strictly physical science*, under psychology, we find him implying, or rather asserting, that *not a single truth ever was arrived at* in geometry by the very method of handling our ideas on which he depends for the knowledge of the axioms of geometry. The striking out of these words seems to indicate that he had perceived the absolute conflict of his two doctrines; yet he maintains his opinion about the *cardinal error* of handling ideas, and merely deletes a too glaring inconsistency which results from it.

¹ Book I., chapter II., section 1, near the end.

² Book II., chapter v., section 5, beginning of fourth paragraph.

take place not at an infinite, but at a finite distance. Supposing, therefore, such to be the case, we can transport ourselves thither in imagination, and can frame a mental image of the appearance which one or both of the lines must present at that point, which we may rely on as being precisely similar to the reality." Now, we are also told¹ that "neither in Nature nor in the human mind do there exist any objects exactly corresponding to the definitions of geometry." Not only are there no perfectly straight lines, but there are not even lines without breadth. Mill says,² "We cannot *conceive* a line without breadth; we can form no mental picture of such a line; all the lines which we have in our minds are lines possessing breadth." Now I want to know what Mill means by the prolongation of a line which has thickness and is not straight. Let us examine this question with some degree of care.

In the first place, if the line, instead of being length without breadth, according to Euclid's definition, has thickness, it must be a wire; if it had had two dimensions without the third, it would surely have been described as a surface, not a line. But then I want to know how we are to understand the *prolongation of a wire*. Is the course of the wire to be defined by its surface or by its central line, or by a line running deviously within it? If we take the last, then, the line being devious and uncertain, its prolongation must be undefined. If we take a certain central line, then either this line has breadth or it has no breadth; if the former, all our difficulties recur; if the latter— Well, Mill denied that we could form the idea of such a line. The same difficulty applies to any line or lines upon the surface, or to the surface itself regarded as a curved surface without thickness. Unless, then, we can get rid of thickness in some way or other, I feel unable to understand what the prolongation of a line means.

But let us overlook this difficulty, and assume that we have got Euclid's line—length without breadth. In fact, Mill tells us³ that "we can reason about a line as if it had no breadth" because we have "the power, when a perception is present to our senses, or a conception to our intellects, of *attending* to a part only of that perception or conception, instead of the whole." I believe that this sentence supplies a good instance

¹ Book II., chapter v., section 1, beginning of third paragraph.

² Same section, second paragraph, eleven lines from end.

³ Same paragraph, seventeen lines from end.

of a *non sequitur*, being in conflict with the sentence which immediately follows. Mill holds that we learn the properties of lines by experimentation on ideas in the mind; these ideas must surely be conceived, and they cannot be conceived without thickness. Unless, then, the *reasoning* about a line is quite a different process from *experimenting*, I fail to make the sentences hold together at all. If, on the other hand, we can reason about lines without breadth, but can only experiment on thick lines, would it not be much better to stick to the reasoning process, whatever it may be, and drop the mental experimentation altogether?

But let that pass. Suppose that, in one way or other, we manage to *attend* only to the direction of the line, not its thickness. Now, the line cannot be a straight line, because Mill tells us that neither in Nature nor in the human mind is there anything answering to the definitions of geometry, and the second definition of Euclid defines a straight line. If not straight, what is it? Crooked, I presume. What, then, are we to understand by the prolongation of a crooked line? If the crooked line is made up of various portions of line tending in different directions, if, in short, it be a zigzag line, of course we cannot prolong it in all those directions at once, nor even in any two directions, however slightly divergent. Let us adopt, then, the last bit of line as our guide. If this bit be perfectly straight, there is no difficulty in saying what the prolongation will be. But then Mill denied that there could be such a bit of straight line; for the length of the bit could scarcely have any relevance in a question of this sort. If not a straight line, it may yet be a piece of an ellipse, parabola, cycloid, or some other mathematical curve. But if a piece of an ellipse, do we mean a piece of a perfect ellipse? In that case one of the definitions of geometry has something answering to it in the mind at least; and if we conceive the more complicated mathematical curves, surely we can conceive the straight line, the most simple of curves. But if these pieces of line are not perfect curves, that is, do not fulfill definite mathematical laws, what are they? If they also are crooked, and made up of fragments of other lines and curves, all the difficulty comes over again. Apparently, then, we are driven to the conception of a line, no portion of which, however small, follows any definite mathematical law whatever. For if any portion has a definite law, the last portion may as well be supposed to be that portion; then we can prolong it in accordance with that law, and the result is a perfect mathematical line or curve, of

which Mill denied the existence *either in Nature or in the human mind*. We are driven, then, to the final result that no portion of any line follows any mathematical law whatever. Each line must follow its own sweet will. What, then, are we to understand by the prolongation of such a line? Surely the whole thing is reduced to the absurd.

But in this inquiry we must be patient. Let us forget the non-existence of straight lines, the cardinal error of mental experimentation, and whatever little oversights we have yet fallen upon. Let us suppose there really are geometrical figures which we can treat in the manner of "a strictly physical science," such as geometry seems to be. What lessons can we draw from Mill's *Logic* as to the mode of treating the figures? A plain answer is contained in the following extract from the second volume:

"Every theorem in geometry," he says,¹ "is a law of external Nature, and might have been ascertained by generalizing from observation and experiment, which in this case resolve themselves into comparison and measurement."

Here we are plainly told that the solution of *every* theorem in geometry may be accomplished by a process of which measurement is, to say the least, a necessary element. No doubt a good deal turns upon the word "generalizing," by which I believe Mill to mean that what is true of the figure measured will be true of all like figures in general. Give him, however, the benefit of the doubt, and suppose that, after measuring, we are to apply some process of reasoning before deciding on the properties of our figure. Still it is plain that, if our measurements are not accurate, we cannot attain to perfect or unlimited accuracy in our results, supposing that they depend upon the data given by measurement. Now, I wish to know how Mill would ascertain by generalizing from comparison and measurement that the ratio of the diameter and circumference of a circle is that of one to 3.14159265358979323846. . . .

Some years ago I made an actual trial with a pair of compasses and a sheet of paper to approximate to this ratio, and, with the utmost care, I could not come nearer than one part in 540. Yet Mr. W. Shanks has given the value of this ratio to the extent of 707 places of decimals,² and it is a question of mere labor of computation to carry it to any greater length. It is obvious

¹ Book III., chapter xxiv., section 7, beginning of second paragraph.

² Proceedings of the Royal Society (1872-'73), vol. xxi., p. 319.

that the result does not and cannot depend on measurement at all, or else it would be affected by the inaccuracy of that measurement. It is obviously impossible, from inexact physical data, to arrive at an exact result, and the computations of Mr. Shanks and other calculators are founded on *a priori* considerations; in fact, upon considerations which have no necessary connections with geometry at all. The ratio in question occurs as a natural constant in various branches of mathematics, as, for instance, in the theory of error, which has no necessary connection with the geometry of the circle.

It is amusing to find, too, that Mill himself happens to speak of this same ratio, in his "Examination of Hamilton,"¹ and he there says, "This attribute was discovered, and is now known, as a result of reasoning." He says nothing about measurement and comparison. What has become, in this critical case, of the empirical character of geometry which it was his great object to establish? A few lines further on (p. 372) he says that mathematicians could not have found the ratio in question "until the long train of difficult reasoning which culminated in the discovery was complete." Now, we are certainly dealing with a theorem of geometry, and if this could have been solved by comparison and measurement, why did mathematicians resort to this long train of *difficult* reasoning?

I need hardly weary the reader by pointing out that the same is true, not merely of many other geometrical theorems, but of all. That the square on the hypotenuse of a right-angled triangle is exactly equal to the sum of the squares on the other sides; that the area of a cycloid is exactly equal to three times the area of the describing circle; that the surface of a sphere is exactly four times that of any of its great circles; even that the three angles of a plane triangle are exactly equal to two right angles—these and thousands of other certain mathematical theorems

cannot possibly be proved by measurement and comparison. The absolute certainty and accuracy of these truths can only be proved deductively. Reasoning can carry a result to infinity—that is to say, we can see that there is no possible limit theoretically to the endless repetition of a process. Thus it is found, in the 117th proposition of Euclid's tenth book, that the side and diagonal of a square are incommensurable. No quantity, however small, can be a sub-multiple of both; or, in other words, their greatest common measure is an infinitely small quantity. It has also been shown that the circumference and diameter of a circle are incommensurable. Such results cannot possibly be due to measurement.

It may be well to remark that the expression "a false empirical philosophy," which has been used in this article, is not intended to imply that all empirical philosophy is false. My meaning is that the phase of empirical philosophy upheld by Mill and the well-known members of his school, is false. Experience, no doubt, supplies the materials of our knowledge, but in a far different manner from that expounded by Mill.

Here this inquiry must for the present be interrupted. It has been shown that Mill undertakes to explain the origin of our geometrical knowledge on the ground of his so-called "Empirical Philosophy," but that at every step he involves himself in inextricable difficulties and self-contradictions. It may be urged, indeed, that the groundwork of geometry is a very slippery subject, and forms a severe test for any kind of philosophy. This may be quite true, but it is no excuse for the way in which Mill has treated the subject; it is one thing to fail in explaining a difficult matter: it is another thing to rush into subjects and offer reckless opinions and arguments, which, on minute analysis, are found to have no coherence. This is what Mill has done, and he has done it, not in the case of geometry alone, but in almost every other point of logical and metaphysical philosophy treated in his works.

—*Contemporary Review.*

¹ Second edition, p. 371.

THE EVOLUTION THEORY AND ITS RELATIONS TO THE PHILOSOPHY OF NATURE.¹

BY PROFESSOR ERNST HAECKEL, OF JENA UNIVERSITY.

AS we meet here to-day to celebrate the opening of the fiftieth Congress of German Naturalists, our first care should be to show how much each particular branch of research contributes to the sum of human knowledge. Educated people of every class, who watch with the liveliest interest the astonishing progress of natural science, have special reason to-day to put to us the question, "What, in view of the general development of the human mind, are the results which you present to us?" In compliance, therefore, with the invitation with which you have honored me, and to recompense the kind attention which I pray you to grant me for a few moments, I have chosen for the subject of my discourse a topic of high mutual interest, namely, the relations of science in general, or of the philosophy of Nature, to that branch of research with which I am more nearly concerned, the Evolution Theory.

During the last ten years or more, no other doctrine has taken hold so firmly of the attention of the public, or has so violently agitated our profoundest convictions, as the resuscitated theory of evolution and the monistic philosophy with which it is connected. By its aid alone can we resolve the question of questions—the one great fundamental question of man's place in Nature. And since man is the measure of all things, the ultimate bases, the highest principles of all science, naturally depend on the place in Nature assigned to man as our knowledge of the cosmos increases.

As every one knows, it is to Charles Darwin, more than any other man, that our present doctrine of evolution is indebted for the supremacy it enjoys. He it was that, eighteen years ago, first broke the ice of dominant prejudices, being inspired with that same idea of unity in the development of the universe which, in the last century, impressed the minds of our greatest thinkers and poets, at whose head we must place Immanuel Kant and Wolfgang Goethe. In setting up his theory of natural selection, Darwin gave a firm foundation to that biological side of the general theory of evolution—the most impor-

tant side of that theory—which appeared as early as the beginning of this century under the title of derivation of beings, or theory of descent. In vain had the old philosophy of Nature previously contended for the theory of descent; neither Lamarck nor Geoffroy St.-Hilaire in France, neither Oken nor Schelling in Germany, could secure its triumph. It is now just fifty years since Lorenz Oken, in this very town of Munich, commenced his academic lectures on the doctrine of evolution; and it becomes us, I think, to lay a crown of laurel on the tomb of that profound zoologist, that enthusiastic philosopher. Again, it was Oken, too, who, out of an ardent desire of unifying science, called together at Jena, in 1822, the first Congress of German Naturalists; on this ground alone he would have a special claim on our gratitude at this fiftieth anniversary.

The philosophy of Nature could at that time only sketch the general plan and barely lay the foundation of the grand edifice of the unity of development. The materials required for its construction were not collected till a later period, through the labors of a multitude of diligent and painstaking workers. A mighty literature, a remarkable perfection of the methods of research, give evidence of the amazing progress made by natural science since Oken's day. At the same time, however, the boundless extension of the field of observation, and the consequent division of labor, have led to a deplorable waste of energies; the more direct interest taken in the observation of details has totally obscured the nobler end of investigating general laws.

And what is the result? That, during the period when this active research most flourished—that is, the thirty years from 1830 to 1859—the two chief branches of natural history proceeded on principles diametrically opposed to each other. Take, first, the problem of the development of the globe. Ever since 1830, since the publication of Lyell's "Principles of Geology," the idea that our planet did not originate in an act of supernatural creation; so, too, that it had passed through no series of revolutions as radical as they were mystical; but that, rather, it had been formed naturally and gradually by a process of progressive and uninterrupted development, has been spread-

¹ An address delivered at the Munich meeting of German Naturalists and Physicians. Translated by J. Fitzgerald, A. M.

ing more and more. In the history of the development of living things, on the contrary, entire confidence was reposed in the ancient and untenable myth, according to which every species of animals or of plants was, like man himself, created independently of every other species. These creations, it was supposed, had succeeded to one another in series, without any tie of filiation. This flat contradiction of the two doctrines—the geologists' theory of natural development, and the naturalists' myth of a supernatural creation—was ended by Darwin in 1859 in favor of the former. Since then we no longer make any difficulty about believing that the formation and the transformation of the living things inhabiting our globe obey the grand eternal laws of a mechanical evolution, precisely like the earth itself and the whole system of the universe.

We no longer are required now, as was the case fourteen years ago at the Stettin meeting of the Congress of Naturalists, to gather together proofs of the new theory of evolution founded by Darwin. Since that time, the knowledge of that truth has made most satisfactory progress. In the field of research with which my own labors are concerned, in the extensive science of organic forms or morphology, it is everywhere recognized as of the very highest importance, as basic. Comparative anatomy and embryology, systematic zoology and botany, can no longer disregard the theory of descent. It alone is able to explain the mysterious relations of innumerable organic forms to one another; in other words, to refer them to their mechanical causes. Their mutual resemblances are explained to be a natural consequence, as being an *inheritance* from a common ancestral form; and their differences are accounted to be the necessary effect of an *adaptation* to different conditions of existence. By the theory of descent alone can we explain, simply and naturally, the facts of paleontology, of chorology, and of œcology;¹ by its aid alone can we account for those remarkable rudimentary organs—eyes that see not, wings that do not fly, muscles that do not contract—in a word, all those useless parts of the body which so embarrass the prevailing teleology. These organs clearly show that conformity to an end, in the structure of organic forms, is neither general nor complete; they do not emanate from a plan of creation drawn up beforehand, but were of necessity pro-

duced by the accidental clash of mechanical causes.¹

The man who, in the face of these imposing facts, should still demand proofs in favor of the theory of descent, would himself give evidence only of one thing, namely, his lack of knowledge and of understanding. To demand proofs exact and strictly experimental would be a totally different thing. Such a demand—and it is often made—results from a very wide-spread, erroneous idea, that all natural sciences may be *exact sciences*. But the truth is, that only a small fraction of the natural sciences is exact, namely, such of them as are based on mathematics. These are, first, astronomy, and, above all, the higher mechanics; then the greater part of physics and chemistry, as also a good deal of physiology, and only a very small portion of morphology. In the last-named department of biology the phenomena are so complex, so variable, that, as a rule with respect to them, the mathematical method is out of the question. Though we may, as a broad principle, require for all sciences an exact and even a mathematical basis, and though the possibility of finding such a basis may be admitted, nevertheless, in nearly all the branches of biology we are absolutely unable to comply with this condition. Here the *historical*, the *historico-philosophical* method is the best substitute for the exact or physico-mathematical method.

This is particularly true of morphology. In truth, we attain scientific knowledge of organic forms only through the history of their development. The great progress of our times in this branch of science comes from the fact that we have extended the signification and the scope of the history of development infinitely beyond the limits it had before Darwin's day. Before his time, that term was applied only to the development of the organized individual, now styled *embryology* or *ontogeny*. When the botanist traced the plant to its seed, or the zoölogist the animal to the egg, they both supposed that with this history of the embryo they had settled the whole question of morphology. Our greatest embryologists, Wolff, Baer, Remack, Schleiden, and (till recently) the whole school founded by them, knew only of individual embryology. Nowadays, and for us, the mysterious phenomena of embryology are very different things. They are no longer incomprehensible enigmas; we grasp their profound meaning. In obedience to the laws of

¹ *Chorology* treats of the geographical and topographical distribution of organisms; *œcology* of the habitations, the means of existence, and the mutual relations of organisms.

¹ *Dysteleology* treats of rudimentary organs as contradicting the "conformity to an end" of the supporters of teleology, or the doctrine of final causes.

heredity, the different states assumed under our own eyes in a very brief period by the embryo are simply a condensed and abridged summing up of the corresponding form-changes through which the ancestors of the form under examination have passed in the course of ages. From a hen's-egg, placed in a hatching apparatus, we see coming forth after twenty-one days a young chick; we are no longer mute with wonder at the marvellous changes which conduct us from the simple ovula-cell to the gastrula, from the gastrula to the vermiform and acephalous embryo, and from the latter to the higher embryonic forms which present the organization of a fish, an amphibian, a reptile, and finally a bird. What is more, we from all this infer the series of corresponding ancestral forms from the unicellular *amœba* to the *gastrea*, and so on through Vermes, Acrania, Fishes, Amphibia, and Reptilia, to the Birds. Thus does the series of embryonic forms in the chicken present to us a sketch-list of its real ancestors.

The direct, original connection, then, which exists between the embryology of the individual and the genealogical history of its ancestors, constitutes our fundamental biogenetic law, and is summed up in this brief expression: *embryology* (or *ontogeny*) is a *synopsis of genealogy* (or *phylogeny*), the laws of heredity being the condition. This palingenetic abridgment is momentarily disturbed only when there appear, in consequence of adaptation to the conditions of embryonic life, cenogenetic modifications.

The phylogenetic meaning of embryological phenomena is the only explanation we can offer of them as yet—an explanation that is confirmed in the highest degree and completed by the results of comparative anatomy and paleontology. The truth is, that this matter does not admit of exact or even experimental demonstration. For all these biological data, from the very nature of things, have to do with historical and philosophical natural science. Their common aim is to discover historic facts which, in the lapse of many thousands of years, took place on the surface of our young planet, long before the coming of the human race. Direct, exact demonstration of them is a thing utterly beyond the limits of possibility.

By a critical study of the historical archives, and by a prudent though bold use of speculative hypothesis, we may indirectly come at the truth. Phylogeny turns these historic data to account, and determines their significance after the same manner as the other historical sciences. Just as the historian, with the aid of chronicles, biog-

raphies, and private letters, faithfully describes for us events that occurred long ago; as the archæologist, from the study of sculptures, inscriptions, utensils, learns the grade of civilization reached by a people that long since disappeared; as the philologist, by comparing kindred languages, whether in their present state or in their most ancient documents, shows that they have developed and that they have their source in a common mother-language—so the naturalist, by making critical use of the phylogenetic archives of comparative anatomy, ontogeny, and paleontology, acquires an approximately correct knowledge of the facts which, in the lapse of untold ages, have brought about changes in the forms of organic life upon the earth.

The genealogical history of organisms or phylogeny cannot rest on foundations more exact, more experimental, than its elder and more favored sister, geology. Nevertheless the scientific value of the latter is now universally recognized. Only an ignorant person can now smile incredulously on being told that the mighty ranges of the Alps, whose snow-capped crests glisten from afar, consist simply of indurated sea-ooze. The stratification of these mountains, and the fossils imbedded in them, admit no other explanation, though the thing is incapable of exact demonstration. All geologists to-day agree in admitting a succession, a fixed classification of these Alpine strata, though this classification presupposes a stratigraphic system that nowhere exists unbroken. Do not our phylogenetic hypotheses possess the same value as these generally-accepted geological hypotheses? The only difference between them is that this vast hypothetical *ensemble* of geology is incomparably more perfect, more simple, more easily comprehended, than that of phylogeny, which is still young.

The historical sciences of Nature, geology and phylogeny, constitute a strong bond between the exact natural sciences on the one hand, and the purely historical, intellectual sciences on the other. Thus does biology in general, but particularly systematic zoology and botany, rise actually to the grade of natural history—a title of honor which they have long borne, but which they deserve only in our own time. If these sciences are still oftentimes designated, and even in official quarters, “descriptive” sciences, as distinguished from the “explicative” sciences, that fact only shows how erroneous an idea people have hitherto had of their true scope. Since the natural system of organisms has come to be regarded as the expression of their genealogy, systematics,

with its dry descriptions, gives place to the more vivid history of the genealogy of classes and species.

But, whatever we may think of this enormous progress of morphology, it does not of itself suffice to explain the extraordinary influence of the present doctrine of evolution upon general science, or the philosophy of Nature. That influence depends, as we know, rather on the special consequences of the theory of descent as applied to man. The ancient question of the origin of our own species is, for the first time, solved by this theory in a scientific sense. If the doctrine of evolution is true in general; if there is, indeed, a natural and historic genealogy of living beings, then man, too, the lord of creation, is descended from the sub-kingdom Vertebrata, the class Mammalia, the sub-class Placentalia, and the order Monkeys. Already in 1735, Linné, in his "System of Nature," classed man with the monkeys and the bats, in the order of Primates. None of the later zoologists have been able to separate him from the Mammalia. Conclusion: this place unanimously assigned to him in classification means phylogenetically only one thing, to wit, that he is a branch of that class of animals.

In vain has every effort been made to invalidate this pregnant consequence of the doctrine of evolution; vain has been every attempt at making an exception in favor of man, and saving him from such an ancestry; in vain has been constructed for him an ancestral line distinct from the genealogical tree of the Vertebrata. The phylogenetic data of comparative anatomy, ontogeny, and paleontology, speak so plainly in favor of a unitary derivation of all vertebrate animals sprung from a common source, that doubt is impossible. No philologist who compares the German, Russian, Latin, Greek, and Sanskrit languages, will say that they may have sprung from different sources, however great the differences between them may be. Nay, all are agreed, as a result of critical study of the structure and the development of these diverse languages, that they all descend from the Aryan or Indo-Germanic. So, too, all morphologists are profoundly impressed with the idea, in short convinced, that all the Vertebrata, from amphioxus to man inclusively—that all fishes, amphibians, reptiles, birds, and mammals, are the descendants of one primitive vertebrate. Indeed, we cannot suppose that the life-conditions, varied and complex as they are, which through a long line of evolutive processes have led to the creation of the vertebrate type,

have occurred more than once in the course of the earth's history.

For the subject in hand, we are concerned only with man's animal origin. We therefore will dwell no longer on the lower stages of our genealogy. We would merely, in passing, state that its upper stages are now firmly established, thanks to the labors of distinguished morphologists, among whom Gegenbaur and Huxley hold the first rank.

True, it is still often asserted that here we have to do only with the descent, the origin of man's body, and not of his intellectual functions. To meet this serious objection we must, first of all, bear in mind the physiological fact that our life is inseparably tied to the organization of our central nervous system. Now, the latter is constituted like the same system in the higher vertebrates, and comes into existence in the same way; even according to Huxley's researches the structural differences existing between the brain of man and that of the higher monkeys are much less than the differences between the higher and the lower monkeys. Besides, the function or work of an organ cannot be thought of without the organ itself, and the function always develops simultaneously with the organ. Hence we are forced to the conclusion that our psychic faculties have been developed slowly, gradually, in a ratio with the phylogenetic building up of our brain.

For the rest, this great question of *the soul* comes up before us now in a very different aspect from that it wore twenty or even ten years ago. Under whatever form we may picture to ourselves the union of soul and body, of spirit and matter, it is still clear, on the theory of evolution, that all organic matter at least, if not matter in general, is in some sense possessed of psychic properties. In the first place the progress of microscopic research has shown that the elementary anatomic parts of organs—the cells—generally possess an individual psychic life. Ever since forty years ago, when Schleiden proposed at Jena the cell-theory of the vegetable kingdom—which theory was straightway applied by Schwann to the animal kingdom—we ascribe to these microscopic beings an individual life of their own. Cells are, according to Brücke, true *individuals of the first* (or lowest) *order*—elementary organisms. The fruitful application made by Virchow in his "Cellular Pathology" of the theory in question to medicine in general, presupposes that the cells must not be regarded as the inert, passive materials of the organism, but as the living and active members of the same state.

Finally, this view rests upon the study of Infusoria, Amœbæ, and other one-celled organisms. In them we again find, in the individual, isolated cells, the same manifestations of psychic life, sensation and perception, will and movement, as in the higher animals, which consist of multitudinous cells. In sociate as well as in solitary cells the psychical life resides in one and the same substance—protoplasm. Further, we know that moneres and other rudimentary organisms—mere detached bits of protoplasm—possess sensation and the power of movement, just as does the entire cell. From this we should conclude that the *cell-soul*, which is the basis of scientific psychology, is itself only a compound, i. e., the sum of the psychic properties of the protoplasmic molecules, called also *plastidules*.¹ Thus the soul of the plastidule would be the ultimate factor to which could be reduced the psychic life of living things.

Does the doctrine of evolution hereby exhaust its psychological analysis? By no means. The new organic chemistry teaches us that it is the physical and chemical properties of a certain element, carbon, which, by its complex combinations with other elements, produces the special psychological properties of organized bodies, and in particular of protoplasm. The moneres, consisting only of protoplasm, form as it were a bridge over the deep gulf which divides organic from inorganic Nature. They show us how the simplest organisms must have sprung, in the beginning, from inorganic carbon combinations. If a certain number of carbon-atoms combined with a certain number of hydrogen, oxygen, nitrogen, and sulphur atoms to form a unit, a plastidule, we may regard the soul of the plastidule, that is to say, the sum total of its vital properties, as the necessary product of the forces of all the atoms combined. Then, from the monistic point of view, we may call this sum of the atomic forces the *soul of the atom*. From the chance meeting and the multiplied combinations of these atom-souls—always constant, always incommutable—come the multiple and highly-variable souls of the plastidules, which are the molecular factors of organic life.

Having reached these extreme psychological consequences of the monistic doctrine, or of the doctrine of evolution, we meet again those ancient conceptions of the universal animation of

matter, which have been variously expressed by such philosophers as Democritus, Spinoza, Bruno, Leibnitz, and Schopenhauer. All psychic life is ultimately reducible to two elementary functions, namely, sensation and motion: on the one hand, excitation; on the other, reflex movements. The simple sensation of pleasure or displeasure, the simple motion of attraction or of repulsion, are the sole elements which, by an endless series of complex combinations, constitute the whole sum of psychic activity. The hate or the love of atoms, the attraction or the repulsion of molecules, the motion and sensation of cells and cellular organisms, the thought and consciousness of man, these are the different steps of one and the same evolutive psychological process.

The unitary conception of the universe, or *monism*, toward which the new doctrine of evolution leads us, puts an end to the opposition which has hitherto existed between the various dualistic systems of the universe. It avoids the narrowness of both materialism and spiritualism; it combines practical idealism with theoretical realism; it unites the science of Nature and the science of mind in one unitary *general science*, which comprises all.

The present theory of evolution is not only of very great theoretical value, as forming the connecting link between these different sciences; it furthermore yields practical results. Neither medicine, considered as an applied natural science, nor political economy, jurisprudence, or theology, in so far as they form a part of applied philosophy, can henceforth resist its influence. Nay, I am convinced that it is precisely in such domains that it will prove to be the most powerful lever of progress and perfectionment; and, inasmuch as the great aim of the sciences just named is the education of the young, the doctrine of evolution, as being the most potent instrument of education, must make its authoritative voice heard even in the school-room. It must not enter the school simply by tolerance, but must be its directing principle.

If I may be permitted briefly to call attention to the more important aspects of this question, I would first of all dwell upon the paramount advantages of the genetic method. Both teachers and pupils will take infinitely greater interest in the subject-matter of instruction, if, first of all, they put to themselves the question, "How did this thing come into existence—how did it develop?" With the question of development comes that of causality, and after all it is the knowledge that we acquire of proximate causes, and not the

¹ *Plastidules*, protoplasm molecules considered as the elementary factors of all vital properties. They are, so to speak, organic atoms, the atoms of the physiologist.

knowledge of facts themselves, that satisfies our desire of knowing and our reason. The knowledge of the simple general causes to which phenomena the most diverse and the most complex are referable, at once simplifies and deepens our instruction. The understanding of causes changes a dry science into one of vivid interest. The true measure of intellectual development is not the quantity of facts learned, but the way in which we understand their causes.

To what extent are the fundamental principles of the doctrine of evolution to be introduced into the schools? In what order are its principal branches—cosmogony, geology, animal and plant phylogeny, anthropology—to be taught in the various classes? That is a matter to be decided by the professors themselves. I believe that comprehensive reformation of our school system in this direction is inevitable, and that it will be eminently successful. What a gain it would be, for instance, if that important branch of instruction, languages, were treated according to the comparative and genetic method! What increased interest would be given to physical geography, if it were genetically connected with geology! What new life and light would be infused into the dry and wearisome systematics of animal and plant forms, were they to be represented simply as the divergent branches of a common genealogical stem! Finally, how different the idea we should have of our own organism, were we no longer to regard ourselves, on the authority of myths and phantoms, as the fictitious image of an anthropomorphic creator, but rather, in the clear light of phylogeny, to consider ourselves as the most highly-developed form of the animal kingdom—as an organism which, in the course of millions and millions of years, has gradually been evolved from a long line of vertebrate ancestors, and which in the struggle for life has risen high above its kindred!

By stimulating every branch of instruction, the theory of evolution will awaken in the breasts of masters and pupils the consciousness of their true dependence. As an historical science it will reconcile the two systems of instruction which are at present vying with each other for mastery in the school—the old, classic, historico-philosophical system on the one hand; the new, exact, physico-mathematical system on the other. Both are equally correct, equally indispensable. The human mind will not attain its perfect development save by satisfying both at once. If, hitherto, education has been too exclusively classical, a like thing happens too often nowadays

in the exact education. The doctrine of evolution reduces the two systems to a true proportion by serving as a bond of union between exact science and classical science—the science of Nature and the science of mind. It points out everywhere the tide of life which flows with a single, unbroken stream. Everywhere it discloses to the assiduous seeker fresh scientific conquests to be achieved; it “gently brings the mind to the truth.” This boundless perspective of progressive perfectionment which is opened to us by the doctrine of evolution is the strongest protest against the pitiable “*ignorabimus*” which is echoed from all sides. No man can foretell at what “limits” the human mind will stand still in the conquest of Nature, or how far its invading progress will extend in the future.

The most urgent demand, and the one most difficult to comply with, addressed by practical philosophy to the evolution doctrine is, it appears to me, the demand for a new morality. No doubt the development of moral character, of religious convictions, will hereafter, as hitherto, be the great concern of education. But hitherto, in all classes of society, the conviction has been that moral precepts are closely connected with certain ecclesiastical tenets; and since these tenets, or dogmas—mixed up as they are with old creation-myths—are in absolute contradiction with the evolution doctrine, it has been supposed that the existence of religion and morality was in danger from that doctrine.

This apprehension is, in my opinion, baseless. It is the result of confounding natural religion, which is true and rational, with the dogmatic and mythological religion of the Church. The comparative history of religions, which is one of the most important branches of anthropology, teaches us how diversified are the garments in which different nations and periods, in accordance with their respective characters and needs, are wont to clothe the religious idea. From it we learn that even the dogmas of the Church itself have slowly and uninterruptedly developed. New churches and new sects arise; old ones die out. How long does any given form of belief persist, under the most favorable conditions? A thousand years or two—a brief span of time, which is lost in the eternity of the geological ages. Finally, the comparative history of civilization also shows us how faint is the connection between true morality and any definite form of faith or of church constitution. Often the utmost brutality, the extremest savagery of manners, are associated with the absolute predominance of a church. We

have only to look at the middle ages. On the other hand, we find the highest degree of morality in men who are entirely freed from church creeds.

Outside of all creeds and churches, there exists in germ in the heart of every man a true natural religion, which is inseparably identified with our nature's best side. Its first precept is love and the abnegation of our natural egoism in favor of our neighbor, and in view of the good of the race to which we belong. This moral law is more ancient than church religion; it is the development of the social instincts of animals. The beginnings of it we find among divers classes of mammals, birds, and insects. Agreeably to the law of association and the division of labor, many individuals unite to form a community, a commonwealth. The existence of these commonwealths necessarily depends on the reciprocal relations of their members, and on each one foregoing his individual interest for the good of the whole. The consciousness of this necessity, the feeling of duty, is simply a social instinct, and instinct is always a psychic habit which, acquired through adaptation and then becoming hereditary, at last appears to be innate.

If we would understand the great force of the sentiment of duty in animals, we need only overturn an ant-hill. What do we see amid the ruin? We see thousands of ant-citizens all intent, not on saving their own lives, but in protecting the precious commonwealth to which they belong. The doughty men-at-arms make sturdy opposition when we would introduce our hand; the nurses of the young ones save the so-called "ants'-eggs"—the nymphæ on whom the future of the community depends; the industrious workers begin on the spot, with indomitable courage, to clear away the *débris*, and to construct a new dwelling-place. The wonderful degree of civilization found among ants, bees, and other social species, sprung originally from the rudest beginnings, just as our human civilization did.

Nay, even the tenderest affections of the human heart, those which inspire all our poetry, we find in germ in the animal kingdom. What shall we say of the deep mother's love of the lioness, the touching conjugal affection of parrots known as "inseparable," the devotion and fidelity of the dog? The noble sentiments of sympathy and love which thus find expression are but perfected instincts, as is the case in man himself.

So understood, the ethics of the evolution theory does not need to seek for new principles; we have only to refer to their true bases the ancient precepts of duty. Long prior to all church religions, these natural precepts governed man's common and legal life, just as they governed the social life of animals. The churches should utilize these weighty data, instead of combating them. The future is not of that theology which vainly struggles against the victorious doctrine of evolution, but rather of that which will adopt it and turn it to account.

Far from apprehending, from the influence of the evolution doctrine on our religious convictions, an overthrowing of all existing moral laws, and a deplorable emancipation of egoism, we look rather for the establishment of natural morals based on the immovable foundation of natural laws. By acquainting us with our true place in Nature, anthropogeny demonstrates the necessity of our ancient social obligations.

Like the theoretic philosophy of Nature, practical philosophy, and pedagogy, henceforth will derive their principles not from pretended revelations, but from the natural conceptions of the doctrine of evolution. This victory of monism over dualism opens to us rich horizons of hope for the unending progress of our development, moral as well as intellectual. Bearing all this in mind, we must say, All hail to the evolution theory, reconstituted in our day by Darwin; it is the mightiest lever of general science, or Nature-philosophy, both pure and applied!

THE LIBERTY OF SCIENCE IN THE MODERN STATE.¹

BY PROFESSOR RUDOLF VIRCHOW, OF BERLIN UNIVERSITY.

WHEN the committee of arrangements honored me with an invitation to address the meeting from this place, I asked myself whether it was not best to discuss one special topic of the recent development of our science from a point of view originally proposed by myself, but more recently recalled to your minds by Herr Klebs. I have, however, once more concluded to treat a subject of general interest, principally because, as I believe, the time has come when some understanding must be reached between science as represented and studied by us, on the one hand, and the general life of the community on the other; and also because in the history of the nations of Continental Europe the time is even now coming on apace when the intellectual destinies of nations must be determined, perhaps for a long time to come, in the tribunals of last resort.

Not for the first time, gentlemen, am I able at a meeting of German naturalists to point in warning to almost dramatic occurrences in our neighbor state. Again and again, at times when this Association has met, I have had occasion to refer to events which had just taken place beyond the Rhine; and these, however remote they may appear to be from our concerns, nevertheless, in the long-run, always touch upon the same domain of controversy—namely, the rôle of modern science in the modern state. To be frank—and here we may, perhaps, be doubly so—the question that is ever pressing upon us is that of Ultramontanism and Orthodoxy. I confess that it is with unfeigned alarm that I look forward to the events of the next few years among our neighbors. At the present moment we here may look about us with some pride and await the tide of events with a degree of calmness. But to-day, when we are engaged in celebrating the fiftieth anniversary of this assembly, it is surely opportune to call to mind what great changes have taken place in Germany, and particularly in Munich, since the days when Oken first assembled the German naturalists and physicians.

¹ An address delivered at the Munich meeting of the German Association of Physicians and Naturalists. *Nature's* translation, revised and corrected by J. Fitzgerald, A. M.

I propose only to refer very briefly to two facts that, though well known, are still of sufficient interest to be mentioned again. The first is that, even when in 1822 the few members constituting the first assembly of German naturalists met at Leipsic, the holding of such a meeting seemed so hazardous a thing that the sessions were held in secret. It was not till 1861—39 years later—that the names of the members who had been present from Austria could be published. The second fact, which has direct reference to the memory of Oken, is that this esteemed and illustrious teacher, this ornament of the Munich High-School, was fated to die in exile in the same Swiss canton in which Ulrich von Hutten ended his life of trouble and conflict. Gentlemen, the bitter exile which oppressed Oken's last years and caused him to languish away far from the spot where he had expended the best powers of his life, this exile will ever remain as the signature of the period through which we have victoriously passed. And so long as there is an Association of German Naturalists, it behooves us gratefully to remember that, down to the day of his death, this man bore all the signs of a martyr, and to look upon him as one of those witnesses unto blood who have achieved for us the freedom of science.

Nowadays, gentlemen, it is easy to speak of the liberty of science in Germany; now we are perfectly secure even here, where, only a few decades back, the fear was great that a new change of things might perhaps produce the extreme reverse, and we can without let or hindrance discuss the highest and most difficult problems of life and the hereafter. Surely the addresses which were delivered at the first and second general meetings are proof sufficient that Munich is now a place which can bear to hear the representatives of science in the most perfect liberty. I was not able to listen to all these addresses, but I have since read those of Profs. Haeckel and Nägeli, and I must say we cannot ask more than such freedom of discussion.

If it were only a question of rejoicing over this possession, I should indeed not have claimed your attention for the subject in hand. But, gentlemen, we have arrived at a point where it becomes necessary to investigate whether we

may hope to retain securely for the future the possession which we actually enjoy. The fact that we are enabled to discuss, as we do to-day, is not for one who, like myself, has had long experience of public life, a sufficient assurance that it will always remain so. Therefore, I think that not only should we strive to awaken the interest of the public, but I believe we should ask ourselves what we must do to maintain the present condition of things. I will tell you at once, gentlemen, what I conceive to be the chief result of my reflections, and what I most desire to prove. I wish to show that, for the present, we have nothing more to ask, but that, on the contrary, we have now reached the point where it must needs be our special task, *by our moderation, and by a certain renunciation of pet theories and personal views*, to make it possible for the favorable disposition of the nation, which we now enjoy, to persist and not to change to the contrary.

In my opinion, we are actually in danger of compromising the future by making too ample use of the freedom afforded by the present state of things; and I would warn you against indulging such caprices of personal speculation as you see nowadays displayed in sundry departments of natural science. The discourses of those who have preceded me, that of Prof. Nägeli in particular, contain, for all who read them, a multitude of highly-important observations on the course and the limits of scientific knowledge; but these it cannot be my task to repeat here. Still, I have some remarks to make about them, and I desire to adduce a few practical instances from the experience of natural science, in order to show how great is the difference between real science in the strictest sense of that term—for which alone, in my opinion, we can justly demand that full measure of liberty which may be called liberty of science, or, more correctly still, perhaps, *liberty of scientific teaching*—and, on the other hand, that wider domain which belongs rather to speculation; which raises the problems toward which research is to be directed; which by anticipation formulates propositions that have yet to be demonstrated, and whose truth has yet to be discovered, though in the mean time they may be with a certain probability accepted, inasmuch as they fill up gaps in our knowledge. We must not forget that there exists a line of demarkation in natural science between what is speculative and what is actually proved and ultimately determined. The people demand of us that this line not only should be on occasion drawn as clearly as possible, but that it be so

fixed and determined that every one shall for evermore know just where it lies, and how far he can be required to accept as truth what he is taught. Such, gentlemen, is the task on which we have to work in our own minds.

The practical questions which are connected with this lie very near. It is evident that, for whatever we consider to be assured scientific truth, we must demand complete admission into the scientific treasury of the nation. *This the nation must take to itself*—it must consume and digest it, and continue to work at it. Herein lies the double advantage which natural science offers to the nation: on the one hand the material progress, that enormous progress which has been made in modern times. All the benefits derived from the steam-engine, telegraphy, photography, etc.; all our discoveries in chemistry and the production of dyestuffs, etc.—all rest essentially on the fact that we men of science establish firmly certain propositions, and when these have been fully demonstrated, so that we know them to be scientific truth, we give them to the nation at large; then others, too, can work with them, and create new products, before unthought of, which come into the world as perfect novelties, and which transform the condition of society and of nations. All this constitutes the material importance of our labors. Their intellectual value is of like importance. If I present the nation with a scientific truth that is fully demonstrated, to which not the least doubt attaches; if I ask every one to convince himself of the correctness of this truth, to assimilate it, to make it part of his own thoughts, of course I assume that his conception of things in general will be similarly affected. Every essentially new truth of this kind must needs influence a man's whole mode of viewing things, his *method of thinking*.

If, for instance, to cite a case that lies near, we consider the advances made during the past few years in our knowledge of the human eye, beginning at the time when the several component parts of the eye were first anatomically separated, when these several anatomically separated parts were first examined microscopically and their respective structures determined, down to the time when we gradually learned the vital properties and the physiological functions of the different parts, until at last, by the discovery of the retina-purple (*Schpurgpur*), and its photographic properties, an advance was made of which but a year ago we hardly had an idea—then it is evident that with each progressive step of this kind some department of optics, particularly the

doctrine of vision, is determined and changed. Through this discovery we get definite knowledge of the action of light within the human body itself, and we see that it is a quite peripheral organ of the body, not at all the brain, but the eye, that experiences this action. Furthermore, we learn that this photographic process is not an intellectual operation, but a chemical action performed with the aid of certain vital processes; and that in reality what we see is, not external objects, but their images in the eye. We thus gain a new analytical fact to aid us in understanding our relations to the outer world, and in more sharply distinguishing between the purely psychic and the purely physical elements of vision. The result is a reconstruction, in part, of optics, and, at the same time, of psychology. Chemistry now steps in to investigate matters that heretofore it had taken no cognizance of, namely, the highly-important questions: "What is the retina-purple? What manner of substance is this? How is it formed, how decomposed, how reformed?" The solution of these questions will not fail to open an entirely new field of research; and it is to be hoped also that we shall soon witness new advances in technical photography—that we shall be enabled to produce colored photographs. Here, then, is an advance made simultaneously on two different planes—progress both material and intellectual. And thus it is that, with each real advance in the knowledge of Nature, a series of changes must of necessity take place not only in the external but also in the internal relations of man; and no one can prevent the new knowledge from affecting him. Each new fragment of real knowledge has its effect on man, producing new ideas, new trains of thought, and ultimately every one finds himself compelled to consider even the highest problems of mind in the light of natural phenomena.

But there are certain practical considerations that concern us more nearly. Everywhere throughout Germany we are now occupied in remodeling our educational systems, enlarging and developing them and determining their forms. The new Prussian education acts are on the threshold of coming events. In all the German states larger schoolhouses are being built, new educational establishments founded, the universities enlarged, high-schools and middle schools established. The question arises: "What is to be the chief staple of the instruction given? What shall be the aim of the school? In what direction shall it work?" If natural science demands, and if for years we ourselves have been striving to gain, an influence

in the schools; if we demand that natural science shall be admitted into the schools in a larger measure, and instilled into the minds of the young, there to form the basis of new ideas, then surely is it high time for us to come to an understanding as to what we may and what we will demand. When Prof. Haeckel declares it to be a question for the schoolmaster to determine whether the theory of descent should even now be made the groundwork of education, whether the *plastidule-soul* should be assumed as the basis of all our conceptions of Mind, and whether the phylogeny of man should be traced back to the lowest classes of the organic world, or beyond, up to spontaneous generation, in my opinion he shrinks the difficulty. If the theory of descent is so certain as Prof. Haeckel assumes it to be, we must needs demand for it a place in the schools. It is not to be thought of that so weighty a doctrine, one so revolutionary, so intimately affecting the consciousness of all, a doctrine that of itself constitutes as it were a new religion, should not be implanted bodily in the system of education. How could we bring ourselves to observe absolute silence in the schools, with regard to such a revelation, as I may call it, or to leave it to the option of the schoolmaster, whether or not he shall acquaint his pupils with the greatest and most important advances that have been made in science during this entire century? That, gentlemen, were an act of resignation of the austere kind, and in reality it never would be practised. The schoolmaster who accepted the doctrine would teach it unconsciously, and he could not do otherwise. He would have to dissimulate, he would at times have to abdicate his own knowledge in the most artificial way, so as not to betray his acquaintance with and acceptance of the doctrine of descent, or the fact that he knows precisely how man originated and whence he is come; and if he does not know whither man goes, at least he would think that he knows precisely how in the course of aeons the progressive series has shaped itself. Therefore, I say that, though we were not actually to demand the admission of the theory of descent into the plan of education, it would introduce itself.

Nor must we forget, gentlemen, that what here we express, perhaps still with a certain timid reserve, is propagated by those outside with a confidence increased a thousand-fold. For instance, I once laid down the proposition—in opposition to the doctrine then reigning of the development of organic life from inorganic matter—that each cell has its origin in another cell, at

least in pathology, and more especially in human pathology. I may remark here that in both relations I still to-day consider this phrase a perfectly correct one. But after I had promulgated this doctrine, and had formulated the origin of the cell from the cell, others were not wanting who extended this phrase not only in the organic world far beyond the limits assigned by me, but who put it down as generally valid even beyond the limits of organic life. I have received the most wonderful communications, both from America and Europe, in which the whole of astronomy and geology was based upon the cellular theory, because it was thought impossible that what was decisive for the life of organic nature upon this earth should not be equally applicable to the heavenly bodies—they, too, being round bodies, which had shaped themselves into globes and represented so many cells flying about in universal space and playing a part there similar to that of the cells in our body.

I cannot pronounce these men to have been all arrant fools and simpletons. Indeed, from some of their arguments, I have conceived the idea that many of them were men of education, who had studied much, and at last had attacked the problems of astronomy, but who could not see that the adaptation (*Zweckmässigkeit*) of heavenly phenomena to their ends should have a different basis from that of man's organization. Hence, in their pursuit of a monistic conception, they reached the conclusion that the heavens, too—nay, even that the whole universe—must be an organism adapted to ends, and that the only principle governing it must be the cell-principle. I cite this only in order to show what shape things take outside, how "theories" are enlarged, and how our own doctrines may return to us in a form fearful to ourselves. Now, only imagine how the theory of descent may be shaped to-day in the head of a socialist!

Indeed, gentlemen, this may seem ridiculous to many, but it is very serious, and I only hope that the theory of descent may not produce those horrors in our country which similar theories have actually brought to our neighbors. Anyhow this theory, if carried through to its consequences, has an extremely dangerous side, and that the socialists have a certain notion of it already, you will doubtless have remarked. We must make this quite clear to ourselves.

Nevertheless, be the matter as dangerous as it may, the confederates as bad as possible, and yet I say, from the moment when we are convinced that the theory of descent is a doctrine

perfectly proved, so certain that we could swear by it, that we could say, thus it is—from that moment we must not hesitate to introduce it into general life, transmit it not only to every educated person, but teach it to every child, make it the basis of our whole conception of the universe, of society, and of the state, and found our educational system upon it. This I consider a necessity.

In saying this I am not at all afraid of the reproach which, to my astonishment, has made a great noise in my Prussian Fatherland, while I was absent in Russia: I mean the reproach of *half-knowledge*. Strange to say, it was one of our so-called liberal journals which asked the question whether the great errors of our time, and socialism in particular, were not based upon the diffusion of half-knowledge. With reference to this I would like to state here, in the midst of the Naturalists' meeting, that *all* human knowledge is only piece-work. All of us who call ourselves naturalists, only possess fragments of natural science; none of us is able to come here and represent with equal right every one of the sciences, or participate in the discussions of every one of the sections. On the contrary, it is just because they have developed themselves in a certain one-sided direction, that we esteem specialists so highly. Outside of our respective specialties, our science is half-knowledge. It were much to be desired if we could only succeed in diffusing this half-knowledge more and more, if we could succeed in causing at least the majority of educated persons to progress far enough to be able to survey the principal directions which the several departments of natural science are taking, and to follow their development without meeting difficulties too great to be overcome, so that they might at least be aware of the general progress of science, if, indeed, they were not acquainted, at every moment, with the totality of all single and special proofs. We do not get much further ourselves. I, for instance, have honestly tried during my life to obtain chemical knowledge; I have even worked in a laboratory; but I feel quite incompetent to sit down at some chemical meeting without preparation, and to discuss modern chemistry in all directions. Nevertheless, I am able to penetrate, after a time, so far into any chemical novelty that it does not strike me as incomprehensible. But I must always first acquire this understanding, I have not got it to start with; and when I want it again I must acquire it again. That which honors me is the *knowledge of my ignorance*. The most important part is that I know

perfectly well what I do *not* know of chemistry. If I did not know that, then, of course, I should always be wavering to and fro. But as I imagine that I am tolerably well aware what I do not know, I say to myself every time I am obliged to enter a domain which is still closed to me: "Now I must begin again to learn; now I must study afresh; now I must do as anybody does who enters the domain of science." The great error, which is shared even by many educated people, consists in not remembering that, with the enormous extent of natural science and with the inexhaustible quantity of its details, it is impossible for any one person to master the whole.

We must acquire such familiarity with the *fundamentals* of natural science and the gaps which exist in our knowledge, that every time we find a gap of this kind we shall say to ourselves, "Now you enter a domain which is unknown to you." If every one had this much knowledge, many a one would strike his breast and own that it is a ticklish thing to draw universal inferences with regard to the history of all things, so long as he is not entirely master of the material on which the inferences are based.

It is easy to say: "A cell consists of small particles, and these we call plastidules; and plastidules are composed of carbon, hydrogen, oxygen, and nitrogen, and are endowed with a special soul; this soul is the product or the sum of the forces which the chemical atoms possess." This may be all so; I cannot judge of it exactly. This is one of those points which are yet unapproachable for me; I feel there like a navigator who gets upon a shoal, the extent of which he cannot guess. But yet I must say that until the properties of carbon, hydrogen, oxygen, and nitrogen, are so defined that I can understand how a soul results from their combination, I cannot admit that we are justified in introducing the plastidule-soul into the educational programme, or in asking every educated man to recognize it as a scientific truth, from which logical conclusions may be drawn, or on which he may base his conception of the universe. We really cannot demand any such thing. On the contrary, I think that before we put forward such theses as the expression of science, before we say this is modern science, we must first make a whole series of laborious investigations. We must therefore say to the schoolmasters, "*Do not teach this.*" This, gentlemen, is the resignation which, in my opinion, they ought to exercise who deem such a solution in itself to be the probable outcome of scientific investigation. We can cer-

tainly not differ on that point for a moment, that, if this doctrine of the soul were really true, it could only be confirmed by a long series of scientific researches.

In the history of the natural sciences is recorded a multitude of facts which go to show that certain problems remain a long time in suspense, awaiting solution. And if this solution is found at last, and found in a direction of which there was a presentiment perhaps centuries ago, it does not follow that during those times which were occupied only by speculation or presentiment the problem might have been taught as a scientific fact.

Herr Klebs spoke of *contagium animatum* the other day, i. e., the idea that in diseases the transmission takes place by means of living organisms, and that these organisms are the causes of contagious diseases. The doctrine of *contagium animatum* is lost in the obscurity of the middle ages. This expression has been handed down to us by our forefathers, and it was very prominent in the sixteenth century. Certain works of that period exist, which propound *contagium animatum* as a scientific dogma with the same confidence, with the same kind of justification, with which the doctrine of the plastidule-soul is nowadays advocated. Nevertheless, the living causes of diseases could not be found for a long time. The sixteenth century could not find them, nor could the seventeenth nor the eighteenth. In the nineteenth century we have begun to find *contagia animata* one by one. Zoölogy and botany have both contributed their contingent; we have found animals and plants which represent contagia, and a special part of the theory of contagia has been confirmed in zoölogy and botany, quite in the sense of the theories of the sixteenth century. But you will already have seen from the address of Herr Klebs that the proof is not yet all in. However much we may be disposed to admit the general validity of the old doctrine, now that a series of new living contagia have been found, now that we know cattle-disease and diphtheria to be diseases which are caused by special organisms, still we may not yet say that *all* contagious or even all infectious diseases are caused by living organisms. After it has appeared that a doctrine, which was propounded as early as the sixteenth century, and which has since obstinately emerged again and again in the ideas of men, has at last, since the second decade of the present century, obtained more and more positive proofs for its correctness, we might really think that now it was our

duty to infer, in the sense of an inductive extension of our knowledge, that all contagia and miasmata are living organisms. Indeed, gentlemen, I will admit that this conception is an extremely probable one. Even those investigators who have not yet gone so far as to regard contagia and miasmata as living beings have yet always said that they resemble living beings very closely, that they have properties which we otherwise know in living beings only, that they propagate their kind, that they increase and are regenerated under special circumstances, that, indeed, they appear like real organic bodies—these men, nevertheless, have waited, and rightly, until the existence of infective organisms was proved. Thus does prudence still counsel reserve.

We must not forget that the history of science presents a number of facts which teach us that phenomena which are very closely allied to one another may occur under very unlike conditions. When fermentation was traced to the presence of certain fungi, when it was known that its beginning is closely connected with the development of certain species of fungi, the inference was easily drawn that all processes related to fermentation happen in the same way; I mean all those processes which are comprised under the name of "catalytic," and which occur so frequently in the human and animal body as well as in plants. There were, indeed, some scientific men who imagined that digestion, which is one of the processes which closely resemble those of fermentation, was brought about by certain fungi which occur frequently (in the special case of cattle the question has been practically discussed), and which were supposed to cause digestion in the stomach in the same way as the ferment fungi cause fermentation elsewhere. We now know that the digestive juices have absolutely nothing to do with fungi. Much as they may possess catalytic properties, we are yet certain that their active substances are chemical bodies which we can extract from them, which we can isolate from their other component parts, and which we can cause to act in the isolated state free from any admixture of living organisms. The human saliva has the property of very rapidly converting starch and dextrine into sugar, and every time we eat bread, "sweet" bread is formed in the mouth; nevertheless we have here no fungus, no ferment organism, but only certain chemical substances which produce transformations very similar to those produced within the fungi. Here, then, we see two processes that closely resemble

one another brought about in very different ways, the one in the interior of the ferment fungus, the other in the digestive organs of man; in one case the process is connected with a definite vegetal organism, in the other case it takes place without any such organism, and simply through a liquid.

I should consider it a great misfortune if we were not to continue, in the same way as I have done now, to examine in each single case whether the *hypothesis* we frame, the *idea* which we form, and which may be highly probable, is really true, whether it is justified by *facts*. Here I would remind you that there are cases also among the infectious diseases where most undoubtedly a similar contrast exists. My friend Herr Klebs will no doubt pardon me if I, even now, in spite of the recent progress which the doctrine of infective fungi has made, still maintain my reserve, and only admit that fungus which has been proved by demonstration, while I deny all the other fungi as long as I do not hear of facts which attest them. Among infectious diseases there is a certain group which are caused by organic poisons—I will only mention one of them, which, according to my opinion, is very instructive—I mean the poisoning by a snake-bite, a very celebrated and most remarkable form. If we compare this kind of poisoning with those kinds which are generally called infectious diseases (infection means little else than poisoning), we must admit that there exists the closest analogy between the two in the course they usually take. As far as the succession of the symptoms is concerned, there is nothing to negative the hypothesis that the *ensemble* of phenomena consequent on snake-bite was caused by fungi entering the body and producing certain changes in different organs. Indeed, there are some processes, septic processes, for instance, where just such phenomena occur, and it is certain that some forms of poisoning by snake-bite resemble some forms of septic infection as much as one egg resembles another. And yet we have not the least cause to suspect an importation of fungi into the body in the case of snake-bite, while in the case of septic processes we, on the contrary, acknowledge and recognize this importation.

The history of natural science has numerous examples, which ought always to cause us more and more to restrict our doctrines absolutely to that domain only in which we can actually prove them, and not by way of induction to proceed so far as to extend doctrines immeasurably which have only been proved for one or more cases. Nowhere is the necessity of such restriction more

apparent than in the history of evolution. The question of the primal origin of organic beings, a question which is at the basis of advanced Darwinism, is very ancient. We know not who was the first to attempt a solution of it. But when we quote the old popular theory, which teaches that all possible living things, whether animals or plants, may originate from a lump of clay—a lumplet, as the case might be—we should at the same time remember that the famous doctrine of *generatio æquivoca*, or *epigenesis*, is closely allied to it, and that it has been a common idea for thousands of years. Now, with Darwinism the doctrine of spontaneous generation has been taken up again, nor can I deny that there is something very alluring in the idea of thus crowning the theory of descent, and, after the whole series of living forms has been constructed, from the lowest of the protista up to the highest human organism, of furthermore connecting this long series with the inorganic world. All this is in harmony with that tendency toward generalization which is so characteristic of the human mind that it has ever since the earliest times occupied a place in the speculation of mankind. We do unquestionably repugn against divorcing the organic world from the rest of the universe as something apart, and we incline rather to make the union between them closer. In this sense it is some satisfaction to be able to say that the group of atoms known as Carbon & Co.—though rather curt, the style is nevertheless correct enough, inasmuch as carbon is the main thing—that the firm of Carbon & Co. once upon a time separated itself from ordinary carbon, and under special conditions produced the first plastidule, and that it still continues to do the same thing. But in the face of this we have to state that all real scientific knowledge has proceeded in the opposite direction. We date the beginning of our real knowledge of the development of higher organisms from the day when Harvey uttered the famous proposition, *Omne vivum ex ovo*—every living being comes from an egg. This proposition, as we now know, is incorrect in its universality. We can nowadays no longer regard it as fully established; indeed, we now know of a multitude of generations and propagations that take place without ova. From the time of Harvey down to that of our illustrious friend Von Siebold, who obtained general recognition for the doctrine of parthenogenesis, there has been established a whole series of limitations which go to show that the expression *Omne vivum ex ovo* was as a general proposition inexact. Nevertheless, it were the height

of ingratitude not to recognize in Harvey's opposition to the old *generatio æquivoca* the greatest advance that has been made by science in this field. Later we became acquainted with a great number of new forms of propagation in sundry species of living beings—as direct segmentation, gemmation, and alternate generation. All these forms of generation, parthenogenesis included, constitute the grounds upon which we have rejected all unitary systems of the generation of organic individuals. Instead of a unitary scheme, we have a number of different schemes; and now we have no one formula to explain once for all how a new animal existence begins.

Generatio æquivoca, however often attacked and refuted, nevertheless confronts us continually. True it is, that not a single *positive fact* is known proving that *generatio æquivoca* has ever occurred; that ever inorganic masses, for instance, the firm of Carbon & Co., have spontaneously developed into an organic substance. Still I admit that if we *will* form an idea how the first organic being *could* have originated by itself, nothing remains but to go back to spontaneous generation. This is clear: if I will not accept a theory of creation; if I will not believe that there was a special Creator who took up a lump of clay and breathed into it the breath of life; if I would account for things in my own way, I must recur to *generatio æquivoca*. *Tertium non datur*. Nothing else remains if once we say, "I do not admit creation, but I do want an explanation." If that is your antecedent proposition, then you must proceed to your consequent and say, "*Ergo* I admit *generatio æquivoca*." But we have no actual proof for it. Nobody has ever seen *generatio æquivoca* occurring in reality, and every one who maintained that he had seen it has been refuted, not by theologians at all, but by naturalists. I mention this, gentlemen, in order to let our impartiality appear in the right light, and this is very necessary at times. We always have our weapons in ourselves and about us, to fight against that which is not fortified with proof.

I therefore say that I must admit the theoretical justification of such a formula. Whoever will have a formula, whoever says, "I absolutely want a formula, I wish to be perfectly at one with myself, I must have a coherent conception of the universe," must either admit *generatio æquivoca* or creation; there is no other alternative. If we want to be outspoken we may indeed own that naturalists have a slight predilection for *generatio æquivoca*. It would be very beautiful if it could be proved.

But we must admit that it is not yet proved. Proofs are still wanting. If any kind of proof were to be successfully given we would acquiesce. But even then it would have to be determined, first, to what extent we could admit *generatio æquivoca*. We should quietly have to continue our investigations, because nobody will think that spontaneous generation is valid for the totality of organic beings. Possibly it would only apply to a single series of beings. But I believe we have time to wait for the proof. Whoever remembers in what a regrettable manner, quite recently, all attempts to find a certain basis for *generatio æquivoca*, in the lowest forms of the transition from the inorganic to the organic world, have failed, should consider it doubly dangerous to demand that this ill-famed doctrine should be adopted as a basis for all human conceptions of life. I may, doubtless, suppose that the story of *Bathybius* has become known to nearly all educated persons. With this *Bathybius* the hope has again vanished that *generatio æquivoca* can be proved.

I think, therefore, that with regard to this first point, the connection between the organic and the inorganic, we must simply own that in reality we know nothing. We may not set down our hypothesis as a certainty, our problem as a dogma; that cannot be permitted. Just as in working up the doctrines of evolution it has been far more certain, more fertile, and more in accordance with the progress of accredited natural science, to analyze the original unitary hypothesis part by part, we shall also have first to keep apart the organic and inorganic in the old well-known analyzing way, and not synthetize them prematurely.

Nothing, gentlemen, has been more injurious to natural science, nothing has done more harm to its progress and to its position in the opinion of nations, than premature syntheses. While laying stress upon this, I would point out specially how our Father Oken was damaged in the opinion not only of his contemporaries, but also of the following generation, because he was one of those who admitted syntheses into their conceptions to a far greater extent than a stricter method would have allowed. Let us not disregard the example of the Nature-philosophers; do not let us forget that every time that a doctrine which has passed for a certain, well-founded, reliable one, and of universal application, turns out to be faulty in its outlines, or is found to be an arbitrary and despotic one in essential and great points, then a great number of men

lose their faith in science entirely. Then the reproaches begin: "You are not sure even yourselves; your doctrine, which is called truth to-day, is a falsehood to-morrow; how can you demand that your doctrine shall become the object of instruction and a part of the general consciousness?" From such experiences I take the warning that if we wish to continue to claim the attention of all we must resist the temptation of pushing our hypotheses, our merely theoretical and speculative views, into prominence, so as to make them the basis of a conception of the universe.

If what I have said before is true—that half-knowledge is more or less predicable of all naturalists, that in many, perhaps in most, of the lateral branches of their own sciences, they are only half-knowers; if later on I said that the true naturalist was distinguished by his being perfectly aware of the limits of his knowledge and his ignorance, then you understand, gentlemen, that also with regard to the public at large we must confine our claims to demanding that what every single investigator in his own direction, in his sphere, can designate as reliable truth which is common to all—that only this shall be admitted into the general plan of education.

In thus marking the limits of our knowledge we must remember before all things that what is generally termed natural science is, like all other knowledge in this world, composed of three totally different parts. Generally a difference is only made between *objective* and *subjective* knowledge, but there is a certain intermediate part—I mean *belief*—which also exists in science, with this difference only, that here it is applied to other things than in the case of religious belief. It is rather unfortunate, in my opinion, that the expression "belief" has been so completely monopolized by the Church, that one can hardly apply it to any secular object without being misunderstood. In reality, even in science there is a certain domain of faith, wherein the individual no longer undertakes to prove what is handed down to him as true, but accepts it as simple tradition: and this is precisely the same thing which we see in the Church. Conversely, I may observe—and my view is one that is not rejected by the Church itself—that it is not belief alone which is taught in the Church, but that even church-doctrines have their objective and their subjective sides. No church can avoid developing in the three directions I have pointed out: in the middle the path of belief, which is certainly very broad, but on the one side of which there is

a certain quantity of objective historical truth, and on the other a variable series of subjective and often very fantastic ideas. In this ecclesiastical and scientific doctrines are alike. The cause of this is that the human mind is one, and that it carries the method which it follows in one domain finally into all the others as well. Still we must always have clear ideas as to how far each of the directions mentioned extends in the different domains. Thus, for example, in the ecclesiastical domain—for in this it is most easily exemplified—we have the special dogma, the so-called positive belief: of this I need not speak. But each church has furthermore its peculiar historical side. It says, "This has happened, this has occurred, these events have taken place." This historical truth is not only handed down, but makes its appearance in the garb of an objective truth, with definite evidences. This is the case with the Christian religion just as much as with the Mohanmedan, with Judaism as with Buddhism. On the other side we find the left wing as it were, where subjectivity reigns; there the individual dreams, there visions come and hallucinations. One religion promotes them by special drugs, another by abstinence, etc. Thus subjective individual currents are developed, which occasionally assume the shape of perfectly independent phenomena existing by the side of and apart from the previous ecclesiastical domain, which at times are rejected as heresies, but which often enough merge into the main current of the recognized church-doctrine. All this we find again in natural science. There too we have the current of dogma, there too we have the currents of objective and subjective doctrines. Consequently our task is a compound one. First of all we try to reduce the dogmatic current. The principal aim of science has for centuries been to strengthen more and more the right, the conservative side. This side, which collects the *ascertained facts with full consciousness of the evidences*; which adheres to *experiment as the highest means of proof*; which is in possession of the real scientific treasury, has steadily grown larger and broader, and this principally at the expense of the dogmatic stream. Really, if we only consider the number of natural sciences which since the end of the last century have grown and now flourish, we must admit that an almost incredible revolution has taken place.

There is no science in which this is so eminently evident as in medicine, because that is the only science which has a continuous history of nearly 3,000 years. We are, so to speak, the

patriarchs of science, inasmuch as we have the dogmatic current at its longest. This current was so strong that, in the early part of the middle ages, even the Catholic Church embraced it, and the heathen Galen appeared like a father of the Church in the ideas of men; indeed, if we read the poems of that period, he often presents himself exactly in the position of a father of the Church. Medical dogma persisted until the time of the Reformation. Vesalius and Paracelsus, who were Luther's contemporaries, made the first grand attempts at reduction; they drove piles into the bed of the dogmatic stream, constructed dikes by its sides, and left only a narrow channel. Beginning with the sixteenth century, it has grown narrower and narrower every century, so that finally only a very small channel has remained for the therapeutists. So passes away earthly glory.

Only 30 years ago the Hippocratic method was spoken of as something so sublime and important that nothing more sacred could be imagined. Nowadays we must own that this method is annihilated nearly down to its root. At least, a good deal of imagination is necessary if we say that any physician of the present day acts as Hippocrates did. Indeed, if we compare the medicine of to-day with the medicine of the year 1800—it so happened that the year 1800 marks a great turning-point in medicine—we find that our science has undergone a complete reformation during the last 70 years. At that time the great Paris school was formed, immediately under the influence of the French Revolution, and we must admire the genius of our neighbors that enabled them to find all at once the fundamental basis of an entirely new science. If now we see medicine continue its development in the greater breadth of objective knowledge, we must never forget that the French were the precursors, as in the middle ages the Germans were.

In citing medicine as an example, I only wished to show you in brief what changes have come about both in the methods and in the data of science. I am confident that in medicine, by the close of this century, there will remain only so much of the dogmatic current as might easily pass through a water-main. For the rest, the objective current will probably altogether swallow up the dogmatic.

The subjective stream will still, perhaps, remain. Perhaps even then many an individual will dream his beautiful dreams. The field of objective facts in medicine, great as it has become, has yet left such a number of lateral fields, that for

anybody who *wants* to speculate plenty of opportunities offer daily. And these opportunities are honestly made use of. A multitude of books would remain unwritten if only objective things were to be communicated. But the subjective, wants are still so great that I believe I am justified in maintaining that, of our present medical literature, about one-half might safely remain unpublished, without doing any damage worth mentioning to the objective side.

Now, when we *teach*, in my opinion, we ought not to look upon this subjective side as an essential object in the doctrine. I believe I now belong to the oldest professors of medicine; I have taught my science now for over 30 years, and I may say that during these 30 years I have honestly striven to free my mind more and more from all subjective tendency, and to get more and more into the objective current. Nevertheless, I openly confess that I find it impossible to give up subjectivity altogether. Every year I see again and again that, even in points where I had believed myself to be entirely objective, I still retained a large number of subjective ideas. I do not go so far as to require everybody to express himself entirely without any admixture of subjectiveness, but I do say that we must set ourselves the task to transmit to the students the real knowledge of facts in the first place, and, if we go further, we must tell them each time: "But this is not proved; but this is *my* opinion, *my* idea, *my* theory, *my* speculation."

This, however, we can only do with those who are already educated and developed. We cannot carry the same method into the elementary schools; we cannot say to each peasant-boy, "This is a fact, this we know, and that we only suppose." On the contrary, that which is known, and that which is only supposed, as a rule, get so thoroughly mixed up that that which is supposed becomes the main thing, and that which is really known appears only of secondary importance. Therefore we who support science, we who live in science, are all the more called upon to abstain from carrying into the heads of men, and most of all into the heads of teachers, that which we only suppose. True, we cannot give facts simply in the shape of raw material; that is impossible. They must be arranged in a certain systematic order. But we must not extend this arrangement beyond what is absolutely necessary.

And here I have an objection to make to Herr Nägeli's address. Herr Nägeli has discussed, certainly in the most measured way, and—you will notice this if you read his address—in a thor-

oughly philosophical manner, the difficult questions which he has chosen as subjects for his discourse. Nevertheless, he has taken a step which I consider extremely dangerous. He has done in another direction what is in one way done by *generatio aequivoce*. He asks that the psychological domain shall be extended not only from animals to plants, but that we shall actually carry from the organic world into the inorganic our conceptions of the nature of mental phenomena. This method of thinking, which is represented by great philosophers, is natural in itself. If any one wants by any means to connect mental phenomena with those of the rest of the universe, then he will necessarily come to transfer mental processes, as they occur in man and the animals of highest organization, to the lower and lowest animals; then a soul is even ascribed to plants; further on the cell thinks and feels, and finally he finds a passage down to chemical atoms, which hate or love one another, seek one another, or flee from one another. All this is very fine and excellent, and may after all be quite true. It *may* be. But, then, do we really want, is there any positive scientific necessity for extending the domain of mental phenomena beyond the circle of those bodies in which and by which we see them really happening? I have no objection to carbon-atoms having a soul, or to their acquiring a soul by their union with the plastidule; but *I do not know how I am to find out whether the thing is so*. This is simply playing with words. If I declare attraction and repulsion to be psychic phenomena, then I simply throw Psyche out of the window, and Psyche is Psyche no longer. The phenomena of the human mind may eventually be explained in a chemical way, but for the present, I think, it is not our task to mix up these domains. On the contrary, it is our duty to keep them strictly where we understand them. And as I have always laid stress upon this, that we should not in the first line try to find the *transition* from the inorganic into the organic, but that we should first of all determine the *contrast* between the inorganic and the organic, and carry on our investigations among those contrasts in the same way, I now maintain that the only way to progress—and I hold the firmest conviction that we shall not advance at all otherwise—is to limit the domain of mental phenomena to where we really perceive mental phenomena, and not to *suppose* mental phenomena, where perhaps they *may* be, but where we do not notice any visible, audible, sensible, in one word, *perceptible* phenomena, which we might call men-

tal. There is no doubt that for us mental phenomena pertain to certain animals, not to the totality of all organic beings, not even to all animals generally, and I maintain this without hesitation. We have no reason yet to say that the lowest animals possess psychic attributes; we find them only in the higher animals, and with perfect certainty only in the highest.

Now I will admit with pleasure that certain gradations, certain gradual transitions, certain points can be found, where from mental phenomena one gets to phenomena of simply material or physical nature. I certainly do not declare that it will never be possible to bring psychical phenomena into immediate connection with physical ones. All I say is, that *at present* we are not justified in setting down this *possible* connection as a scientific doctrine, and I must distinctly oppose the attempts to enlarge our doctrines prematurely in this manner, and to bring again and again into the foreground as a positive statement what we so often proved a useless problem. We must distinguish strictly between what we want to teach and what we want to investigate. What we investigate are problems. We need not keep them to ourselves; we may communicate them to the whole world and say, "There is the problem, this is what we are trying to find;" like Columbus, who, when he started to discover India, made no absolute secret of it, but who eventually did not find India, but America. And the same happens to us not rarely. We start to prove certain problems which we suppose to be perfectly correct, and in the end we find something quite different, which we never expected. The investigation of such problems, in which the whole nation may be interested, must be open to everybody. That is the *liberty of research*. But the problem is not at once to be the object of instruction. When we teach we must confine ourselves to those smaller domains which are already so large, and which we have actually mastered.

Gentlemen, I am convinced that only with a resignation of this kind, which we impose on ourselves, which we exercise toward the rest of the world, shall we be enabled to conduct the fight against our enemies with a victorious result. All attempts to transform our problems into doctrines, to introduce our theories as the basis of a plan of education, particularly the attempt simply to depose the Church, and to replace its dogma by a religion of descent, these attempts, I say, must fail, and their failure would at the same time very seriously compromise the position of science generally.

Therefore let us be moderate, let us exercise resignation, so as to set forth even our favorite problems, always as problems only, and let us never tire of saying: "Do not take this for confirmed truth; bear in mind that this may perhaps be changed; only for the moment we are of opinion that *it may be true*."

By way of illustration I will add another example. At this moment there are probably few naturalists who are not of opinion that man is allied to the rest of the animal world, and that a connection will possibly be found, if indeed not with apes, then perhaps in some other direction, as is now the opinion of Prof. Vogt.

I acknowledge openly that this is a desideratum of science. I am quite prepared for it, and I should not for a moment wonder nor be alarmed if the proof were found that the ancestors of man belonged to some other order of vertebrates. You know that just at present I work by preference in the field of anthropology, but yet I must declare that every step of positive progress which we have made in the domain of prehistoric anthropology has really moved us further away from the proof of this connection. At this moment anthropology studies the question of fossil man. From man in the present "period of creation" we have descended to the Quaternary period, to that period when, as Cuvier maintained with the greatest confidence, man did not exist. Nowadays Quaternary man is a generally accepted fact. Quaternary man is no longer a problem, but a real doctrine. But Tertiary man, on the contrary, is a problem, though a problem which is already being discussed according to the evidence of facts. There are objects already about which discussions are going on as to whether they may be admitted as proofs of the existence of man during the Tertiary period. We do not merely speculate on the subject, but we discuss certain objects, whether they may be recognized as witnesses for the existence of man during the Tertiary period. The question raised is answered differently, according to whether these objective material elements of proof are considered sufficient or not. Even men who, like the Abbé Bourgeois, are decided ecclesiastics, are convinced that man lived during the Tertiary period; for them Tertiary man is already a doctrine. For us, who are of a more critical nature, Tertiary man is still a problem, but, as we must acknowledge, a problem worthy of discussion. Let us, therefore, for the present remain at Quaternary man, whom we really find. If we study this Quaternary, fossil man, who ought after all to stand nearer to our ancestors in the

series of descent, or rather of ascent, we find a man just the same as we are ourselves.

Only ten years ago, when a skull was found, perhaps in peat or in lake-dwellings, or in some old cave, men always fancied that they detected in it evidences of a savage and quite undeveloped state; in short, they were ready to find the monkey type. There is now much less of this sort of thing. The old troglodytes, lake-inhabitants, and peat-people, turn out to have been quite a respectable society. They have heads of such a size that many a person now living would feel happy to possess one like them. Our French neighbors have certainly warned us not to infer too much from the great size of these heads; it may be possible that they were not filled only with nerve-substance, but that the old brains had more intermediary tissue than is the case nowadays, and that their nerve-substance, in spite of the size of the brain, remained at a low state of development. However, this is only a friendly conversation which, to some extent, is held as a support of weak minds. On the whole, we must really acknowledge that no fossil type of a lower human development exists. Indeed, if we take all the fossil human remains that have been found hitherto and compare them with what the present offers, we can maintain with certainty that among the present generation there is a much larger number of relatively low-type individuals than among the fossils hitherto known. That only the highest geniuses of the Quarternary period enjoyed the good-fortune of being preserved for us I dare not suppose. Commonly conclusions are drawn from the condition of a single fossil object with respect to the majority of others which have not been found. But I will not do this. I will not maintain that the whole race was as good as the few skulls which have been found. But I must say that one fossil monkey-skull or man-ape skull which really belonged to a human proprietor has never been found. Every addition which we have obtained in the material inventory of objects for discussion has moved us farther away from the problem to be solved. Now, of course, we cannot avoid the consideration that perhaps it was on some quite special spot of the earth that Tertiary man lived.

This is quite possible, since during the last few years the remarkable discovery has been made in North America that the fossil ancestors of our horses occur in countries from which the horse had entirely disappeared for a long time. When America was discovered there were no horses there at all; in the very place where the ancestors of our horses had lived no living horse had remained. Thus it may also be that Tertiary man has existed in Greenland or Lemuria, and will again be brought to light from under the ground somewhere or other. But, as a fact, we must positively acknowledge that there is always a sharp limit between man and the ape. *We cannot teach, we cannot designate as a revelation of science the doctrine that man descends from the ape or from any other animal.* We can but designate this as a problem, however probable it may appear.

The experience of the past should have been for us sufficient warning not needlessly to give way to the temptation of drawing premature conclusions. Here, gentlemen, is the difficulty that faces every scientific man who addresses the public. He who writes or speaks to the public should exercise double care now in finding out how much of what he knows and says is objectively true. He must as much as possible have all his inductive amplifications, all his analogous reasonings printed in small type underneath the text, and only what is objectively true embodied in the text. In that way, gentlemen, we may perhaps succeed in winning an ever-increasing circle of followers and fellow-workers, and in effectively interesting the educated public. Unless we do so, gentlemen, I fear we overrate our power. Old Bacon, it is true, said with justice, *Scientia est potentia*—knowledge is power. But he also defined knowledge; and knowledge, as he understood it, was not speculative knowledge—knowledge of problems—but objective knowledge of facts. Gentlemen, in my opinion, we shall abuse our power, endanger our influence, if we do not fall back on this perfectly solid, this perfectly safe and impregnable ground. Thence we can, as investigators, invade the domain of problems, and I am convinced that every attempt of this kind will then find the necessary safety and support.

THE CURIOSITIES OF CREDULITY.

By WILLIAM B. CARPENTER, C. B., M. D., LL. D., F. R. S.

IN the last number of *Fraser's Magazine*, Mr. A. R. Wallace holds me up as "an example of what prepossession and blind skepticism can do for a man;" "how it makes a scientific man unscientific, a wise man foolish, and an honest man unjust."

The following historical narrative will serve, I think, as "an example of what prepossession and blind credulity can do for a man," and will further afford a very useful lesson as to the "fallacies of testimony" in regard to the class of subjects at present under discussion between Mr. Wallace and myself.

Every one who has attended to the history of animal magnetism knows full well that a belief in its higher pretensions not only prevailed extensively in France during the decade of 1820-'30, but took a very strong hold of the medical profession in that country, many of its most distinguished members giving their public attestation to the reality of those claims. Thus M. Rostan, one of the ablest medical psychologists of his day, contributed to the first edition (1825) of the "*Dictionnaire des Sciences Médicales*" (of which he was one of the conductors) an article on "*Magnétisme Animal*," in which he detailed experiments carried on by himself and other eminent physicians, which had entirely satisfied them of the truth of clairvoyance. Another very able advocate of mesmerism during this epoch was M. Georget, a young physician of high reputation, and the author of a much-esteemed treatise on the "*Physiology of the Nervous System*."¹ And a commission appointed by the French Academy of Medicine in 1826 to inquire into the subject (of which commission M. Husson, physician to the *Hôtel Dieu*, was the reporter) reported in the same sense in 1831, its members bearing their personal testimony to the genuineness of phenomena which they had themselves witnessed and tested, and of which they considered that no reasonable doubt could be entertained.

¹ It so happened that my father, having broken down in health from overwork, was, during some months of 1826-'27, under the medical care of MM. Rostan and Georget, the latter of whom told him that the evidence of the reality of spiritual existence afforded by clairvoyance had brought him back from a state of materialistic atheism—exactly what a lady of high culture told me some twenty years ago in regard to spiritualism.

The state of mind of these eminent men, therefore, in regard to mesmerism was thus exactly parallel, on the one hand, to that of the authorities of Salem (New England) in 1692 in regard to witchcraft, and, on the other, to the present attitude of Mr. Wallace and his associates in regard to spiritualism. On evidence which "hundreds of the most solemn people knew to be true," the Salemites hung scores of innocent people. And so, on evidence which Mr. Wallace and his friends know to be true, they brand as "arrogant" skeptics not only myself, but the great body of medical and scientific men of whose opinions on this subject I am the exponent, because, warned by the experience I am now relating, we decline to accept their testimony as binding on our own belief.

Our mental attitude, on the other hand, is that of the courageous skeptics of 1692, who, possessed by "the froward spirit of Sadduceism," caused the release of 150 reputed witches, and the stoppage of proceedings against 200 more, in spite of the indignant protests of Dr. Cotton Mather, and the "hundreds of most solemn people" who backed it up. And it is also that of the obstinate skeptics in the French Academy of Medicine, forty-six years ago, who dared to question the authority of MM. Rostan and Georget, as well as of the eminent reporter and other members of its commission; and who succeeded in preventing the academic adoption of their report, which was simply *enterré* in the archives of the Academy, as the expression of the opinion of the individuals composing that commission.

Early in 1837, however, the academic discussion was renewed; and this renewal elicited the following remarkable statement from M. Bousquet: "*Messieurs, tout le monde a la prétention de bien voir; tout le monde croit avoir bien vu; et vous savez combien un homme est fort, lorsqu'il peut dire—'J'ai vu.'* C'est sans doute un grand avantage; toutefois l'illusion est à côté de la réalité. Georget croyait donc avoir bien vu; il y paraît assez à la manière dont il parle du magnétisme dans son ouvrage sur le système nerveux. Cependant, on sait aujourd'hui qu'il a été trompé par des misérables qui s'en vantent. Je tiens cela de M. Londe, le collaborateur de Georget, et le témoin de toutes ses expériences.

Ainsi, Messieurs, Georget est mort plein de foi dans le magnétisme; son ouvrage reste, et l'auteur n'est pas là pour effacer les erreurs qu'il contient." The circumstance referred to by Dr. Bousquet was a death-bed confession made by a female hospital patient, one of the principal subjects of MM. Rostan and Georget's experiments on clairvoyance; who declared that she and a confederate (who occupied the next bed) used to spend many delicious hours of their nights in chuckling over the deceits they had put on the doctors, and in contriving new ones for the next day. The effect of this disclosure upon the mind of M. Rostan (which I learned at the time through the private channel already referred to) is shown by the fact that when a second edition of the "Dictionnaire de Médecine" came out in 1838, he withdrew the article he had contributed to the first, this being replaced by one from the pen of M. Calmeil (a physician of the highest repute in the same line), which went as strongly against the pretensions of animal magnetism as Rostan's article of 1825 had gone in their favor.

At a subsequent sitting of the Academy, an earnest appeal was made to it by a young magnetizer, M. Berna, to enter anew upon a systematic investigation of the whole subject. "Ma croyance au magnétisme," he urged, "n'est point le fruit de l'enthousiasme ou d'un examen superficiel, mais de plusieurs années d'expériences et de méditation. . . . Je propose de faire voir, sur des personnes que j'ai actuellement à ma disposition, des faits concluants en faveur du magnétisme." Moved by the obvious sincerity of this appeal, and unwilling to hold back from inquiring into the facts which M. Berna professed himself fully prepared to substantiate, the Academy appointed a second commission, which included MM. Roux, Bouillaud, Hippolyte Cloquet, Pelletier, and other distinguished members of its body, with M. Dubois (d'Amiens) as its reporter. This commission reported, six months afterward, that M. Berna had utterly failed to prove his case; the only *fait concluant* demonstrated being that he had been victimized by cunning cheats. Against this conclusion a protest was made by M. Husson, the reporter of the first commission; but the report of M. Dubois was nevertheless almost unanimously adopted by the Academy. It was to meet the argument of M. Husson—that, although M. Berna's *clairvoyantes* had failed, other magnetizers might bring forward more "lucid" subjects—that M. Burdin offered his prize; and a third commission was then appointed, for the special purpose of investigating the claims of

clairvoyance. This third commission included, with M. Husson, the reporter of the first, and M. Dubois, the reporter of the second, such acknowledged leaders of the medical profession as MM. Chomel, Louis, Double, and Moreau. It continued open to the investigation of all claims to the Burdin prize for a period of three years. It detected and exposed the trickery of the claimants who ventured to present themselves. And when, in 1840, it presented its report, the Academy was so completely satisfied that the members of its first commission had been (like the Salemites of 1692) "sadly deluded and mistaken," that it arrived at the determination thenceforth to regard all communications on the subject of animal magnetism as *non avenues*, having no more claims on its attention than claims to the discovery of "perpetual motion," or the "quadrature of the circle," would have upon that of the Academy of Sciences.

Now, I ask what would be thought of the fairness of a stanch Scripturalist who should now quote, as valid testimony to the universality of the Noachian Deluge, the "Reliquiæ Diluvianæ" of Dr. Buckland, whose fundamental doctrine was subsequently retracted by its author in his Bridgewater Treatise; or should accuse a scientific opponent either of culpable ignorance, or of intentional *suppressio veri*, in making no mention of a report presented in favor of the same doctrine to a scientific society, which not only never adopted it, but, in the course of a few years, passed upon it the strongest possible sentence of condemnation? Yet this is exactly what Mr. Wallace has done in reviewing my "Lectures" in Mr. Crookes's journal, accusing me of "ignoring every particle of evidence which is too powerful to be explained away," and citing, as conspicuous examples of one-sidedness, my silence as to M. Rostan's article and M. Husson's report. If time had permitted, I should have most gladly adjoined in my "Lectures" these very testimonies as conspicuous examples of the extent to which the most able but "prepossessed" men may be led away by cunning cheats—M. Rostan by his own confession, and the members of the first commission on the almost unanimous verdict of the French Academy of Medicine.

That animal magnetism is now, as in 1840, regarded by the highly-trained medical intelligence of France as a "dead letter," only worthy of attention as a "curiosity of history," which "points a moral" in regard to other like demands on human credulity, may be judged from the manner in which it is treated in one of the

great medical dictionaries now in course of publication. The second section of the "Dictionnaire Encyclopédique" contains a long and elaborate historical article on "Magnétisme Animal," from the pen of M. Dechambre, who has the reputation of being one of the ablest of French medical critics. After bringing down his history to 1840, M. Dechambre thus continues: "Ici pourrait se terminer l'histoire analytique du magnétisme animal; car il ne se produira plus désormais, en France du moins, que des faits isolés, dépourvus de toute authenticité, et le plus souvent pour les besoins d'une misérable industrie." Further on, he says: "Quant à toutes les propriétés et facultés extraordinaires dont on a doté les somnambules, et qu'il est inutile de rappeler, nous attendons sans impatience ni préoccupation qu'on en démontre mieux l'existence; et nous les considérons, jusqu'à nouvel ordre, comme un double produit de l'illusion et de la supercherie." And he sums up as follows: "Comme ceux des effets que nous regardons comme possibles résultent d'une autre cause que l'influence d'un agent spécial dit magnétisme, nous terminons par cette conclusion radicale: *le magnétisme animal n'existe pas*."

In this condemnation M. Dechambre does not hesitate to include the Odylism of Von Reichenbach, which Mr. Wallace (in his review of my "Lectures") blames me for repudiating—the reality of Reichenbach's experimental results having been attested by about sixty persons of repute in Vienna, including "a number of literary, official, and scientific men and their families;" and having been verified in this country by Prof. Gregory, of Edinburgh, and by Dr. Ashburner in London. Now, it so happened that I was assured at the time by the late Prof. Daubeny, of Oxford, who himself witnessed Von

Reichenbach's experiments at Vienna, that nothing could be more loose and unscientific than the manner in which they were conducted; and the verdict of that very clear-sighted and trustworthy observer has been subsequently confirmed by the general *consensus* of the scientific and medical public of Germany, which, as I have been recently assured by my distinguished friend Prof. Hofmann, of Berlin, would treat any attempt to rehabilitate Odyle (as it appears from M. Dechambre's testimony that it would be treated by the scientific and medical public of France) as simply *non avenue*. And any one who is acquainted with the state of scientific and medical opinion in this country must be well aware that any attempt to rehabilitate Odyle, except on the basis of a new set of experiments, in which the old sources of fallacy should be carefully guarded against, would be utterly futile; neither the authority of Prof. Gregory in Edinburgh, nor that of Dr. Ashburner in London, having been considered by the scientific and medical contemporaries among whom they respectively lived, and to whom their qualifications for such an inquiry were well known, as of more account than that of Von Reichenbach himself.

I do not for a moment call in question the right of any one either to hold or to express his belief in clairvoyance and Odylism. But I do protest against the right of such a one either to call in question the candor and honesty of any other who entertains an opinion as to the probative value of the evidence on these subjects that differs from his own; or to charge him with perverting the facts of history because his conclusions as to the untrustworthiness of that evidence are drawn from a survey of the *whole* of the history, and not from selected parts of it.—*Athenæum*.

THE GERM-THEORY OF DISEASE.

BY H. CHARLTON BASTIAN, F. R. S., M. D.

THOUGH it may be conceded that with our present state of knowledge an affirmative decision in regard to the absolute proof of the present occurrence of archebiosis (*spontaneous generation*) may be still withheld, there is, I think, no similar warrant for suspense of judgment in regard to the Germ-Theory of Disease, or, as it is also called, the doctrine of Contagium

Vivum. Existing evidence seems to me abundantly sufficient for the rejection of this doctrine as untrue.¹

¹ Since this paper was read, the doctrine has again been proclaimed—and never with more force and ability—by Dr. William Roberts (*British Medical Journal*, August 11, 1877). Its essential points may be stated in the words of its latest exponent. He says: "I

My urine and potash experiments will go far to illustrate this difference in the weight of the evidence in regard to the two questions.

A "sterilized" fluid—that is, one which left to itself would always remain pure—may be caused to ferment by the addition of a certain proportion of liquor potassæ devoid of all living things, especially if the influence of the potash be favored by certain accessory physical conditions. This fact is admitted by M. Pasteur himself. During the fermentation thus initiated, a matter (ferment) appears and increases, which is capable of spreading a similar process far and wide in suitable media.

But, on the strength of the analogy upon which the germ-theorists rely, we may find in such an experiment a warrant for the belief that in a healthy person, free from the contagium of typhoid fever or any other of its class, certain kinds of ingesta (solids or fluids), wholly free from all specific poison may, with or without the favoring influence of other altered conditions, give rise to an independent zymotic process. And during the process thus initiated, a matter (contagium) appears and increases in certain of the fluids or tissues of the body, which is capable of spreading a similar disease far and wide among receptive members of the community.

Can the germless liquor potassæ plus the favoring conditions (the principal of which is a certain high temperature) be regarded as the "cause" of the fermentation? The answer does not admit of doubt; the effect in question would not have taken place without their influence. The old logical formula in regard to the word, *cessante causa, cessat effectus*, completely justifies this point of view; and so also does the definition of Sir John Herschel. A "cause," said this philosopher, is

have already directed your attention to the analogy between the action of an organized ferment and a contagious fever. The analogy is probably real, in so far, at least, that it leads us to the inference that contagium, like a ferment, is something that is alive. . . . If, then, the doctrine of a contagium vivum be true, we are almost forced to the conclusion that contagium consists (at least in the immense majority of cases) of an independent organism or parasite; and it is in this sense alone that I shall consider the doctrine, . . . it is more than probable, looking to the general analogy between them, that all infective diseases conform in some fashion to one fundamental type. If septic Bacteria are the cause of septicæmia, if the Spirilla are the cause of relapsing fever, if the *Bacillus anthracis* is the cause of splenic fever, the inference is almost irresistible that other analogous organisms are the cause of other infective inflammations and of other specific fevers."—September, 1877.

"an assemblage of phenomena which occurring, some other phenomenon invariably commences or has its origin."

But there is a point of view which must not be lost sight of. It is of considerable importance, and has of late been dwelt upon by G. H. Lewes with his usual force and clearness. He says: "The fact that it is a convenience to select some one element out of the group, either for its conspicuousness, its novelty, or its interest, and that we call it the cause of the change, throwing all the other elements into the background of *conditions*, must not make us overlook the fact that this cause—this selected condition—is only effective in coalescence with the others. Every condition is causal; the effect is but the sum of the conditions."

This brings us to the only point of doubt which can possibly exist in regard to the interpretation of my experiment. It is whether our most prominent causal element, the liquor potassæ, exercises its influence (a) partly upon the fluid and partly upon certain otherwise dead or impotent germs still lurking within the vessel, or (b) simply upon the mere chemical constituents of the fluid medium, but in such a way as actually to engender minute particles of living matter which thereafter appear as ferment-organisms.

If a practically dead germ can by any treatment be revived, it may take its place as one of the causal conditions leading to fermentation; hence it is that a certain reserve may still be maintained as regards the absolute proof of the possibility of a germless origin of common fermentations, and the almost simultaneous occurrence of a new birth of living units (archebiosis).

But all similar grounds for reserve are absent—are non-existent, in fact—in regard to the bearing of this experiment upon the possibility of an occasional independent origin for zymotic disease, whether or not such disease is characterized by the appearance within the body of any distinctive living organisms.²

This I will now endeavor to demonstrate.

It is the process of fermentation which is supposed to be in part analogous to the zymotic disease. It is true that a contagious something becomes engendered during fermentation and during zymosis, by means of which the process or the disease may be spread abroad. But there

¹ "Problems of Life and Mind," vol. ii., p. 390.

² The rule is, that organisms are present in fermentations, while they are, so far as we know, quite exceptional in zymotic diseases.

are important differences in regard to the possible independent origin of the two processes which have hitherto been only too much neglected. The treatment of this subject has often been much too superficial. In order to produce a kind of pictorial effect which may easily captivate the imagination, difficulties are often ignored, and many new, modifying, or antagonistic points of view have even of late been treated as though they were non-existent.

A few words will suffice to make plain some of the differences between the respective conditions which would be operative in the germless origin of fermentation on the one hand, and in the *de novo* origin of a contagious disease on the other. And in so doing I shall be able, I think, at the same time, to show how much simpler it would be to bring about an independent zymosis than an independent fermentation—that is, if we are to rely on the analogy upon which the germ-theorists base their arguments.

During the great majority of fermentations, living organisms make their appearance and rapidly multiply. These living organisms have been proved to be common producers of chemical principles, some of which are soluble ferments, others (like pyrogen) are poisons which may be almost as deadly as that of a serpent, while others still are inert and appear as mere pigment-granules. It is proved that some of these chemical principles act as true ferments.¹ It is thought, and it is probable, that the organisms themselves—altogether apart from their media and what else they may contain—may be capable of doing the same. Still this has not yet been definitely proved; so that the action of soluble chemical ferments is at present almost better substantiated than that of the living organisms by which they may have been formed. By means of boiling alcohol and other agents these bodies can be isolated and freed from living impurity. It is, however, much more difficult entirely to separate minute living organisms from their media,² and, consequently, more difficult to be perfectly certain in regard to their potencies. It is, however,

on account of the derivation of the chemical ferments from the living units, and because of the presence of these latter bodies in all fermenting mixtures, that their own agency is still regarded by many as essential to the initiation of ordinary fermentations. But, as I have already indicated, we much need further information as to the precise mode in which fermentation is initiated and carried on by soluble ferments like that which M. Musculus discovered in and separated from urine. If they (all or any of them) are capable of setting up fermentations in germless fluids in the course of which organisms appear, such phenomena would most effectually disprove an exclusive germ-theory.

Turning now to the process of zymosis, we find the available generative conditions altogether different. Here we have to do not with fluids only, but with tissues and organs composed of living elements characterized by all kinds and degrees of activity. Some of them produce the various soluble ferments of the body, some may produce poisons, and others habitually lead to the formation of pigment-granules—vital acts severally similar in kind to those which the common ferment-organisms are known to manifest. Tissue-elements without number having such and multitudes of other properties are, therefore, ever present, capable under certain influences of being more or less easily diverted into unhealthy modes of action, so that many of them may become true living ferments in the modern sense of that term,¹ and therefore possible producers of chemical ferments (contagia) capable of initiating some or the whole of the series of changes by which they were themselves produced, in other suitable sites.

The essential difference between the two problems thus becomes plain. The only point which my experiment leaves in the least doubtful in regard to the causal conditions initiating fermentation is, whether any latent, powerless, and, as it

¹ How legitimate this statement is may be seen from what M. Pasteur himself says. These are his most mature views: "I have been gradually led to look upon fermentation as a necessary consequence of the manifestation of life, when that life takes place without the direct combustion due to free oxygen. . . . We may partially see, as a consequence of this theory, that every being, every organ, every cell which lives or continues its life without making use of atmospheric air, or which uses it in a manner insufficient for the whole of the phenomena of its own nutrition, must possess the characteristics of a ferment with regard to the substance which is the source of its total or complementary heat."—*Comptes Rendus*, 1872, t. lxxv., p. 784.

¹ Pasteur, *Comptes Rendus*, July 3, 1876, p. 4.

² The more efficient means of filtering organisms from their media, which we now possess, by means of porous earthenware, ought to be useful in this direction. Such organisms and their germs might be subsequently washed with several distilled waters, just as a chemist would wash a delicate precipitate. It would be strange, indeed, if this very mild usage interfered with the properties of organisms which at other times are credited with such remarkable powers of endurance.

were, dead organized ferment may still, in spite of the usual evidence to the contrary, lurk in the seemingly "sterilized" fluid. This, however, is the very point about which there is no shadow of doubt in regard to zymosis. Possible ferments without number are, by necessity, present in the form of tissue-elements. So that if we are to be guided by the analogy upon which all germ-theorists so strongly rely, the independent generation of a zymotic process should, for the reason above specified, be incomparably more easy to be brought about than fermentation in a germless fluid. In regard to the independent origin of a zymosis, the all-important point is, not whether latent ferments exist, but whether any causes, or sets of unhygienic conditions, can rouse or modify, in certain special modes, the activity of any of these myriads of potential ferments of which the human organism is so largely composed. And if, as some germ-theorists would have us believe, impotent germs of common ferment-organisms, incapable of exclusion, are also widely disseminated throughout the body, these, if they are such unavoidable elements, could (in regard to the etiology of disease) only be looked upon as components of the body, ranking side by side with the tissue-elements themselves.

Thus such organized ferments or germs as are possibly absent from the "sterilized" experimental fluids are confessedly present by myriads in persons who may be sickening under the influence of various unhygienic conditions or non-specific states of the system; and the only point which is regarded as doubtful in connection with the *de novo* origin of a zymosis is what analogy might lead us to affirm as completely proved by my experiments, viz., that certain conditions, or states of system, may be capable of rousing some of such ferments into a specific kind of activity, wholly apart from the influence of any specific contagia coming from without.¹

¹ While the last sheets of this paper are passing through the press, a very interesting address by Dr. B. W. Richardson, F.R.S., has been published (*Nature*, October 4, 1877), entitled "A Theory as to the Natural or Glandular Origin of the Contagious Diseases." In it the author advances many strong arguments against the germ-theory; he also propounds some interesting speculations as to the mode of origin and action of the chemical principles, or poisons, which constitute, as he believes, the "contagia" of the communicable diseases. Some such views make a very fitting supplement to the doctrines which I have been here attempting to establish in regard to these diseases; only we must, as Dr. Richardson observes, seek gradually to put well-proved facts in the places now occupied by mere speculations. In regard to the practical aspects of the two opposite doctrines, Dr.

Even if independent ferment organisms of common or special kinds do make their appearance during any process of zymosis originated in the manner above suggested, they would, from the point of view of the etiology of disease, be just as much consequences of the morbid influences as proliferation of tissue-elements is a consequence of the direct application of acetic acid or any other irritant.

But here, in order to make this point of view more plain, a short digression is necessary.

The intracellular fermentation in vegetal tissues supplies us with a kind of link between the ordinary processes of fermentation and the zymotic processes of animals. MM. Lechartier and Bellamy, as well as Pasteur and others, have now clearly shown that in vegetal tissues placed under certain abnormal or unhealthy conditions, fermentative phenomena take place essentially similar to those occurring in solutions containing independent ferment-organisms. And just as the vegetal cell can do what, in other cases, the independent organism does, so it is supposed that in the process of zymosis tissue-elements may take on a specifically faulty action, leading to the formation of certain chemical principles or "contagia" in the fluids or tissues of the animal body; so that, in the great majority of zymotic diseases, offcast particles from the body, whether living or dead, when saturated with such principles, may constitute the veritable contagia by which the specific disease is spread abroad among the community.

In the majority of the cases of intracellular fermentation no independent organisms are generated, though in others, as in that of the beet-root and the potato, they are invariable concomitants. Similarly in the majority of zymotic diseases no independent organisms are generated, though in others, such as relapsing fever and

Richardson makes some very pertinent observations. "If the contagium vivum view be true," he says, "if the air around us is charged with invisible germs, which come whence we know not, which have unlimited power to fertilize, which need never cease to fertilize and multiply, what hope is there for the skill of man to overcome these hidden foes? Why on some occasion may not a plague spread over the whole world, and destroy its life universally? While, on the other hand, if the opposite notion be true, we have complete mastery over the diffusion of the poisons of all the communicable diseases. We have but to keep steadily in view that the producing and the reproducing power is in the affected body, and we can, even with our present knowledge, all but completely limit the action to the propagating power of that body—its power. I mean, of secretion and diffusion of secretion.—October 6, 1877.

splenic fever, they are invariable concomitants; and being engendered in diseased parts and fluids they may thereafter themselves act either as real contagia or as carriers of contagion.

The causal conditions capable of inducing fermentation in the beet-root and the potato, and with it the appearance of Bacteria in swarms throughout their tissues, are known, and have no ordinary connection with preëxisting Bacteria. And similarly the causal conditions capable of inducing relapsing fever and splenic fever, though not so definitely known, may nevertheless have no ordinary connection with preëxisting Spirilla and Bacilli resembling those which appear in the blood or tissues of the patients suffering from either of these diseases.

Thus the mere fact that in certain zymotic diseases living organisms have been proved to appear, affords of itself no support whatever to an exclusive germ-theory, as I shall, after this digression, endeavor to show.

The fact may be quite otherwise explained, either (1) in accordance with the views of certain germ-theorists, though these are in direct opposition to the statements of others of the same party; (2) in accordance with the statements of this second section of the germ-theorists, supplemented by a belief in heterogenesis:

1. The presence of latent germs of common though modifiable ferment-organisms throughout the body is invoked by one section of the germ-theorists, who contend that certain altered states of health, together with altered vitality of tissues, may rouse such hitherto latent common organisms into activity, and occasionally convert them into so-called "specific" forms capable of new actions. But based as this view is upon wholly insufficient evidence, and with its fundamental position denied by other leading germ-theorists, it would, even had it been securely founded, be quite inadequate to meet the necessities of their position. A special zymotic disease, which had arisen in the manner above indicated, would assuredly have had what is termed a *de novo* origin—it would have started from no specific cause, and would never have developed, but for the existence of those "determining conditions" which brought about the altered state of health and tissues. This group of conditions would therefore constitute the cause of the disease; and inasmuch as, by the hypothesis we are now considering, the common germs are held to be *ever present and unavoidable*, any changes or developments which they might take on could only be studied in the same rank and side by side with

those of the other tissue elements—that is, as consequences or phenomena of the disease.

2. It was originally affirmed by Prof. Burdon-Sanderson,¹ and it has of late been distinctly reasserted by M. Pasteur,² that the blood and internal tissues of healthy animals and of man are entirely free from ferment-organisms or their germs. Some have sought to modify this view, on the strength of certain experiments which are so extremely inconclusive as to make it almost puerile to have brought them forward.³

For, however strong the evidence is that living units may, on certain occasions, be even proved experimentally to appear in fluids in which no living matter previously existed (archebiosis), it is even stronger to show that, under certain conditions, similar low, independent forms of life may originate in the midst of living tissues previously free from them, by a kind of transformation (heterogenesis) of some of the units of protoplasm, which, though still living, have been modified in nature and tendency by reason of their existence in a partially devitalized area.

The evidence in favor of this last kind of change may be regarded wholly apart from that furnished by the closed-flask experiments, from which it is quite distinct. It suffices, I think, to account for the presence of organisms in some of those local and general diseases with which they are known to be associated, and, therefore, to complete the proof that even such disease may originate *de novo* (as well as by contagion), and that the organisms which characterize them are, in such cases, consequences or concomitant products, not causes of the local or general condi-

¹ "Thirteenth Report of the Medical Officer of the Privy Council."

² *Comptes Rendus*, April 30, 1877, p. 960.

³ Cutting out portions of the internal organs of recently-killed animals, enveloping them with superheated paraffine, and then placing them in an incubator at a suitable temperature to see whether germs and organisms will appear, would, even if taken alone, obviously permit no certain conclusion to be drawn from their appearance. But the evidence relied upon by Sanderson and Pasteur tends as strongly to show that they are not developments of preëxisting germs, as certain other evidence subsequently to be mentioned tends to show that they are heterogenetic products ("Transactions of the Pathological Society," 1875, p. 267). Yet, following a now long-established custom of ignoring the possibility of the heterogenetic origin of Bacteria, the results of such experiments are by some supposed to demonstrate the existence of latent germs in an organ like the spleen, for instance, which is wholly cut off from outside communication—and even when the blood itself is declared to be germless.

tions at whose bidding they appear. The elements of the proof are these :

(a.) First, there is the evidence which has been adduced by various observers as a result of the study by the microscope of the mode in which organisms appear within tissue-elements. I do not lay much stress upon this here, because evidence of such a nature is more open to various objections than that which is to follow.¹

(b.) Although the blood and internal tissues of healthy animals and of man are free from independent organisms and their germs, yet such organisms will habitually show themselves after death, in the course of a few days, throughout all the organs of one of the lower animals or of man—even when life has been abruptly terminated during a state of health. It cannot be said, in explanation of this, that the organisms naturally present in the intestinal canal have been enabled to spread through the body so as to reach its inmost recesses *after death*—since many of the organisms found are motionless, and others have mere to-and-fro movements of a non-progressive character. The blood, again, has ceased to circulate, so that this fluid, germless during life, cannot after death be considered to act even as a carrier. If the organisms themselves cannot make their way through the tissues, and if no carrier exist, they must naturally have been born in or near the sites in which they are found.

Phenomena of this kind are to be witnessed even in insects, such as silk-worms and flies ; and the organisms that habitually develop in them after death are, as in the case of higher animals, just such organisms as appear in some of their best-known contagious diseases.² Certain of these diseases, like "muscardine," seem to be generable *de novo* at the will of the operator by merely placing the animal for a few days under particular sets of unhealthy conditions.

(c.) Some of the ferment-organisms may also be made to appear at will in certain parts of still living and previously healthy animals by determining in any such part either (1) a greatly lowered vital activity, or (2) an active perversion of the nutritive life of the part of considerable intensity :

1. This subject has been studied experimentally by Messrs. Lewis and Cunningham,³ two

thoroughly competent and trustworthy observers, whose researches during recent years have won for them a deservedly high reputation. They say: "The object of the experiments was to ascertain whether, by interfering with the vascular supply of certain tissues and organs of the body of an animal without injuring the isolated tissue, we should be able within the course of some hours to detect organisms in those parts in the same manner as we had been able to do when an animal had been killed under chloroform and set aside in a warm place. We found that such was the result, and that a kidney, for example, when [its artery was] carefully ligatured without interfering with its position in the abdomen, would be found after some hours to contain precisely similar organisms ; whereas the other kidney, whose circulation had not been interfered with, contained no trace of any vegetation whatever."¹

2. Facts of this second order have been thoroughly established by the important researches of Prof. Burdon-Sanderson. He says:² "If a few drops of previously boiled and cooled dilute solution of ammonia are injected underneath the skin of a Guinea-pig, a diffuse inflammation is pro-

¹ On September 17, 1877, I had an opportunity of seeing how far this would hold good for the human subject. On that day I made an examination, twelve hours after death, of the body of a young man who had been suffering from severe heart-disease in University College Hospital. His temperature had only been slightly raised for about forty-eight hours before death ; but there was reason for believing that embolic obstructions had recently occurred in one or both kidneys. Abundant "vegetations" were found on the mitral and aortic valves, and two or three embolic patches existed in each kidney, some being recent and others of older date. One large yellowish embolic patch was likewise found occupying the upper extremity of an enlarged spleen. Some blood from the right ventricle and some urine from the bladder, carefully removed with capillary tubes, on examination with the microscope and a one-twelfth object-glass, showed no organisms of any kind. Portions of tissue cut from the interior of the liver also showed no organisms. On the other hand, the embolic patch in the spleen as well as those in the kidney, both old and recent, showed, when portions of their disintegrated substance were examined, organisms, more or less abundantly distributed, similar to those which Messrs. Cunningham and Lewis have figured. Some were Bacilli, and some were more like what Cohn now distinguishes as Vibriones. They were not so abundant as to be always found without careful examination ; and, on the other hand, in the diseased splenic tissue there were a multitude of small acicular crystals which an inexperienced observer might mistake for motionless organisms. In the lower healthy portion of the spleen no organisms were found.

² "Transactions of the Pathological Society," 1872, pp. 306-368.

¹ On this subject see "Beginnings of Life," vol. ii., p. 342.

² Ibid., pp. 327, note 1, and 330, and "Transactions of the Pathological Society," 1875, p. 243.

³ "The Fungus-Disease of India," Calcutta, 1873, p. 89.

duced, the exudation liquid of which is found after twenty-four hours to be charged with Bacteria. . . . Other chemical agents," he adds, "will lead to the same results, and always under conditions which preclude the possibility of the introduction of any infecting matter from without."

Elsewhere¹ the same investigator refers to experiments which were made about the same time, in order to throw light upon the cause of the appearance of Bacteria in certain peritoneal exudations, and to ascertain whether or not their presence was to be considered as "a mere result of the intensity of the peritonitis." He says: "To determine this, experiments were made during the following month (May, 1871), which consisted in inducing intense peritonitis by the injection, not of exudation liquids, but of chemical irritants, particularly dilute ammonia and concentrated solution of iodine in hydriodic acid. As regards the ammonia, precautions were taken to guard against contamination by boiling and cooling the liquids as well as the implements to be used immediately before injection. In the case of the iodine solution this was, of course, unnecessary. In every instance it was found that the exudation liquids, collected from twenty-four to forty-eight hours after injection, were charged with Bacteria, whence it appeared probable that the existence of these organisms was dependent, not on the nature of the exciting liquid by which the inflammation was induced, but on the intensity of the inflammation itself."

From the various evidence more or less fully referred to in the present section it seems to me legitimate to conclude:

1. That if we are to be guided by the analogy now dwelt upon as existing between fermentation and zymosis, it would be perfectly certain that the latter process can originate *de novo*—that is, under the influence of certain general or special conditions, and where specific contagia of any kind are at first absent, though they subsequently appear as results or concomitant products. So that an exclusive theory of "contagion," as

the only present cause of communicable diseases, is not supported by experimental evidence.

2. That some contagia are mere not-living chemical principles, though others may be living units.

3. That even in the latter case, if the primary contagious action be really due to the living units and not to the media in which they are found, such primary action is probably dependent rather upon the chemical changes or "contact actions" which they are capable of setting up than upon their mere growth and vegetative multiplication.

4. That where we have to do with a true living contagium (whether pus-corpuscle or ferment-organism), the primary changes which it incites are probably of a nature to engender (either in the fluids or from the tissue-elements of the part) bodies similar to itself, so that the infected part speedily swarms therewith. When pus from a certain focus of inflammation comes into contact with a healthy conjunctiva, and therein excites a contagious form of inflammation, no one adopts the absurd notion that all the pus-corpuscles in this second inflammatory focus are the lineal descendants of those which acted as the contagium; and the mode of action may be altogether similar when matter containing Bacilli, by coming into contact with a wounded surface, gives rise to splenic fever and the appearance of such organisms all through the body. The old notion about the excessive self-multiplication of the original contagium is probably altogether erroneous.

Thus all the distinctive positions of those who advocate a belief in the so-called "Germ-Theory of Disease," or rely upon the exclusive doctrine of a "Contagium Vivum," seem to be absolutely broken down and refuted. We may give that attention to the appearance and development of independent organisms in association with morbid processes which the importance of their presence demands, but we must regard them as concomitant products, and not at all, or except to an extremely limited extent, as causes of those local and general diseases with which they are inseparably linked.

¹ "Reports of the Medical Officer of the Privy Council," etc., new series, No. vi., 1875, p. 57.

JOHN STUART MILL'S PHILOSOPHY TESTED.

By W. STANLEY JEVONS, F. R. S.

II.

IN the previous article on John Stuart Mill's "Philosophy," I made the strange assertion that *Mill's mind was essentially illogical*. To those who have long looked upon him as their guide, philosopher, and friend, such a statement must of course have seemed incredible and absurd, and it will require a great body of evidence to convince them that there is any ground for the assertion. My first test of his logicalness was derived from his writings on geometrical science. I showed, by carefully authenticated extracts, that Mill had put forth views which necessarily imply the existence of perfectly straight lines; yet he had at the same time distinctly denied the existence of such lines. It was pointed out that he emphatically promised to use names *always* as the names of things, not as the names of our ideas of things; yet, as straight lines in his opinion do not exist, the name straight line is either the name of "just nothing at all," as James Mill would have said, or else it is the name of our ideas of what they are. It is by experimenting on these ideal straight lines in the mind that we learn the axioms and theorems of geometry according to Mill; nevertheless Mill had denounced, as *the cardinal error of philosophy*, the handling ideas instead of things, and had, indeed, in the earlier editions of the "System of Logic," asserted that not a single truth ever had been arrived at by this method, except truths of psychology. Mill asserted that we might experiment on lines in the mind by prolonging them to any required distance; but these lines according to Mill's own statements must have thickness, and on minute inquiry it was found impossible to attach any definite meaning at all to the *prolongation of a thick line*. Finally, it was pointed out that, when Mill incidentally speaks of an important mathematical theorem concerning the ratio of the diameter and circumference of the circle, he abandons his empirical philosophy *pro tempore*, and speaks of the ratio in question as being discovered by a long train of difficult reasoning.

Such is the summary of the first small installment of my evidence. On some future occasion I shall return to the subject of geometrical reasoning, which is far from being exhausted. It

will then be proved that, on the question whether geometry is an inductive or a deductive science, Mill held opinions of every phase; in one part of his writings geometry is strictly inductive; in another part it is improperly called inductive; elsewhere it is set up as the type of a deductive science, and anon it becomes a matter of direct observation and experiment; presently Mill discovers, unexpectedly, that there is no difference at all between an inductive and a deductive science—the true distinction is between a deductive and an experimental science. But Mill characteristically overlooks the fact that, if the difference lies between a deductive and an experimental science, and not between a deductive and an inductive science, then a similar line of difference must be drawn between an inductive and an experimental science, although Mill's inductive methods are the Four Experimental Methods.

But the origin of our geometrical knowledge is a very slippery subject, as I before allowed. It would not be fair to condemn Mill for the troubles in which he involved himself in regard to such a subject if there were no other counts proved against him. Certainly he selected geometry as a critical test of the truth of his empirical philosophy, but he may have erred in judgment in choosing so trying a test. Let us, therefore, leave geometry for the present, and select for treatment in this second article a much broader and simpler question—one which lies at the basis of the philosophy of logic and knowledge. We will endeavor to gain a firm comprehension of Mill's doctrine concerning the *nature and importance of the relation of Resemblance*. This question touches the very nature of knowledge itself. Now, critics who are considered to be quite competent to judge have declared that Mill's logic is peculiarly distinguished by the thorough analysis which it presents of the cognitive and reasoning processes. Mill has not restricted himself to the empty forms and methods of argument, but has pushed his inquiry, as they think, boldly into the psychology and philosophy of reasoning. In the "System of Logic," then, we shall find it clearly decided whether resemblance is, or is not, the fundamental relation with which reasoning is concerned. It was the doc-

trine of Locke, as fully expounded in the fourth book of his great Essay, that knowledge is the perception of the agreement or disagreement of our ideas.

"Knowledge, then," says Locke, "seems to me to be nothing but the perception of the connection and agreement, or disagreement and repugnancy, of any of our ideas. In this alone it consists. Where this perception is, there is knowledge; and, where it is not, there, though we may fancy, guess, or believe, yet we always come short of knowledge."

Many other philosophers have likewise held that a certain agreement between things, variously described as resemblance, similarity, identity, sameness, equality, etc., really constituted the whole of *reasoned knowledge* as distinguished from the mere knowledge of sense. Condillac adopted this view, and stated it with admirable breadth and brevity, saying, "*L'évidence de raison consiste uniquement dans l'identité.*"

Mill has not failed to discuss this matter, and his opinion on the subject is most expressly and clearly stated in the chapter upon "The Import of Propositions."¹ He analyzes the state of mind called Belief, and shows that it involves one or more of five matters of fact—namely, Existence, Coexistence, Sequence, Causation, Resemblance. One or other of these is asserted (or denied) in every proposition which is not merely verbal. No doubt relations of the kinds mentioned form a large part of the matter of knowledge, and they must be expressed in propositions in some way or other. I believe that they are expressed in the terms of propositions, while the copula always signifies *agreement*, or, as Condillac would have said, *identity* of the terms. But we need not attempt to settle a question of this difficulty. We are only concerned now with the position in his system which Mill assigns to Resemblance. This comes last in the list, and it is with some expression of doubt that Mill assigns it a place at all. He says:²

"Besides propositions which assert a sequence or coexistence between two phenomena, there are, therefore, also propositions which assert resemblance between them—as, this color is like that color; the heat of to-day is *equal* to the heat of yesterday. It is true that such an assertion might with some plausibility be brought within the description of an affirmation of sequence by considering it as an assertion that the simultaneous contemplation of the two colors is *followed* by a spe-

cific feeling termed the feeling of resemblance. But there would be nothing gained by encumbering ourselves, especially in this place, with a generalization which may be looked upon as strained. Logic does not undertake to analyze mental facts into their ultimate elements. Resemblance between two phenomena is more intelligible in itself than any explanation could make it, and under any classification must remain specifically distinct from the ordinary cases of sequence and coexistence."

It would seem, then, that Mill had, to say the least, contemplated the possibility of resolving Resemblance into something simpler—namely, into a special case of sequence and coexistence; but he abstains, not apparently because it would be plainly impossible, but because logic does not undertake ultimate analysis. It would encumber us with a "strained generalization," whatever that may be. He therefore accords it provisionally a place among the matters of fact which logic treats.

Postponing further consideration of this passage, we turn to a later book of the "System of Logic," in which Mill expresses pretty clearly his opinion that Resemblance is a *minor kind of relation* to be treated last in the system of Logic, as being of comparatively small importance. In the chapter headed "Of the Remaining Laws of Nature,"¹ we find Mill distinctly stating that² "the propositions which affirm Order in Time, in either of its two modes, Coexistence and Succession, have formed, thus far, the subject of the present book. And we have now concluded the exposition, so far as it falls within the limits assigned to this work, of the nature of the evidence on which these propositions rest, and the processes of investigation by which they are ascertained and proved. There remain three classes of facts: Existence, Order in Place, and Resemblance, in regard to which the same questions are now to be resolved."

From the above passage we should gather that Resemblance has not been the subject treated in the preceding chapters of the third book, or certainly not the chief subject.

Of the remaining three classes of facts, Existence is dismissed very briefly. So far as relates to simple existence, Mill thinks³ that the inductive logic has no knots to untie, and he proceeds to the remaining two of the great classes into which facts have been divided. His opinion

¹ Book I., chapter v.

² Book I., chapter v., section 6.

¹ Book III., chapter xxiv.

² First section, near the beginning.

³ Same section.

about Resemblance is clearly stated in the second section of the same chapter, as follows :

"Resemblance and its opposite, except in the case in which they assume the names of Equality and Inequality, are seldom regarded as subjects of science; they are supposed to be perceived by simple apprehension; by merely applying our senses or directing our attention to the two objects at once, or in immediate succession."

After pointing out that we cannot always bring two things into suitable proximity, he adds :

"The comparison of two things through the intervention of a third thing, when their direct comparison is impossible, is the appropriate scientific process for ascertaining resemblances and dissimilarities, and is the sum total of what Logic has to teach on the subject.

"An undue extension of this remark induced Locke to consider reasoning itself as nothing but the comparison of two ideas through the medium of a third, and knowledge as the perception of the agreement or disagreement of two ideas: doctrines which the Condillac school blindly adopted, without the qualifications and distinctions with which they were studiously guarded by their illustrious author. Where, indeed, the agreement or disagreement (otherwise called resemblance or dissimilarity) of any two things is the very matter to be determined, as is the case particularly in the sciences of quantity and extension, there the process by which a solution, if not attainable by direct perception, must be indirectly sought, consists in comparing these two things through the medium of a third. But this is far from being true of all inquiries. The knowledge that bodies fall to the ground is not a perception of agreement or disagreement, but of a series of physical occurrences, a succession of sensations. Locke's definitions of knowledge and of reasoning required to be limited to our knowledge of, and reasoning about, Resemblances."

We learn from these passages, then, that science and knowledge have little to do with resemblances. Except in the case of equality and inequality, *resemblance is seldom regarded as the subject of science*, and Mill apparently accepts what he holds to be the prevailing opinion. The sum total of what logic has to teach on this subject is that two things may be compared through the intervention of a third thing, when their direct comparison is impossible. Locke *unduly* extended this remark when he considered reasoning itself as nothing but the comparison of two ideas through the medium of a third. Locke's definitions of knowledge and of reasoning require to be limited to our knowledge of, and reasoning about, resemblances.

In the preceding part of the third book of the "System of Logic," then, we have not been concerned with Resemblance. The subjects discussed have been contained in propositions which affirm Order in Time, in either of its modes, Co-existence and Succession. Resemblance is another matter of fact, which has been postponed to the twenty-fourth chapter of the third book, and there dismissed in one short section, as being *seldom regarded as a subject of science*. Under these circumstances we should hardly expect to find that Mill's so-called Experimental Methods are wholly concerned with resemblance. Certainly these celebrated methods are the subject of science; they are, according to Mill, the great methods of scientific discovery and inductive proof; they form the main topic of the third book of the Logic, indeed, they form the central pillars of the whole "System of Logic." It is a little puzzling, then, to find that the names of these methods seem to refer to Resemblance, or to something which much resembles resemblance. The first is called the Method of Agreement; the second is the Method of Difference; the third is the Joint Method of Agreement and Difference; and the remaining two methods are confessedly developments of these principal methods. Now, does Agreement mean Resemblance or not? If it does, then the whole of the third book may be said to treat of a relation which Mill has professedly postponed to the second section of the twenty-fourth chapter.

Let us see what these methods involve. The canon of the first method is stated in the following words,¹ which many an anxious candidate for academic honors has committed to memory :

"If two or more instances of the phenomenon under investigation have only one circumstance in common, the circumstance in which alone all the instances agree, is the cause (or effect) of the given phenomenon."

Now, when two or more instances of the phenomenon under investigation agree, do they, or do they not, resemble each other? Is agreement the same relation as resemblance, or is it something different? If, indeed, it be a separate kind of relation, it must be matter of regret that Mill did not describe this relation of agreement when treating of the "Import of Propositions." Surely the propositions in which we record our observations of "the phenomenon under investigation" must affirm agreement or difference, and as the experimental methods are the all-important

¹ Book III., chapter viii., section 1. near the end.

instruments of science, these propositions must have corresponding importance. Perhaps, however, we shall derive some light from the context; reading on a few lines in the description of the Method of Difference,¹ we find Mill saying that—

"In the Method of Agreement we endeavored to obtain instances which agreed in the given circumstance but differed in every other: in the present method (i. e., the Method of Difference) we require, on the contrary, two instances resembling one another in every other respect, but differing in the presence or absence of the phenomenon we wish to study."

It would really seem, then, as if the great Experimental Method depends upon our discovering two instances *resembling* one another. Here resemblance is specified by name. We seem to learn clearly that Agreement must be the same thing as Resemblance; if so, Difference must be its opposite. Proceeding accordingly to consider the Method of Difference, we find its requirements described in these words:² "The two instances which are to be compared with one another must be exactly similar, in all circumstances except the one which we are attempting to investigate."

This exact similarity is not actual identity, of course, because the instances are *two*, not *one*. Is it, then, resemblance? If so, we again find the principal subject of Mill's Logic to be that which he relegated to section 2 of chapter xxiv. If we proceed with our reading of Mill's chapter on the "Four Experimental Methods," we still find sentence after sentence dealing with this relation of resemblance, sometimes under the very same name, sometimes under the names of similarity, agreement, likeness, etc. As to its apparent opposite, *difference*, it seems to be the theme of the whole chapter. The Method of Difference is that wonderful method which can prove the most general law on the ground of two instances! But of this peculiarity of the Method of Difference I shall treat on another occasion.

Perhaps, however, after all, I may be misrepresenting Mill's statements. It crosses my mind that by Resemblance he may mean something different from *exact similarity*. The Methods of Agreement and Difference may require that complete likeness which we should call *identity of quality*. It is only fair to inquire, then, whether he uses the word Resemblance in a broad or a

narrow sense. On this point Mill leaves us in no doubt; for he says distinctly,¹ "This resemblance may exist in all conceivable gradations, from perfect undistinguishableness to something extremely slight."

Again, on the next page, while distinguishing carefully between such different things as numerical identity and indistinguishable resemblance, he clearly countenances the wide use of the word resemblance, saying,² "Resemblance, when it exists in the highest degree of all, amounting to undistinguishableness, is often called identity." It seems, then, that all grades of likeness or similarity, from indistinguishable identity down to *something extremely slight*, are properly comprehended under resemblance; and it is difficult to come to any other conclusion than that the agreement and similarity and difference treated throughout the Experimental Methods are all cases of that minor relation, seldom considered the subject of science, which was postponed by Mill to the second section of the twenty-fourth chapter.

But the fact is, that I have only been playing with this matter. I ought to have quoted at once a passage which was in my mind all the time—one from the chapter on the Functions and Value of the Syllogism. Mill sums up the conclusion of a long discussion in the following words:³

"We have thus obtained what we were seeking, a universal type of the reasoning process. We find it resolvable in all cases into the following elements: Certain individuals have a given attribute; an individual or individuals resemble the former in certain other attributes; therefore they resemble them also in the given attribute."

All reasoning, then, is resolvable into a case of resemblance; the word *resemble* is itself used twice over, and, as I shall hereafter show, the word *attribute*, synonymous with *property*, is but another name, according to Mill, for resemblance. It is true that this quotation is taken from the second book of the System, not from the preceding part of the third book to which Mill referred as not having treated of resemblance. But this can hardly matter, as he speaks of the *universal type of the reasoning process*, which must include, of course, the whole of the inductive methods expounded in the third book.

But, in case the reader should not be quite satisfied, I will give yet one more quotation, taken

¹ Same chapter, second section.

² Same chapter, third section, third paragraph, fourth line.

¹ Book I., chapter iii., section 11, paragraph 4.

² Same section, fifth paragraph, third line.

³ Book II., chapter iii., section 7, at beginning.

from the twentieth chapter of the third book, a chapter, therefore, which closely precedes the chapter on "The Remaining Laws of Nature," where Mill dispatches Resemblance. This chapter treats nominally of analogy, but what must be our surprise to find that in reality it treats from beginning to end of Resemblance! This is the way in which he describes reasoning by analogy:¹

"It is, on the whole, more usual, however, to extend the name of analogical evidence to arguments from any sort of resemblance, provided they do not amount to a complete induction: without peculiarly distinguishing resemblance of relations. Analogical reasoning, in this sense, may be reduced to the following formula: Two things resemble each other in one or more respects; a certain proposition is true of the one; therefore, it is true of the other. But we have nothing here by which to discriminate analogy from induction, since this type will serve for all reasoning from experience. In the strictest induction, equally with the faintest analogy, we conclude because A resembles B in one or more properties, that it does so in a certain other property."

It seems, then, that the universal type of the reasoning process wholly turns upon the pivot of resemblance. The stone which was despised and slightly treated in a brief section of the twenty-fourth chapter, has become the corner-stone of Mill's logical edifice. It would almost seem as if Mill were one of those persons who are said to think independently with the two halves of their brain. On the one side of the great longitudinal fissure must be held the doctrine that resemblance is seldom a subject of science; on the other side, Mill must have thought out the important place which resemblance holds as the universal type of the reasoning and inductive processes. Double-mindedness, the Law of Obliviscence, or some *Deus ex machina*, must be called in; for it is absurd to contemplate the possibility of reconciling Mill's statement of the *universal type of all reasoning* with his remarks upon Locke's doctrine. Locke, he says in the passage already quoted, *unduly extended the importance of resemblance, when he made all reasoning a case of it*, and Locke's definition of knowledge and of reasoning required to be limited to our knowledge of and reasoning about resemblances. Yet, according to Mill himself, the *universal type of all reasoning* turns wholly on resemblance. Under such circumstances, it is impossible to discuss seriously

ly the value of Mill's analysis of knowledge. Which part of the analysis are we to discuss? That in which resemblance is treated as the basis of all reasoning, or that in which it belongs to the "remaining" and "minor matters of fact," which had not been treated in the books of induction, and which therefore remained to be disposed of?

We have not yet done with this question of resemblance; it is the fundamental question as regards the theory of knowledge and reasoning, and, even at the risk of being very tedious, I must show that in the deep of Mill's inconsistency there is still a lower deep. I have to point out that some of his opinions concerning the import of propositions may be thus formulated:

1. The names of attributes are names for the resemblances of our sensations.
2. Certain propositions affirm the possession of properties, or attributes, or common peculiarities.
3. Such propositions do not, properly speaking, assert resemblance at all.

Proceeding in the first place to prove that Mill has made statements of the meaning attributed to him, we find the matter of the first in a note¹ written by Mill in answer to Mr. Herbert Spencer, who had charged Mill with confounding exact likeness and literal identity. With the truth of this charge we will not concern ourselves now; we have only to notice the following distinct statement: "What, then, is the common something which gives a meaning to the general name? Mr. Spencer can only say, it is the similarity of the feelings; and I rejoin, the attribute is precisely that similarity. The names of attributes are in their ultimate analyses names for the resemblances of our sensations (or other feelings). Every general name, whether abstract or concrete, denotes or connotes one or more of those resemblances." Mill's meaning evidently is that when you apply a general name to a thing, as for instance in calling snow *white*, you mean that there is a resemblance between snow and other things in respect of their whiteness. The general name *white* connotes this resemblance; the abstract name *whiteness* denotes it.

Let us now consider a passage in the chapter on the Import of Propositions, which must be quoted at some length:²

¹ Book II., chapter ii., section 3, near the beginning of the third paragraph of the foot-note. This note does not occur in some of the early editions.

² Book I., chapter v., section 6, second paragraph.

¹ Book III., chapter xx., beginning of second section.

"It is sometimes said that all propositions whatever, of which the predicate is a general name, do, in point of fact, affirm or deny resemblance. All such propositions affirm that a thing belongs to a class; but things being classed together according to their resemblance, everything is of course classed with the things which it is supposed to resemble most; and thence, it may be said, when we affirm that gold is a metal, or that Socrates is a man, the affirmation intended is, that gold resembles other metals, and Socrates other men, more nearly than they resemble the objects contained in any other of the classes coördinate with these."

Of this doctrine Mill goes on to speak in the following curious remarks,¹ to which I particularly invite the reader's attention:

"There is some slight degree of foundation for this remark, but no more than a slight degree. The arrangement of things into classes, such as the class *metal*, or the class *man*, is grounded indeed on a resemblance among the things which are placed in the same class, but not on a mere general resemblance: the resemblance it is grounded on consists in the possession by all those things, of certain common peculiarities; and those peculiarities it is which the terms connote, and which the propositions consequently assert; not the resemblance. For though when I say, Gold is a metal, I say by implication that if there be any other metals it must resemble them, yet if there were no other metals I might still assert the proposition with the same meaning as at present, namely, that gold has the various properties implied in the word metal; just as it might be said, Christians are men, even if there were no men who were not Christians. Propositions, therefore, in which objects are referred to a class because they possess the attributes constituting the class, are so far from asserting nothing but resemblance, that they do not, properly speaking, assert resemblance at all."

I have long wondered at the confusion of ideas which this passage exhibits. We are told that the arrangement of things in a class is founded on a resemblance between the things, but not a "mere general resemblance," whatever this may mean. It is grounded on the possession of certain "common peculiarities." I pass by the strangeness of this expression; I should have thought that *common peculiarity* is a self-contradictory expression in its own terms; but here it seems to mean merely *attribute* or *quality*. The terms then connote this attribute, not the resemblance. Here we are in direct and absolute conflict with Mill's previous statement that *attribute*

is precisely that similarity—that common something—which gives a meaning to the general name, and that the names of attributes are, in their ultimate analysis, *names for the resemblances* of our sensations. Previously he said that "every general name" connotes one or more of these resemblances; now he says that it is "these peculiarities" which the terms connote, and which the propositions consequently assert, not the resemblances. But these peculiarities are *common peculiarities*—that is, common qualities or attributes. The self-contradiction is absolute and complete, except, indeed, so far as Mill admits that there is "some slight degree of foundation" for the remark which he is controverting.

We will afterward consider what is this *slight degree of foundation*; but proceeding for the present with the interpretation of the remarkable passage quoted, we learn that when I say, "Gold is a metal," I may imply that if there are other metals it must resemble them; yet, if there were no other metals, I might still assert that gold has the various properties implied in the word metal. The "Law of Obliviscence" seems to have been at work here; Mill must have quite forgotten that he was speaking of propositions, "of which the predicate is a general name," or the name of a class. Now if, as Mill sometimes holds, a class consists only of the things in it,¹ there must be more metals than gold, else metal would not be a general name. If, as Mill elsewhere says, to the contrary effect, the class may exist whether the things exist or not,² we still have him on the other horn of the dilemma; for then the meaning of the general name must consist in its connotation, which consists of attributes, which are but another name for resemblances. Yet, forsooth, the proposition does not, properly speaking, assert resemblances at all.

The important passage quoted above is, as we might readily expect, inconsistent with various other statements in the "System of Logic," as, for instance, most of the seventh section of the chapter on "Definition," where we are told³ that the philosopher "only gives the same name to things which resemble one another in the same definite particulars," and that the inquiry into a definition⁴ "is an inquiry into the resemblances and differences among those things." Elsewhere we

¹ "System of Logic," Book II., chapter ii., section 2, fourth paragraph.

² Book I., chapter vii., section 1, first paragraph.

³ Book I., chapter viii., section 7, paragraph 4, about the seventeenth line. This section is numbered 8 in some of the early editions.

⁴ Same section, paragraph 8, line 7.

¹ Same section, third paragraph.

are told¹ that "the general names given to objects imply attributes, derive their whole meaning from attributes; and are chiefly useful as the language by means of which we predicate the attributes which they connote." Again, in the chapter on the "Requisites of a Philosophical Language," he says:²

"Now the meaning (as has so often been explained) of a general connotative name resides in the connotation; in the attribute on account of which, and to express which, the name is given. Thus, the name of animal being given to all things which possess the attributes of sensation and voluntary motion, the word connotes those attributes exclusively, and they constitute the whole of its meanings."

Now, *the attribute, as we learned at starting, is but another name for a Resemblance, and yet a proposition of which the predicate is a general name, does not, properly speaking, assert resemblance at all.*

The inconsistency is still more striking when we turn to another work, namely, John Stuart Mill's edition of his father's "Analysis of the Human Mind." Here, in a note³ on the subject of classification, Mill objects to his father's ultra-nominalist doctrine, that "men were led to class solely for the purpose of economizing in the use of names." Mill proceeds to remark⁴ that "we could not have dispensed with names to mark the points in which different individuals resemble one another: and these are class-names." Referring to his father's peculiar expression—"individual qualities"—he remarks very properly:

"It is not *individual* qualities that we ever have occasion to predicate. . . . We never have occasion to predicate of an object the individual and instantaneous impressions which it produces in us. The only meaning of predicating a quality at all, is to affirm a resemblance. When we ascribe a quality to an object, we intend to assert that the object affects us in a manner similar to that in which we are affected by a known class of objects."

A few lines farther down he proceeds:

"Qualities, therefore, cannot be predicated without general names; nor, consequently, without classification. Wherever there is a general name there is a class; classification, and general names, are things exactly coextensive."

¹ Book IV., chapter iii., eight lines from end of chapter.

² Book IV., chapter iv., section 2, second line.

³ Vol. i., p. 260.

⁴ Page 261.

This is, no doubt, quite the true doctrine; but what becomes of the paragraph already quoted, which appeared in eight editions of the "System of Logic," during Mill's lifetime? In that paragraph he asserted that propositions referring an object to a class because they possess the attributes constituting the class, do not, properly speaking, assert resemblance at all. Now, when commenting on his father's doctrine, Mill says that *the only meaning of predicating a quality at all, is to affirm a resemblance.*

In a later note in the same volume Mill is, if possible, still more explicit in his assertion that the predication of general names is a matter of attributes and resemblances. He begins thus:¹

"Rejecting the notion that classes and classification would not have existed but for the necessity of economizing names, we may say that objects are formed into classes on account of their resemblance."

On the next page he says in the most distinct manner:

"Still, a class-name stands in a very different relation to the very definite resemblances which it is intended to mark, from that in which it stands to the various accessory circumstances which may form part of the image it calls up. There are certain attributes common to the entire class, which the class-name was either deliberately selected as a mark of, or, at all events, which guide us in the application of it. These attributes are the real meaning of the class-name—are what we intend to ascribe to an object when we call it by that name."

There can be no possible mistake about Mill's meaning now. The class-name is *intended to mark definite resemblances*. These resemblances must be the attributes which the class-name was either deliberately selected as a mark of, or which guide us in the application of it. These attributes are the *real meaning* of the class-name—are *what we intend to ascribe to an object*, when we call it by that name. Yet we were told in the passage of the "System of Logic" to which I invited the reader's special attention, that propositions in which objects are referred to a class, because they possess the attributes constituting the class, are so far from asserting nothing but resemblance, that they do not, *properly speaking*, assert resemblance at all. A class-name is now spoken of as *intended to mark definite resemblances*. Previously we were informed that, in saying, "Gold is a metal," I do not assert re-

¹ James Mill's "Analysis of the Human Mind," new edition, vol. i., p. 288.

semblance, forsooth, because there might be no other metal but gold. Yet *metal* is spoken of as a class, so that the word *metal* is a class-name, and the whole discussion refers to propositions of which the predicates are general names.

The fact is, the passage contains more than one *non-sequitur*; it tacitly assumes that *metal* might continue to be a class-name, while there was only one kind of metal, so that there would be nothing else to resemble. Then there is another *non-sequitur* when Mill proceeds straightway to another example, thus—"just as it might be said, Christians are men, even if there were no men who were not Christians." The words "just as" here mean that this example bears out the last; but Christians and men being plural, the predicate *men* is now clearly a class-name, and the meaning is that Christians all resemble each other in the attributes connoted by the class-name *man*. Mill adds, indeed, the words "even if there were no men who were not Christians." Here is unquestionable confusion of thought. *Man* is a class-name and connotes the definite resemblances of the objects in the class, even if the class happens to be coextensive with the class *Christians*. If I say, "Men are capable of laughter," the general predicate "capable of laughter" connotes a character in which men resemble each other, even though there be no beings capable of laughter who are not men. Thus, when we closely examine the passage in question, it falls to pieces; it has no logical coherence.¹

I may remark incidentally that it is strange to meet, in a discussion of the fundamental principles of logic and knowledge, with things which have a *slight degree of foundation*. The elementary principles of a science either are true or are not true. There is no middle term. Degree in such matters is out of place. But in Mill's philosophical works, as I shall have various opportunities to show, there is a tendency to what may be called *philosophical trimming*. Instead of saying outright that a thing is false, he says too frequently that it is "not strictly true," as in the case referring to the primary ideas of geometry quoted in my last article. Mill's opinions, in fact, so frequently came into conflict with each other, that he acquired the habit of leaving a lit-

tle room to spare in each of his principal statements: they required a good deal of fitting together. Now "the slight degree of foundation" for the remark that propositions, of which the predicate is a general name, do assert resemblance, seems to be explained in the two paragraphs which follow that quoted, and these we will now consider.

Mill proceeds to remark¹ that there is sometimes a convenience in extending the boundaries of a class so as to include things which possess in a very inferior degree, if in any, some of the characteristic properties of the class, provided that they resemble that class more than any other. He refers to the systems of classification of living things, in which almost every great family of plants or animals has a few anomalous genera or species on its borders, which are admitted by a kind of courtesy. It is evident, however, that a matter of this sort has nothing to do with the fundamental logical question whether propositions assert resemblance or not. This paragraph is due to the ambiguity of the word *resemblance*, which here seems to mean vague or slight resemblance, as distinguished from that incontestable resemblance which enables us to say that things have the same attribute. In fact, a very careful reader of the sections in which Mill treats of resemblance will find that there is frequent confusion between definite resemblance, and something which Mill variously calls "mere general resemblance" or "vague resemblance," which will usually refer to similarities depending on the degree of qualities, or the form of objects.

There is, however, a second case bearing out Mill's opinion that there is "some slight degree of foundation" for the remark that propositions whose predicates are general terms affirm resemblance. This is a matter into which we must inquire with some care, so that I give at full length the paragraph relating to it:²

"There is still another exceptional case, in which, though the predicate is the name of a class, yet in predicating it we affirm nothing but resemblance, that class being founded not on resemblance in any given particular, but on general unanalyzable resemblance. The classes in question are those into which our simple sensations, or rather simple feelings, are divided. Sensations of white, for instance, are classed together, not because we can take them to pieces, and say they are alike in this, and not alike in that, but because

¹ In my own opinion, an affirmative proposition asserts resemblance in its highest degree, i. e., identity, even when the subject and predicate are singular terms; but to prevent confusion, I argue the question on Mill's assumption that the predicate is a general or class name.

¹ Book I., chapter v., section 6, fourth paragraph h.

² Book I., chapter v., section 6, paragraph 5.

we feel them to be alike together, though in different degrees. When, therefore, I say, 'The color I saw yesterday was a white color;' or, 'The sensation I feel is one of tightness,' in both cases the attribute I affirm of the color or of the sensation is mere resemblance—simple likeness to sensations which I have had before, and which have had those names bestowed upon them. The names of feelings, like other concrete general names, are connotative; but they connote a mere resemblance. When predicated of any individual feeling, the information they convey is that of its likeness to the other feelings which we have been accustomed to call by the same name. Thus much may suffice in illustration of the kind of propositions in which the matter of fact asserted (or denied) is simple resemblance."

Such a paragraph as the above is likely to produce intellectual vertigo in the steadiest thinker. In an off-hand manner we are told that *this much may suffice* in illustration of an *exceptional case* in which resemblance happens to be predicated. This resemblance is mentioned slightly as *mere* resemblance, or *general unanalyzable resemblance*. Yet, when we come to inquire seriously what this resemblance is, we find it to be that primary relation of sensation to sensation, which lies at the basis of all thought and knowledge. Prof. Alexander Bain is supposed to be, since Mill's death, a mainstay of the empirical school, and, in his works on "Logic," he has unfortunately adopted far too much of Mill's views. But, in Prof. Bain's own proper writings, there is a vigor and logical consistency of thought for which it is impossible not to feel the greatest respect.

Now we find Mr. Bain laying down, at the commencement of his writings on the intellect,¹ that the primary attributes of intellect are: 1. Consciousness of difference; 2. Consciousness of agreement; and, 3. Retentiveness. He goes on to say with admirable clearness that discrimination or feeling of difference is an essential of intelligence. The beginning of knowledge, or ideas, is the discrimination of one thing from another. As we can neither feel nor know without a transition or change of state, every feeling, and every cognition, must be viewed as in relation to some other feeling or cognition. There cannot be a single or absolute cognition.

Then, again, Mr. Bain proceeds to say that

¹ "Mental and Moral Science. A Compendium of Psychology and Ethics," 1868, pp. 82, 83. The same doctrine of the nature of knowledge is stated in the treatise on "The Senses and the Intellect," second edition, pp. 325-331; in the "Deductive Logic," pp. 4, 5, 9, and elsewhere.

the conscious state arising from agreement in the midst of difference is equally marked and equally fundamental:

"Supposing us to experience, for the first time, a certain sensation, as redness; and, after being engaged with other sensations, to encounter redness again; we are struck with the feeling of identity, or recognition; the old state is recalled at the instance of the new by the fact of agreement, and we have the sensation of red, together with a new and peculiar consciousness, the consciousness of agreement in diversity. As the diversity is greater, the shock of agreement is more lively."

Then Prof. Bain adds, emphatically:

"All knowledge finally resolves itself into differences and agreements. To define anything, as a circle, is to state its agreements with some things (genus) and its difference from other things (differentia)."

Prof. Bain then treats as the fundamental act of intellect the recognition of redness as identical with redness previously experienced. This is changing red for white, exactly the same illustration as Mill used in the example, "The color I saw yesterday was a white color." Now Mr. Bain says, and says truly, that all knowledge finally resolves itself into differences and agreements. Propositions, accordingly, which affirm these elementary relations, must really be the most important of all classes of propositions. They must be the elementary propositions which are presupposed or summed up in more complicated ones. Yet such is the class of propositions which Mill dismisses in an off-hand manner in one paragraph as "still another exceptional case."

If we look into the details of Mill's paragraph, perplexity only can be the result. He speaks of "the class being founded not on resemblance in any given particular, but on *general unanalyzable resemblance*." The classes in question are those into which "our simple sensations, or rather simple feelings, are divided." Now, what can he possibly mean by *any given particular*? If the color I saw yesterday was a white color, that was the given particular in which resemblance existed. No doubt the resemblance is unanalyzable, because analysis has done its best, and the matter refers, Mill states, to a *simple sensation*. When we are dealing with the elements of knowledge, of course analysis is no longer applicable. But I confess myself unable to understand why he calls it *general unanalyzable resemblance*. If I understand the matter aright, Mill should have said *specific analyzed resemblance*. When one red flower is noticed to resemble an-

other red flower in color, the general resemblance *has been analyzed* and found to consist in a specific resemblance of color to color. If I see an orange, I know it to be an orange, because it resembles similar fruits which I have often heard so called. In the first instance, the resemblance may be to my mind mere general resemblance; that is to say, I may not devote separate attention to the several points of resemblance. But if one asks me why I call it an orange, I must analyze my feeling of resemblance, and I then discover that the color of the fruit resembles the color of fruit formerly called oranges, and that in regard to the form, the texture of the surface, the hardness, the smell, and so forth, there are other resemblances. My knowledge, as Prof. Bain says, finally resolves itself *into differences and agreements*. But the agreements in question are precisely those resemblances—the base-work of all knowledge—which Mill dismisses as *still another exceptional case*.

There is really no mystery or perplexity in the matter, except such as Mill has created by the perversity of his intellect. Mill has made that into a species, which is really the *summum genus* of knowledge. Locke truly pronounced knowledge to consist in the perception of agreement or repugnance of our ideas, and Prof. Bain has stated the same view with a force and distinctness which leave nothing to be desired. But Mill, strange to say, has treated this all-fundamental relation among "The Remaining Laws of Nature," "Minor Matters of Fact," or "Exceptional Cases." It is usually impossible to trace the causes which led to Mill's perversities, but, in this important case, it is easy to explain the peculiarity of his views on Resemblance. He was laboring under *hereditary prejudice*. His father, James Mill, in his most acute but usually wrong-headed book, the "Analysis of the Phenomena of the Human Mind," had made still more strange mistakes. In several curious passages the son argues that we cannot resolve resemblance into anything simpler. These needless arguments are evidently suggested by parts of the "Analysis" in which the father professed to *resolve resemblances into cases of sequence*!

Thus, when James Mill is discussing¹ the "Association of Ideas," he objects to Hume specifying Resemblance as one of the grounds of association. He says:

"Resemblance only remains, as an alleged

principle of association, and it is necessary to inquire whether it is included in the laws which have been above expounded. I believe it will be found that we are accustomed to see like things together. When we see a tree, we generally see more trees than one; when we see an ox, we generally see more oxen than one; a sheep, more sheep than one; a man, more men than one. From this observation, I think, we may refer resemblance to the law of frequency, of which it seems to form a particular case."

I cannot help regarding the misapprehension contained in this passage as perhaps the most extraordinary one which could be adduced in the whole range of philosophical literature. Resemblance is reduced to a *particular case of the law of frequency*, that is, to the frequent recurrence of the same thing, as when, in place of one man, I see many men. But how do I know that they are men, unless I observe that they resemble each other? It is impossible even to speak of *men* without implying that there are various things called men which resemble each other sufficiently to be classed together and called by the same name. Nevertheless James Mill seems to have been actually under the impression that he had got rid of resemblance!

Later on in the same work,¹ indeed, we have the following statement:

"It is easy to see, among the principles of association, what particular principle it is, which is mainly concerned in Classification, and by which we are rendered capable of that mighty operation; on which, as its basis, the whole of our intellectual structure is reared. That principle is Resemblance. It seems to be similarity or resemblance which, when we have applied a name to one individual, leads us to apply it to another, and another, till the whole forms an aggregate, connected together by the common relation of every part of the aggregate to one and the same name. Similarity, or Resemblance, we must regard as an Idea familiar and sufficiently understood for the illustration at present required. It will itself be strictly analyzed, at a subsequent part of this inquiry."

In writing this passage, James Mill seems to have forgotten, quite in the manner of his son, that he had before treated Resemblance as an *alleged* principle of association, and had referred it to a particular case of the law of frequency. Here it reappears as the principle on which the whole of our intellectual structure is reared. It is strange that so important a principle should elsewhere be called an "alleged principle," and

¹ "Analysis:" first edition, vol. i., p. 79; second edition, vol. i., p. 111.

¹ "Analysis:" first edition, vol. i., pp. 212, 213; second edition, vol. i., pp. 270, 271.

equally strange that it should afterward be "strictly analyzed." Before we get down to the basis of our intellectual structure it might be supposed that analysis had exhausted itself.

James Mill gives no reference to the subsequent part of the inquiry where this analysis is carried out, nor do I find that John Stuart Mill, or the other editors of the second edition, have supplied the reference. Doubtless, however, the analysis is given in the second section of chapter xiv., where, in treating of "Relative Terms,"¹ he inquires into the meaning of Same, Different, Like, or Unlike, and comes to the conclusion that the resemblance between sensation and sensation is, after all, only sensation. He says:

"Having *two* sensations, therefore, is not only having sensation, but the only thing which can, in strictness, be called having sensation; and the having two and knowing they are two, which are not two things, but one and the same thing, is not only sensation, and nothing else than sensation, but the only thing which can, in strictness, be called sensation. The having a new sensation, and knowing that it is new, are not two things, but one and the same thing."

This is, no doubt, a wonderfully acute piece of sophistical reasoning; but I have no need to occupy space in refuting it, because John Stuart Mill has already refuted it in several passages which evidently refer to his father's fallacy. Thus I have already quoted, at the commencement of this article, a statement in which John Stuart Mill argues that resemblance between two phenomena is more intelligible than any explanation could make it. Again, in editing his father's "Analysis," Mill comments at some length upon this section,² showing that it does not explain anything, nor leave the likenesses and unlikenesses of our simple feelings less ultimate facts than they were before.

But though Mill thus refuses to dissolve resemblance away altogether, his thoughts were probably warped in youth by the perverse doctrines which his father so unsparingly forced upon his intellect. Too early the brain-fibres received a decided *set*, from which they could not recover, and all the power and acuteness of Mill's intellect were wasted in trying to make things fit, which could not fit, because mistakes had been made in the very commencement of the structure.

This misapprehension of the Mills, *père et fils*, concerning resemblance, is certainly one of

the most extraordinary instances of perversity of thought in the history of philosophy. That which is the *summum genus* of reasoned knowledge, they have either attempted to dissolve away altogether, or, after grudgingly allowing its existence, have placed in the position of a minor species and exceptional case. Yet it is impossible to use any language at all without implying the relation of resemblance and difference in every term. There is not a sentence in Mill's own works in which this fact might not be made manifest after a little discussion. We cannot employ a general name without implying the resemblance between the significates of that name, and we cannot select any class of objects for attention without discriminating them from other objects in general. To propose *resemblance* itself as the subject of inquiry presupposes that we distinguish it from other possible subjects of inquiry. Thus, when James Mill is engaged (in a passage already quoted) in dissipating the relation of resemblance, he presupposes resemblance in every name. What is a *new* sensation, unless it resembles other *new* sensations in being discriminated from *old* sensations? What is a *sensation* unless it resembles other sensations in being separated in thought from things which are *not-sensations*? But it is truly amusing to find that, in the very first sentence of the paragraph immediately following that quoted, James Mill uses the word resemblance. He says,¹ "The case between sensation and sensation resembles that between sensation and idea." Nevertheless, James Mill sums up the result of the section of his work in question by the following:²

"It seems, therefore, to be made clear, that in applying to the simple sensations and ideas their absolute names, which are names of classes, as red, green, sweet, bitter; and also applying to them names which denote them in pairs, as such and such; there is nothing whatsoever but having the sensations, having the ideas, and making marks for them."

This sentence, if it means anything, means that our sensations and our ideas have no ties between them except in the common marks or names applied to them. The connection of resemblance is denied existence. This ultra-nominalism of the father is one of the strangest perversities of thought which could be adduced; and, though John Stuart Mill disclaims such an absurd doctrine in an apologetic sort of way, yet he nev-

¹ "Analysis;" first edition, vol. ii., p. 10; second edition, vol. ii., pp. 11-12.

² Vol. ii., pp. 17-20.

¹ "Analysis;" first edition, vol. ii., p. 10; second edition, vol. ii., p. 12.

² *Ibid.*, first edition, p. 15; second edition, p. 17.

er, as I shall now and again have to show, really shook himself free from the perplexities of thought due to his father's errors.

It may seem to many readers that these are tedious matters to discuss at such length. After all, the import of propositions and the relation of resemblance are matters which concern metaphysicians only, or those who chop logic. But this is a mistake. A system of philosophy—a school of metaphysical doctrines—is the foundation on which is erected a structure of rules and inferences touching our interests in the most vital points. John Stuart Mill, in his remarkable "Autobiography," has expressly stated that a principal object of his "System of Logic" was to overthrow deep-seated prejudices, and to storm the stronghold in which they sheltered themselves. These are his words: ¹

"Whatever may be the practical value of a true philosophy of these matters, it is hardly possible to exaggerate the mischiefs of a false one. The notion that truths external to the mind may be known by intuition or consciousness, independently of observation and experience, is, I am persuaded in these times, the great intellectual support of false doctrines and bad institutions. By the aid of this theory, every inveterate belief and every intense feeling, of which the origin is not remembered, is enabled to dispense with the obligation of justifying itself by reason, and is erected into his own all-sufficient voucher and justification. There never was such an instrument devised for consecrating all deep-seated prejudices. And the chief strength of this false philosophy in morals, politics, and religion, lies in the appeal which it is accustomed to make to the evidence of mathematics and of the cognate branches of physical science. To expel it from these, is to drive it from its stronghold; and because this had never been effectually done, the intuitive school, even after what my father had written in his 'Analysis of the Mind,' had in appearance, and as far as published writings were concerned, on the whole the best of the argument. In attempting to clear up the real nature of the evidence of mathematical and physical truths, the 'System of Logic' met

the intuitive philosophers on ground on which they had previously been deemed unassailable; and gave its own explanation, from experience and association, of that peculiar character of what are called necessary truths, which is adduced as proof that their evidence must come from a deeper source than experience. Whether this has been done effectually, is still *sub judice*; and even then, to deprive a mode of thought, so strongly rooted in human prejudices and partialities, of its mere speculative support, goes but a very little way toward overcoming it; but, though only a step, it is a quite indispensable one; for since, after all, prejudice can only be successfully combated by philosophy, no way can really be made against it permanently until it has been shown not to have philosophy on its side."

This is at least a candid statement of motives, means, and expected results. Whether Mill's exposition of the philosophy of the mathematical sciences is satisfactory or not, we partially inquired in the previous article; and in one place or another the inquiry will be further prosecuted in a pretty exhaustive manner. Mill allowed that the philosophy of his solution was still *sub judice*, and it must remain in that position for some time longer. But of the importance of the matter it is impossible to entertain a doubt. If Mill's own philosophy be yet more false than was, in his opinion, the philosophy which he undertook to destroy, we may well adopt his own estimate of the results. "Whatever," he says, "*may be the practical value of a true philosophy of these matters, it is hardly possible to exaggerate the mischiefs of a false one.*" Intensely believing, as I do, that the philosophy of the Mills, both father and son, is a false one, I claim, almost as a right, the attention of those who have sufficiently studied the matters in dispute to judge the arduous work of criticism which I have felt it my duty to undertake.

ERRATUM.—In the first article on John Stuart Mill's Philosophy, *Contemporary Review* for December, 1877, vol. xxxi., p. 170, fifth line (POPULAR SCIENCE MONTHLY SUPPLEMENT, No. IX., p. 280, second column, last line), for *Liberty* read *Necessity*.—*Contemporary Review*.

¹ "Autobiography," pp. 225-227.

DISSECTING A DAISY.

BY PROFESSOR GRANT ALLEN.

I AM lying on my back in the sunshine, close to the edge of a southward-sloping cliff, on the green and smiling coast of Dorsetshire. There is a pleasant scent of thyme upon the breeze, and a drowsy buzzing strikes my ear from the great awkward humble-bee who is bustling about in his burly fashion from blossom to blossom just before my eyes. A few yards away a couple of country lassies, some four or five years old, are picking bunches of centaury and buttercup, which they immediately pull to pieces with evident enjoyment of their destructive power. Being by trade a philosopher, I proceed to philosophize upon their conduct, and pluck the nearest flower I can reach, in imitation of my bucolic fellow-creatures. It happens to be a daisy. I look at it closely, and think to myself, "What a lovely little blossom it is, after all!" As a psychologist I am bound to account for my own pleasure in looking at it, and for the delight with which my five-year-old friends pull it to pieces. Let me dissect my daisy, then, not literally and materially, as they do, but in a psychological and æsthetic sense. Let me set to work and find out exactly what it is in the daisy which makes me like it, and what it is in myself that makes a daisy please me.

In two previous articles I endeavored to show the readers of this Magazine what was the source of our pleasure in looking at a carved cocoanut cup and a polished granite obelisk.¹ In the present paper I shall try to explain the higher æsthetic enjoyment derived from the contemplation of a simple blossom. It might at first sight appear that the love of little meadow-flowers was a more elementary feeling than the appreciation of a work of art like the bowl or the obelisk. But I think if we look carefully at the matter we shall see reason to believe that even in children and much more in adults the pleasure derived from the contemplation of a daisy is far higher, more complex, and more developed, than the primitive sense of beauty in a human utensil or a massive monolithic monument. We shall see as we go on that mankind has really *advanced* from the admiration for colored and sculptured human products to the admiration for color and sculpt-

ure in plants and flowers and shells and minerals; and that the appreciation of art, rude or refined, has been a stepping-stone to the appreciation of Nature, forming a necessary factor in the evolution of each new mode of æsthetic pleasure.

One element in the love for flowers is undoubtedly of immense antiquity in the whole race of vertebrate animals, and goes back much further than the origin of human arts. I mean the stimulation of bright color—the most conspicuous constituent in the pleasure felt by children and by savages, and by no means an inconsiderable element in the enjoyment of our most refined horticulturists. There are good grounds for believing that this gratification is shared by a large part of the animal creation, and has descended to us men from our early half-human frugivorous ancestors. The bright hues of fruits and flowers seem to have been acquired by them as attractive allurements for the animal eye, and as aids to cross-fertilization or the dispersion of seeds. At any rate, we find many animals acutely sensitive to the stimulation of brilliant colors; and we know that human infants will notice red or yellow patches long before their attention is attracted by more sombre hues. Accordingly, we may consider that the primordial element of beauty in flowers is to be found in their bright coloring, which affords immediate pleasurable stimulation to the eye by its brilliance and pungency.

But primeval man did not probably care very greatly for flowers, even when gorgeously adorned in all the richest tints of the rainbow. The enjoyment of color seems to have been a gradual growth, and to have depended largely on the taste for personal decoration. The modern savage does not particularly trouble himself about any bright-hued objects that cannot be employed for his individual adornment. He picks up and prizes bits of coral, or brilliant pebbles, or glistening shells, because these can be manufactured into necklets or waistbands. He robs birds of their gorgeous plumage, and animals of their gay furs, to make himself a cloak or a girdle. He stains his body blue and yellow, or paints his weapons and domestic implements with such rude pigments as he can extract from plant or clay or

¹ See the *Cornhill Magazine* for October and November, 1877.

mollusk. But he does not care very much for such transitory beauty as that of leaves and flowers, which cannot be worked up into a permanent means of human decoration. Yet by accustoming his eyes to feast on the bright hues of his ochre-stained bow and his wampum-belt, he is laying the foundation for far higher and more discriminative æsthetic pleasures in later generations. The susceptibility to the pungent stimulation of dispersed color which the savage derives from his ante-human ancestors, he improves and strengthens by exercise on his broad contrasts of red and blue, and hands on in a more developed form to his semi-barbarous and civilized descendants.

Even savages, however, cannot fail to be struck by the hues of flowers when they are very large and very brilliant. The Malays, who reported to Dr. Arnold their discovery of the first *Rafflesia*—the monstrous parasitical blossom of Sumatra, a yard in diameter, which deceives insects by its exact resemblance in smell and appearance to a piece of putrid meat—testified their admiration by cries of "Come, come! A flower, big, beautiful, wonderful!" Such masses of blossom as we find on the lilac, the tulip-tree, the rhododendron, and the hibiscus, must fix and gratify the eye of the most callous savage. There is scarcely a literature in the world, if it be but the embryo songs of the South-Sea-Islanders, which does not contain abundant mention of flowers as beautiful objects, whose loveliness is apparent even to those rude poets and their brutal audience. Though negro children never pluck the road-side posies as our own little villagers do, yet I have found it difficult to keep their hands off the scarlet bunches of poinsettia, the crimson-hearted foliage of caladium, and the purple sprays of bougainvillia. Even among the unsophisticated Admiralty-Islanders, the officers of the Challenger found little garden-plots filled with a wild profusion of red or yellow blossom.

So with ourselves, the mere pleasure of color enters largely into our love for the golden crocus, the imperial tulip, and the joyous geranium. We get a pleasant shock of varied stimulation from a garden glowing with roses, peonies, fuchsias, chrysanthemums, asters, dahlias, and Canterbury bells. We look with delight upon the hanging masses of laburnum, the clustered wealth of apple-blossom, the crimson glory of Virginia-creeper, tinged by the first autumnal frost. I do not say that we have here no higher emotional and poetic sentiments, intermingled with the simple delight of color in some inextricable way:

on the contrary, I shall try to show hereafter that such feelings inevitably complicate the analysis of our mental state in admiring a hyacinth, a daffodil, or a gladiolus. But in spite of these superadded emotional elements, I think the unmixed delight of pure color-stimulation must count for a great deal. It is the most original part of our pleasure in looking at a flower, and to the last it remains the principal part in many cases.

Among our English wild-flowers there are not a few that challenge attention on the ground of brilliancy and purity of hue alone, without taking into consideration other æsthetic advantages. The dark purple of the fritillary and the lighter shades of the foxglove would make them beautiful even apart from the drooping, serpentine grace of the one and the tall, clustered shaft on which the other bears its dappled bells. The intense yellow of the buttercup, the marsh marigold, and the gorse, would extort our praise if it occurred in any costly exotic. Clover, broom, lucerne, poppies, cornflowers, thistles, dandelions, convolvulus, and heather, are all bright enough to fix our eyes upon their lovely tints as we scan the fields in which they grow. Each blossom stands out as a little patch of pungent color in the midst of the uniform background of green which throws them up in strong relief. And so the eyes of our village children are attracted from one to another in succession (just as the eyes of the bee, for whose guidance their fair tints were first developed, are drawn on from each to its neighbor), and their little hands are soon filled with cowslips, and primroses, and white-fringed daisies, like the one which I am now holding in my palm, and which is to form the text for our morning's discourse.

Our daisy is not like some of these other flowers, a gayly-decked, flaunting madam, in robe of crimson and ornaments of gold. She has no very fine colors and no very large mass of bloom to unfold before our admiring gaze. And yet, I suppose, there never was a flower about which so much poetry has been written in books, and said in love-making, and thought in the heart of man, as this same humble, quiet little daisy. Moreover, since all poetry is only æsthetic feeling crystallized into words, there must be some wonderful potency in this tiny flower, little as it attracts our eyes by its outer hues, or we should not find its name so often in the pages of our poets. But, before we go on to see what good points it actually *has*, let us look briefly at those which it *has not*, that we may thus more clearly realize the problem before us.

We have seen that the daisy has not bright color in any conspicuous degree, nor has it a noticeable size. But besides these disadvantages, it also lacks the pleasant property of perfume. Some of our bright-hued flowers, like the rose and the carnation, add this further beauty to their large dimensions and delicate tints; others, a little less fortunate, like the primrose, the wall-flower, the heliotrope, the violet, and the meadow-sweet, make up by their exquisite scent for the comparative sobriety of their petals. Many of those blossoms which can boast scarcely any attractions of form or pigment yet gratify us by their delicious fragrance; such are mignonette, lavender, sweet-brier, and rosemary. But the little daisy cannot lay claim to this source of pleasure; it cannot even compete with thyme, marjoram, or hawthorn, far less with the lilac, the orange, or the flowering almond.

Furthermore, the daisy does not possess that intellectual interest which many blossoms arouse by their quaintness or unusual form. There is a certain uncanny look about a listera, a snapdragon, or a bee-orchis, which is sure to fix our attention upon it for a moment. Monk's-hood, with its queer cowl and upright honey-glands; cock's-comb, with its intricate mass of crimson fluff; begonia, with its lop-sided leaf and quadrangular blossom; calceolaria, with its padded and inflated slipper; the dodder twining thread-like its long pink filaments; the teasel, imbedded in its prickly mail; the cactus, seeming to spring from the middle of a leaf—all these have an oddity and idiosyncrasy which insures at least a curious glance. But the daisy is just a simple, symmetrical, yellow-centred flower—or at least (to save my credit with the botanical reader) it looks so to a cursory inquirer. It has a shape with which we are perfectly familiar through a thousand examples, from sunflowers to camomile; and there is nothing about it in any way to draw toward it the eye of a careless wayfarer.

On the other hand, the daisy is free from some disagreeable qualities which spoil the beauty of certain other plants. It has not the objectionable odor of its sister composites, such as milfoil, tansy, and corn-marigold. If it cannot compete with the honeysuckle or the lily-of-the-valley, it does not disgust us like the leek, the dragon arum, and the strong-smelling night-plants. Again, though the colors of the daisy are not very brilliant, at any rate it is a recognizable flower in the popular sense, not an insignificant botanical inflorescence like that of a grass, an oak, or a plantain. It is quite prominent enough

to catch the eyes of children, who pass over dock, and groundsel, and galeum; indeed, on a level plot of grass it is sure to gain a certain amount of notice from every one in contrast with the green area by which it is surrounded. It was the first flower I could see just now, when I stretched my hand for a text to philosophize upon, though, when I look down closer in the grass, I see half a dozen little blossoms of tinier dimensions which escaped my notice beside the larger disk of the daisy.

All this while, however, the daisy has been lying passive in my hand, under sentence of vivisection, while I have been quietly settling in my own mind what it *is not*. It is time for me now to change my method of inquiry, and to discover what it *is*.

First of all, as I take it up and look at it closely, I see that it is a little, white-fringed flower, with a yellow centre. Though not very brilliant, it has quite color enough to be pretty. Its white is pure and lucid; its yellow is clear and soft; while its outer edge is tipped with a dainty pink, that rivals the inner surface of a shell. When it was half open, this pink edge was its most conspicuous part; and, as I turn to look again, I see that my five-year-old psychological subjects are stringing a number of its fellows in their pinky stage into a rosy-colored daisy-chain. Clearly, on the score of color alone, our daisy might fairly lay claim to a certain share of simple beauty. I doubt whether my little friends here care for much else in its composition besides this commonest and earliest element of æsthetic pleasure.

I look again, and I see that beyond its delicate tint it has the charm of symmetrical form. Its outer rays are disposed in regular order, radiating from the centre of the head; while its inner orb is a perfect circle of soft, yellow bloom. In recognizing this source of pleasure, we pass from the purely sensuous factor of color to the intellectual one of symmetry. The mind is agreeably occupied in noticing the circular shape, the orderly repetition of form, and the even arrangement both of parts and hues. Next to the primordial pleasure of brilliant optical stimulation, this is perhaps the earliest in historical development of all æsthetic feelings; and, unlike the other, it is of purely human origin. Birds and mammals—perhaps even reptiles—are apparently gratified by pure color; but only man is capable of taking pleasure in the intellectual recognition of symmetrically-repeated forms. We saw, in the case of the cocoanut which we carved to-

gether last October, how early this love for regular patterns appeared among mankind, and how large a share it bore in the evolution of æsthetic taste. Derived originally from the contemplation of the organic world, it has reacted at last upon our perceptions of organisms themselves. From the tattooing and carving of the savage; from the paddles, the bowls, and the clubs, of early chieftains; from the Greek temples, and urns, and key-patterns; from the Roman arch and amphitheatre and tessellated pavement; from the Gothic rose-window, and sedilia, and screen; from obelisk, and column, and monument; from every vase, basin, table, plate, dish, carpet, wall-paper, and decorative device generally, throughout all time, savage, barbarous, or civilized, we have learned to expect symmetry and regularity, and to feel a pleasure at their due occurrence. And, as I look at this little daisy in my hand, I recognize in it the possession of those attributes which concur with its color to make me call it pretty.

I take the daisy in my fingers and pull out one of the pink-tipped rays. As I inspect it closely, I see that it forms a perfect but very irregular floret. Our daisy, then, is a composite plant, and this which looks a single blossom is in reality a thick-set head of lovely little bells. Gaze hard into the central mass, and you will see them clustered thickly together, each with a yellow fringe, shaped like a Canterbury bell, within which lie the stamens and pistil, scarcely visible without the aid of a lens. In the very heart of the flower, each tiny floret is still unopened—in the bud, so to speak—and they stand like little golden knobs, too small to count with the naked eye. Toward the circumference, however, the separate bells are fully opened, and, if you will take the trouble to look hard enough, you will see that they are perfect miniature flowers, every one having a deeply-cleft corolla, which forms a bright-yellow tube with five projecting, vandyked points. The outer florets of all are the pinky-white rays which first attracted our attention, and, when I look at one of them by itself, I can see that it is a marvelously misshapen representative of the little inner bells. Its corolla has grown together into a single, one-sided leaflet, in which we can scarcely distinguish a trace of the original petals, four or five in number, answering to the vandyked points of the internal bells. Its color has been entirely blanched, while at the outer extremity it has been dyed with a melting shade of delicate pink. Its stamens have disappeared altogether, but the pistil still

remains as in the central blossoms. My scientific teachers have taught me to recognize in this arrangement the joint effect of incident sunlight, freer elbow-room, and natural selection. Most of the daisy-shaped composites have an outer row of radial florets, to give size, color, and attractiveness to the blossom, and to allure those great fertilizing agents, the bees and the butterflies; while the real working organs, the golden bells, lie thickly packed together in the middle, and take a comparatively passive part in the task of fascinating the insect-eye. But at present, when my purpose is purely æsthetic, I must neglect these interesting biological speculations and return to my analysis of a daisy, viewed as a beautiful object alone.

What a new sphere of æsthetic pleasure this discovery, that the daisy is composite, has laid open before us! I was just beginning to tire of its pinky rays and its yellow centre, my interest in its various parts was just beginning to flag, when suddenly I find a whole unthought-of region disclosed to my delighted view. I can sit and look at it now, and have full occupation for my intellect at least ten minutes longer. In the case of our cocoanut we saw already how large an element of æsthetic pleasure is given us in the intellectual interest and the sensuous gratification of numerous visual, salient points. If we look at a book of engravings, and turn over the pages in rapid listlessness, it is clear that we are not receiving very much pleasure from their contents; but if we linger for ten minutes over a single plate, marking every detail and taking in every figure, the inference is strong that we are thoroughly enjoying our occupation.

Yet such enjoyment is not always of necessity æsthetic in kind. If I had never seen a daisy before, and were pulling it to pieces for the purpose of settling its botanical affinities, my interest, though strong, would be purely scientific. I should not be concentrating my attention on its color and its symmetry, but rather noticing trivial and sensuously dull traits in its internal economy, reduced to botanical rule and number. I should not be thinking of it in such poetical terms as golden bells and pink-tipped rays, but in the cut-and-dried phraseology of natural science: "Inner florets, bisexual, regular, of five yellow petals, combined into a tubular corolla; stamens four to five, anthers combined; pistil with one cell, one style, and two stigmas," and much more to the same technical effect. In all this process, the sense of laborious investigation and toilsome straining of the eye and the intel-

lect would be too prominent to allow of its inclusion among æsthetic feelings. But when we look into a daisy merely to recognize its minute workmanship, its marvelous complexity, its incredible accuracy of detail, our pleasure is truly and simply æsthetic in kind.

In the last sentence we have hit by accident upon the source of this pleasure. It is derived from the gratification with which we regard delicate workmanship in human products. Both the cocoanut and the obelisk showed us how large a factor this feeling forms in our appreciation of artistic handiwork. The theory of special creation, which taught us for so many generations to regard each organism as a separate invention of the Supreme Mind, naturally led us to extend the notion of intentional ornamentation and decorative detail to these living forms, moulded into shape by the finger of God. And even now, when many of us have learned to see in every plant or animal the natural resultant of antecedent causes acting by physical laws on an endless line of ancestors, we still figure to ourselves the minute organization of each in terms of human activity. We find a flower or a shell most beautiful when we think of it as an artistic product. The very words we apply to them—sculpture, tracery, chiseling, and so forth—are derived from the works of man, and add a fresh sense of beauty to the natural objects which we invest with their connoted ideas. A couple of examples will make this clear.

As I came along this morning from the quiet watering-place where we have pitched our summer tent, I did a little amateur geologizing in the blue lias cliffs which I passed on my way. Among other fossils, I found this ammonite. A beautiful object it is, even in the eyes of children, who may often be seen hunting for them in the fallen *débris* of the cliff; for its surface is brilliant with a metallic iridescence, and gold or bronze alternate every moment on its shining crystalline texture with fitful gleams of gorgeous purple and strange undertones of lucid green. But a closer glance reveals other beauties besides this simple effect of scattered light-rays. The spire is composed of three or four overlapping whorls, exquisitely graceful in their curved outline and fullness of depth. The dorsal ridge, or backbone of the shell, is embossed with small studs and projections at proportionate distances. The sides are covered by a fluted pattern, carved with a delicate accuracy which no human graver could compass. And, more wonderful than all, traversing this sculptured surface in every direc-

tion are tiny lines of tracery, like the leaves of a very delicate fern, repeated at measured intervals over all the whorls. In and out they wind, each one following exactly the same course as its neighbors, so that the space between any two lines forms a symmetrical and marvelously minute pattern, compared to which the finest lace is a mere bungling mass of knotted cord. This ammonite was once a chambered shell, like that of the pearly nautilus in our own time; and each of these sutures, as the sculptured lines are called in scientific books, marks the point of juncture between one of the chamber-walls and the external shell. Wrinkled and twisted into ten thousand folds, it yet preserves throughout its exquisite symmetry, and presents to our eyes an appearance of decorative design which no amount of reasoning can dispel from our fancy and our æsthetic imagination. To the last, we shall think of it as a piece of Nature's handiwork, and praise her for the exquisite taste and unapproachable skill which she lavishes on all her productions.

Or, take again some of those fossil trees of the coal-measures, which grew like huge club-mosses and mare's-tails to the height of our own modern tropical palms. Even a geologist describes them as "fluted columns, ornately carved in the line of the channeled flutes;" as "sculptured into gracefully-arranged rows of pointed and closely-imbricated leaves, similar to those into which the Roman architects fretted the torus of the Corinthian order;" and as "furnishing examples of a delicate diaper-work, like that so admired in our more ornate Gothic buildings—such as Westminster Abbey or Canterbury and Chichester Cathedrals—only greatly more exquisite in their design and finish." Wherever we look at a description of beautiful natural objects which owe their effectiveness to detail and intricacy, we shall find the self-same language employed. The apparent similarity to human handiwork is the peg upon which we hang our æsthetic admiration.

So, too, with our little daisy. As we peer into its golden disk, we see in it one of Nature's most complicated works—a whole head of flowers, each in perfect miniature, with every part complete, crowded into a circle of half an inch diameter. It is truly wonderful! I will call my little neighbors here, and ask them to enjoy the spectacle with me. Strange, indeed! they come and look at it, but don't betray the slightest symptom of interest. I try again. I take a single bell on the point of a pin, and dilate upon its loveliness. The eldest of the two stares at me

in mingled pity and contempt. "It's only a daisy!" she says, in her native Dorsetshire tongue. There is nothing more in it. Why! dear me, I had forgotten my "Peter Bell." I see it now, and repent me of my bad psychology. I have been asking these children to experience a feeling for which they have no appropriate nervous organ. I have been requesting the blind to enjoy the glories of sunset, or exhorting the deaf to drink in the touching strains of Mendelssohn. Indeed, if the reader will believe me, I don't think I would have committed such a blunder in practical psychology except for the sake of experiment, example, and precept. These little maidens can receive pleasure from the pink and white and yellow of the blossom; perhaps they can even appreciate the symmetrical arrangement of disk and rays and daisy-cup; but they cannot possibly see the beauties of those tiny separate specks of yellow which the educated observer resolves into perfect individual flowers.

How could it be otherwise? In the individual and in the race appreciation of art *must* come before appreciation of Nature. Only by connecting the workmanship of flowers and shells and insects with the workmanship of bowls and paddles and sculptured stone, can we ever rise to a love for beauty in these natural shapes. The savage who delights in patiently-wrought clubs and war-canoes can see no marvel in the delicate handicraft of the ammonite, the lycopodium, or the thistle-flower. Indeed, I venture myself to think that our enjoyment of the beauty of *design* in Nature—as opposed to the more sensuous gratification of form and color—is largely due to the influence of that Hebrew cosmogony which for fifty generations has formed an intimate portion of our every-day life. It has taught us to look upon every plant or animal as *made*, while the savage regards them merely as *growing*. And though we may now accept a somewhat different account of the origin of life, yet we cannot cast away in a moment—let us hope we may never cast away—the beautiful and poetical implications of the earlier creed.

But these little peasant-children beside me can hardly profit much by the sublime conception of the Hebrew bards. They have never seen those fluted pillars and diapered patterns on which the taste for intricate design has been slowly built up. They and their ancestors forever have formed their æsthetic ideas from the glazed pottery and rude furniture of the laborer's cottage. They can admire a red-and-blue German print, or a pink-and-white daisy viewed as a whole; but I doubt

whether they would look twice at the deeply-recessed Norman doorway of Ifley Church, or the Prentice's Column in Roslyn Chapel. Much less, then, can they transfer this feeling of admiration for skill and delicacy of handicraft to the foliated suture of my lias ammonite or the bell-shaped florets of my dissected daisy.

It could not have been for this, I suppose, that I noticed them pulling to pieces their centauries when I first lay down here. Probably not. That was doubtless an ebullition of the natural taste for destruction which we all inherit, more or less, from our predatory ancestors. It was not without reason that those pseudo-philosophers, the phrenologists, assigned a separate bump on their fanciful cranial chart to the faculty of destructiveness. The self-same impulse which drove our naked forefathers to burn one another's villages, entered into alliance at later times with political or religious fanaticism to overthrow the temples of Ephesus and Persepolis, the library of Alexandria, the painted windows of our own cathedrals, the Hôtel-de-Ville, and the Colonne Vendôme. Iconoclasts and Puritans and Communards doubtless fully believed in the justice of their principles, but they all felt a grim pleasure, one imagines, in the destruction of idolatrous images and anti-social monuments. As I was coming here this morning, I passed through a field of stubble with a thick sprinkling of tall thistle-heads. Whenever I came within reach of a big one, I cut it off with a smart blow from my stick. The thistle deserves no quarter as an enemy to the agricultural interest, and it was certainly very pleasant to see their heads roll off so nicely at a single clean cut.

So far we have looked at those æsthetic points in our daisy which a complete examination of its structure could not fail immediately to suggest. But there are many others which, though not so obvious to the analyst, are far more generally perceived than those with which we have lately dealt. We will retrace our steps to the stage where we have merely considered the daisy in its aspects as a colored and symmetrical object. Everybody feels at once that it is a great deal more than that. Let us see why.

In the first place, it is a *flower*—a real flower, with all the general attributes of flowers as a class. Milliners will sell you an artificial daisy which really looks at first sight nearly as good as the genuine article. But you and I feel that a natural field-grown daisy is worth a good ten thousand of such tinsel abominations. And yet notice here a curious revulsion which has been brought

about in our feelings during the evolution of civilization. A savage does not care much for flowers: they are bright and pretty enough, but, if he picks them, they fade in half an hour. Give him a few pieces of red and blue cloth or glass, similarly dyed, and he infinitely prefers them to the handiwork of Nature. He would consider the milliner's daisy ever so much prettier than the living flower. The vulgar among ourselves think a bunch of wax or paper flowers beautiful ornaments for a sitting-room table, more lasting and so more desirable than an actual bouquet; whereas, with more refined natures, the feeling of artificiality spoils the one, and the sense of reality gives the other loveliness. A great many threads of feeling go to make up this complex mental state.

For one thing, the texture and composition of the two are quite different. The daisy's leaves are soft and smooth and delicate, while the imitation is hard and glazed and coarse-grained. The daisy will bear looking into, and the closer we look the more beauty do we discover; but the artificial flower is all made up of wires and twisted rag, which disclose their ugly workmanship when we scrutinize them too curiously. The daisy's pigment is diffused within its cells like the native roses of a maiden's cheek; but the pink of the milliner's flowers is smeared on outside like the rouge and pearl-powder of a vulgar actress. We, who are accustomed to manufactured goods, have learned to discriminate between the coarse handiwork of man and the dainty devices of Nature. We recognize the difference between the microscopic cells of a real leaf and the twisted fibres of a calico petal. Sometimes a false begonia or coleus on a London landing deceives us for a moment, but, so soon as we discover by the touch its artificial character, all feeling of beauty is gone in a moment. It is the freshness, the smoothness, the delicate texture, the living flower, which we love, as well as the mere brightness, and color, and form.

Again, in our adult minds the very fragility and short-livedness of the real daisy give it a certain poetical interest. We like it the better for being so frail. We don't care for that tough calico thing, with knobs of yellow composition, which will stand any amount of knocking about. We would rather have a live daisy, whose little leaves will shrink and die at any exposure or rough treatment.

Furthermore, the daisy is not merely a natural object and a living thing, but it is yet more specifically a flower. Our sentiment toward it is not at all the same as that which we entertain

with regard to a bird or a butterfly. With them, the consciousness of animal life, of pleasurable existence, occupies the foreground of our mental picture. We think of them as happy and joyous and free; we watch them with delight as the one cleaves the unresisting air in rapid motion, and the other flits fairy-like from blossom to blossom, sucking the honey from their perfumed depths. A stuffed bird or a dried butterfly in a cabinet does not affect us with the like gladsome sentiments. The color and form are still the same, but the life and the joy are wanting to fill in the measure of our sympathetic delight. A flower, however, rests its claims on totally different grounds. Dim recollections of childhood, vague echoes of pleasure felt by generations long dead, whose experience yet reverberates through our brains by the mystic transmission of heredity—these give to the flower, insentient and unconscious as it is, a certain deeper beauty of its own. Some attraction toward a form of life so unlike our own, so unfathomable, so incapable of realization to our minds, exists in every poetical heart, and reaches its furthest development in such an exquisite, if overwrought, outpouring as Shelley's "Sensitive-Plant."

But all these poetical feelings, which to the educated and refined among us have come to be part and parcel of our love for flowers, do not exist at all among children or unrefined adults. *They* like them chiefly as colored and symmetrical objects, very little distinctively as flowers. Now and then one may meet a cottager whose sentiments on the subject are more like one's own; but, on the whole, these subtler, evanescent elements of æsthetic pleasure are confined to the literary and artistic class. It was the error of Burke and Alison to refer *all* æsthetic pleasure to these rare constituents, overlooking the far commoner gratifications of immediate sensuous stimulation.

Even among the most refined, there are certain flowers, like the gladiolus and the tulip, which attract us chiefly by their brilliant hues; and others, like the daisy and the violet, which appeal more strongly to our associated sentiments. We have seen already what is the æsthetic worth of a flower as a flower: let us ask next what is the value of a daisy as a daisy.

Dear little daisy, how beautiful it is, hiding its modest little head in the grass, and bowing gently before the tyrant breeze! We think of it as such a shrinking, unassuming, lovable little flower. It does not flaunt abroad like the marsh-mallow, nor grow in weedy patches like the dan-

delion; but it just raises its pretty, simple head in the midst of a level sward of close-cropped grass. Mr. Herbert Spencer has pointed out how nearly the tender feeling toward our children—our *little ones*, as we love to call them—is allied with the tender regard for littleness generally. "Sweet little thing," the women say of any tiny work of art, or bird or plant. And all women being by nature mothers, it is no wonder that their hearts go forth toward whatever seems weak and helpless and shrinking, even as their own babies are. "Dear little flower," says every man instinctively, as he stoops to pick the first daisy of the season. The tininess of the daisy is evidently one source of its attractiveness.

Dear little English daisy, growing at home on every common and pasture and road-side throughout the length and breadth of the land! Emphatically to us an English flower, toward which, as a symbol of home, we turn with loving regret and longing of heart in distant lands across the sea. In Mr. Charles Reade's "Never too Late to Mend," there is a touching scene in which a party of rough miners and ex-convicts go together on a Sunday morning through the Australian bush to see and hear an English lark. Many a wayfarer in the heats of a tropical summer or the depths of a Canadian winter has been gladdened and refreshed for a moment by the fragrance of an English violet, crushed and mangled in a letter, but still redolent of England and of home. And so, too, our little English daisy is to all of us a rallying-point for many memories of home, in whatsoever quarter of the globe our lot for the moment may be cast.

Dear little familiar daisy, picked when we were children in the fields around us, or on the half-holidays, when we turned out from town for a blow in the country and a feast of green grass and bright blossoms! We wove it then into daisy-chains, or pulled it to pieces as we sat, and learned its well-known features by heart a thousand times over. And when we pick it again on a spring morning now, it comes back to us as a love of our childhood, and we feel a thrill of personal affection even to-day toward that insensible little mass of yellow bloom.

In all these emotional ways does the daisy appeal to our affections. Besides its beauty of color and symmetry of form, besides its intellectual interest as a composite and its sentimental claims as a flower, it has a title to our love in its character of a simple little familiar English daisy. This is the secret of its frequent appearance in poetry and its effectiveness in rhetorical illustration.

And, finally, the figure which it takes in literature reacts upon the feelings with which we regard it in the actuality. We think at once of a daisy, a rose, or a violet, as poetical, while we only think of a dahlia or a hollyhock as handsome. With the reading class, memories of Wordsworth, and Burns, and Tennyson, cling about every individual daisy. But here again we must beware of that literally *pre-posterous* theory which would refer the beauty of an æsthetic object to its external associations. The daisy is admitted as a component of poetry because it is a flower, pink and white and yellow, pretty, symmetrical, graceful, familiar, and domestic. Poetry is all made up of such pretty objects, strung into a beautiful framework of metre, and connected by a thread of narrative or abstract lyrical thought. And then, in consequence, we love the objects themselves all the better, because of the good company in which we have so often found them. But they must always have been either pretty or lovable in themselves to begin with, or else they would never have found their way into poetry at all.

And now that we have reached this rough analysis of the æsthetic pleasure involved in the contemplation of a daisy, let us hark back again to inquire by what steps it has arisen. The first basis of our enjoyment we saw to be the sensuous gratification of pure color. Though red and orange are the most agreeable of all hues to the unsophisticated eye, yet white and yellow are by no means without their proper effectiveness. This pleasure we believed to be the fundamental one in our appreciation of a daisy, as of all other flowers. It is this which first fixes our attention upon it, and which gives it an immediate claim to be included in the æsthetic class. Of all the gratification involved in its perception that of color is by far the most universal, and in several cases it is probably the only one.

Next, in order of development, comes the pleasure of symmetry. It is not perceived by very young children, because it is not immediate and sensuous, like that of color, but requires an intellectual exercise of the higher organs, whose functions are not developed in early life. But with this exception it is almost universal in the human race, though it does not seem to be shared by our anthropoid kinsmen.

Above this, again, come the emotional pleasures of familiarity and homeliness. These require a considerable evolution of the domestic and social feelings before they can attain to any great intensity. They are probably quite wanting in absolute savages, and very little developed

among such peoples as the negroes and Malays. But there are considerable traces of a love for familiar flowers in the verse of the Hindoos, the Japanese, and the Greeks; while the feeling is easily recognized in our own unlettered peasantry. Among all the literary class it reaches a very highly-evolved and conspicuous form.

The next element to be developed is that of sentimental attachment to a flower as such. This takes its rise out of the preceding stages, coupled with that intellectual advance which makes the distinction between natural and artificial products wider and more impassable.

Still later the poetical and literary associations come in to complicate our simple æsthetic feeling. While last of all to appear upon the field are those purely scientific elements which result from a physical analysis of the flower into its component parts. But these two final sources of æsthetic pleasure, though late in order of time, belong to portions of our nature, every day increasing in depth and power. Just as in the kindred region of the sublime every fresh enlargement of our gaze into the surrounding infinities of space and time increases and deepens our sense of sublimity for all our after-life, so in this other region of the beautiful, every fresh enlargement of our acquaintance with Nature lays open before us newer and yet newer sources of pleasurable æsthetic feeling. The geologist, the botanist, and the naturalist, are forever exercising their eyes and their intellects on unseen or unobserved features of crystals, and minerals, and ferns, and flowers, and butterflies, and birds, which quicken their appetite for the beautiful in Nature, and will doubtless lead the way hereafter to further developments of æsthetic expression in art.

It has been the error of all systematizers, however, to begin with these highest and most evolved factors of æsthetic emotion, instead of beginning with the simplest and most primordial. Being themselves educated and cultivated men, they have thought only of feelings shared by them with the educated and cultivated classes generally. Perhaps they have considered the simpler and commoner feelings participated in by the child, the savage, and the animal, as too trivial and vulgar to be worthy of their exalted notice. If they wish to account for the beauty of a daisy, they do not refer to its color and its shape, but talk only of its humility, its modesty, its simplicity, and its poetical associations. These are certainly factors in their own complex and imaginative mental state, but do they constitute the primitive ele-

ments of beauty as understood by ninety-nine out of a hundred human beings everywhere? If you ask any intelligent child, he will give you a truer and more philosophic answer: "I like a daisy because it's a pretty flower, and pink, and white, and round, and yellow; and you can string them on a straw, and they look beautiful." The transcendentalists who try to account for all beauty on a theory of typical infinity, unity, repose, symmetry, purity, and moderation, will find no echo in the heart of the child or the savage. My little friends in the meadow here can readily agree with me that a pink daisy is a very pretty thing, but they seem to be somewhat uncertain on the question whether it is a type of Divine incomprehensibility. Perhaps they enjoy the even arrangement of its radial florets, but I doubt whether they see in its symmetry a type of Divine justice.

We might venture to go further, I think, and to assert that those higher emotional feelings which the Associationists make the basis of the æsthetic property are really and truly not æsthetic at all. The modesty, humility, and familiarity, of the daisy make us say, "How touching and how dear it is!" which are expressions proper to our affections; but its pinkness, whiteness, and regularity, make us say, "How pretty or how beautiful it is!" which are expressions proper to our æsthetic sentiment. The sensuous pleasures which Alison rejected are, in reality, the prime elements of beauty, and to the vast majority of persons the only ones ever perceived. Perfume, softness, color, form, symmetry, musical tone, rhythm, these are the main and primordial components of all æsthetic objects; and if we add to them harmony, variety, and decorative detail of a sort which testifies to or recalls human workmanship, we have summed up all the properties which in strictness entitle any natural or artificial product to the name of beautiful. The higher intellectual and emotional feelings come in to supplement and intensify the original pleasures thus defined; but they yield us rather the sense of pathos, of sublimity, of tenderness, of scientific interest, than that of beauty in the strictest sense.

Æsthetics is the last of the sciences in which vague declamation is still permitted to usurp the place of ascertained fact. The pretty imaginative theories of Alison, of Jeffrey, and of Prof. Ruskin, are still allowed to hold the field against scientific research. People think them beautiful and harmless, forgetting that everything is fraught with evil if it "warps us from the living truth."

We shall never understand the nature of beauty so long as we attack our problem from the wrong side. As in every other department of knowledge, so in æsthetics, we must be content to

begin at the beginning, and then we may, perhaps, have fair hopes of some day reaching the end.

—*Cornhill Magazine.*

DOG-POISON IN MAN.

By HENRY W. ACLAND, M.D.

PERIODICAL literature has developed one great change in modern life, and there is no subject too technical, none too professional, to be brought before the general reader. As regards medical questions, the great surgeon, Brodie, and the Nestor of English medicine, Sir Thomas Watson, led the way.

The subject of the present paper, that of the mode of working in man of poison from a mad dog, has one advantage, that it well illustrates the importance of viewing biological studies as a whole, and shows that human and comparative pathology are inseparable.

Let us consider what hydrophobia is, and how it comes to exist: 1. How it acts. 2. How it is spread. 3. How it is to be prevented.

We must look at these from a general rather than from a medical point of view.

Hydrophobia, as all know, is the result of an animal poison operating on man. What does this mean? What are animal poisons? Whence do they come? How do they operate?

The subject of animal poisons is one of strange—nay, of fascinating interest. It is so extensive that, if pursued in detail, it would wholly exhaust the patience of any that had not a special purpose in following it through its manifold particulars. Some idea of it, however, may be easily gained.

We are each of us constructed on a definite plan, the outcome of we know not how many myriads of ages operating under definite conditions by regular laws. We have a certain form which varies according to the race from which we spring. We are composed of matter much the same in every human being, and little varying in all animal life endued with the higher kinds of consciousness. The fish, the reptile, the bird, the gentle quadruped that culls the living herb, the fierce brute that spreads terror and death, whether for sustenance or delight, all have a structural kinship with ourselves. We are but a part of a vast army of living things, living in the

warmth of one life-sustaining fire, breathing the same air, imbibing the same moisture, obeying the same physical attractions, building in and in the same chemical elements, growing a kindred growth, deploying for a time the same animal forces, dying the same death, disintegrated by the same physical decomposition, returning to the same air, and water, and dust.

How strange, then, that this family, so knit up, should find in itself members whose function should seem to be that of bringing instant destruction to those about them, for no purpose that we can see—neither for self-defense nor for self-maintenance by way of food! It is as though there were set in the eternal order of things, somewhere in the animal series, a terrible material contrast with the heavenward aspirations of the soul of man.

Poisons, no doubt, surround us. We have heard enough of late of poisoning air, poisoning water, poisoning food, poisoning soil. The marvel is, that animals exist who themselves generate them for the sake of poisoning.

Since much of the poison which surrounds us is created by ourselves, its origin may be to a great extent prevented by ourselves. But the growth of some poisons is beyond control, except by the destruction of the grower; for instance, the poison of snakes. This is the simplest case of an animal communicable poison. No manner of life, nor self-discipline, could hinder the snake from manufacturing his deadly dynamite, or from using it when manufactured.

How, then, does this typical animal poison act so as to produce its terrible results? "Snake-poison," says Sir Joseph Fayrer, "is essentially a neurotic; and, when it takes full effect, kills by annihilating the source of nerve-force in ways which bid fair to be elucidated by modern investigation."

To illustrate this, I quote from that scientific surgeon and accomplished physiological inquirer the following typical case:

"Lotawon Chumar, aged fifty years, was bitten on August 7, 1870, under the following circumstances: He was sleeping in a poultry-yard in Benares, when he suddenly awoke by a great noise among the fowls at 4 A. M., and, while moving about to ascertain the cause, was bitten by something that he did not see, as it was dark—he suspected it was a snake. When daylight appeared he found a fowl lying dead, and he then himself began to feel ill; a little later he became insensible, and unable to stand. The only mark of injury was a black spot near the ankle-joint. The wound was incised and liquor ammoniæ applied to it. It was also administered internally every fifteen minutes; twenty drops with water, equal parts, were injected under the skin, but he never rallied, and died half an hour after admission."¹

Another instance, quite as characteristic of life among our native brethren in India, is worth perusal:

"Information was received at 6 P. M. of November 21st, that a native boy, name and residence unknown, had died from the effects of snake-bite. It appears that the diseased had been on the Diamond Harbor Road, and, near the house of the informant, had gone into the jungle, having previously laid down on the road-side a *basket containing a snake* and some other things used by snake-charmers. He returned in a few minutes, and was observed to be rubbing his right with his left hand; on being questioned as to what was the matter, as he looked as though he was suffering, he said he had a burning sensation all over his body, and shortly after he fell down and died. *He had, while in the jungle, met with a snake*, the kind he did not mention, and, *on trying to catch it*, it bit him on the back of his right hand. . . . The precise time between the bite and the death is not known, but it could not have been more than from fifteen to twenty minutes, from the account I received of the circumstances of the case."²

The effect of virulent snake-poison, as, for instance, that of the cobra, is produced, *first*, by its introduction into the blood; *second*, by affecting the nerves either at their periphery, or along their course, or at their centre. Depression and faintness are the first result; then loss of coördinating power; then paralysis, convulsions, and asphyxia.³

It would seem by various experiments and observations on cobra-poisoned animals and men, that the motor-nerves alone, or the spinal cord,

or the brain, may be each separately affected, or any combination of them.

Fayer quotes Genesis, chapter xlix. 17, where Jacob says, "Dan is an adder in the path, that biteth the horse heels, so that his rider falleth backward"—i. e., produces instant paralysis of the hinder limbs. This snake-poison is the simplest, deadliest, naturalest, healthy poison.

The poison created by the dog, our companion and friend, is in another category. It is not natural to him. He is himself a victim. The poison he transmits he has received. It works almost certainly his own destruction. He spreads it without intention. Man perhaps helps to cause it by his treatment of him. It is a consequence of his faithfulness and of his domestic relations, and of his familiarity, that he inflicts the injury on his master. The rabies, which is his torment and curse, brings about the hydrophobia in his protector and guardian. It lies with man to save the dog from the sickness, which, once engendered, rebounds with terrible force on the human family.

Since the secreted poison which the dog emits when himself affected by rabies does not produce on man the same results that it produces on the dog, it might be suspected that there is something wild and uncertain in the *modus operandi* of a poison. It is not so. It has been well said by a classical writer that there are three prime laws of poisons:

1. That all have certain definite and specific actions.
2. That they lie latent a certain but varying period of time before these actions are set up.
3. That the phenomena which result from the poison, when roused into action, vary according to the dose, and the condition or special character of the victim.

In illustration of these laws, we may cite, firstly, so familiar an instance as that scarlet-fever poison will not produce small-pox; secondly, that the effect may be latent only a moment (as in the poison of prussic acid, and the poison of the cobra) before the symptoms are set up; or it may be latent for definite days, as in measles; or for uncertain weeks, months, or even years, as in hydrophobia; and, thirdly, that temperament, state of health, mode of life, race, inheritance, the animal, as well as the nature of the poison itself, produce remarkable variations in the action of some poisons.

What, then, is canine rabies? and how does rabies arise? Probably never spontaneously, or, if it ever does so, it is certainly with extreme

¹ Fayer, "Thanatophidia of India," p. 58.

² *Ibid.*, p. 59.

³ This is admirably described, and in the fullest manner, by Fayer in the "Proceedings of the Royal Society," 1874, p. 3.

rarity. It is communicated from one rabid animal to another animal which becomes rabid. Whether it ever does originate except by communication is a question belonging to the interminable controversy of spontaneous generation.

I quote from Youatt a graphic description of rabies in the dog:

"The early symptoms of rabies in the dog are occasionally very obscure. In the greater number of cases, these are sullenness, fidgetiness, and continual shifting of posture. Where I have had opportunity, I have generally found these circumstances in regular succession. For several consecutive hours, perhaps, he retreats to his basket or his bed. He shows no disposition to bite, and he answers the call upon him laggardly. He is curled up, and his face is buried between his paws and his breast. At length he begins to be fidgety. He searches out new resting-places; but he very soon changes them for others. He takes again to his own bed; but he is continually shifting his posture. He begins to gaze strangely about him as he lies on his bed. His countenance is clouded and suspicious. He comes to one and another of the family, and he fixes on them a steadfast gaze as if he would read their very thoughts. 'I feel strangely ill,' he seems to say; 'have you anything to do with it? or you? or you?' Has not a dog mind enough for this? If we have observed a rabid dog at the commencement of the disease, we have seen this to the very life.

"There is a species of dog—the small French poodle—the essence of whose character and constitution is fidgetiness or perpetual motion. If this dog has been bitten, and rabies is about to establish itself, he is the most irritable, restless being that can be conceived; starting convulsively at the slightest sound; disposing of his bed in every direction; seeking out one retreat after another in order to rest his wearied frame, but quiet only for a moment in any one, and the motion of his limbs frequently simulating chorea and even epilepsy. A peculiar delirium is an early symptom, and one that will never deceive. A young man had been bitten by one of his dogs; I was requested to meet a medical gentleman on the subject: I was a little behind my time. As I entered the room I found the dog eagerly devouring a pan of sopped bread. 'There is no madness here,' said the gentleman. He had scarcely spoken, when in a moment the dog quitted the sop, and, with a furious bark, sprang against the wall as if he would seize some imaginary object that he fancied was there. 'Did you see that?' was my reply; 'what do you think of it?' 'I see nothing in it,' was his retort; 'the dog heard some noise on the other side of the wall.' At my serious urging, however, he consented to excise the part. I procured a poor worthless cur, and got him bitten by this dog, and carried the disease from this dog to the third vic-

tim; they all became rabid one after the other, and there my experiment ended."

And again:

"A terrier, ten years old, had been ill, and refused all food for three days. On the fourth day he bit a cat of which he had been unusually fond, and he likewise bit three dogs. I was requested to see him. I found him loose in the kitchen, and at first refused to go in, but, after observing him for a minute or two, I thought that I might venture. He had a peculiarly wild and eager look, and turned sharply round at the least noise. He often watched the flight of some imaginary object, and pursued with the utmost fury every fly that he saw. He searchingly sniffed about the room, and examined my legs with an eagerness that made me absolutely tremble. His quarrel with the cat had been made up, and when he was not otherwise employed he was eagerly licking her and her kittens. In the excess or derangement of his fondness, he fairly rolled them from one end of the kitchen to another. With difficulty I induced his master to permit me to destroy him."

No person of ordinary observation need be told that dogs, like little children, have all their personal characters, which they carry with them into their hours of sickness and suffering.

"It is not every dog that in the most aggravated state of the disease shows a disposition to bite. The finest Newfoundland dog that I ever saw became rabid. He had been bitten by a cur, and was supposed to have been thoroughly examined in the country. No wound, however, was found: the circumstance was almost forgotten, and he came up to the metropolis with his master. He became dull, disinclined to play, and refused all food. He was continually watching imaginary objects, but he did not snap at them. There was no howl, nor any disposition to bite. He offered himself to be caressed, and *he was not satisfied except he was shaken by the paw*. On the second day I saw him. He watched every passing object with peculiar anxiety, and followed with deep attention the motions of a horse, his old acquaintance; but he made no effort to escape, nor evinced any disposition to do mischief. I went to him, and patted and coaxed him, and he told me, as plainly as looks and actions and a somewhat deepened whine could express it, how much he was gratified. I saw him on the third day. He was evidently dying. He could not crawl even to the door of his temporary kennel; *but he pushed forward his paw a little way, and, as I shook it, I felt the tetanic muscular action which accompanies the departure of life*.

"On the other hand, there are rabid dogs whose ferocity knows no bounds. If they are threatened with a stick, they fly at and seize it, and furiously shake it. They are incessantly em-

¹ Youatt, "The Dog," p. 131.

ployed in darting to the end of their chain, and attempting to crush it with their teeth, and tearing to pieces their kennel, or the wood-work that is within their reach. They are regardless of pain. The canine teeth, the incisor teeth are torn away; yet, unwearied and insensible to suffering, they continue their efforts to escape. A dog was chained near a kitchen-fire. He was incessant in his endeavors to escape, and, when he found that he could not effect it, he seized, in his impotent rage, the burning coals as they fell, and crushed them with his teeth.

"If by chance a dog in this state effects his escape, he wanders over the country bent on destruction. He attacks both the quadruped and the biped. He seeks the village street or the more crowded one of the town, and he suffers no dog to escape him. The horse is his frequent prey, and the human being is not always safe from his attack. A rabid dog running down Park Lane, in 1825, bit no fewer than five horses, and fully as many dogs. He was seen to steal treacherously upon some of his victims, and inflict the fatal wound. Sometimes he seeks the more distant pasturage. He gets among the sheep, and more than forty have been fatally inoculated in one night. A rabid dog attacked a herd of cows, and five-and-twenty of them fell victims. In July, 1813, a mad dog broke into the menagerie of the Duchess of York at Oatlands, and, although the palisades that divided the different compartments of the menagerie were full six feet in height, and difficult or apparently almost impossible to climb, he was found asleep in one of them; and it was clearly ascertained that he had bitten at least ten of the dogs."¹

How subtly and by what small change of circumstance results may be altered, the following will show:

"There is a beautiful species of dog, often the inhabitant of the gentleman's stable—the Dalmatian or coach dog. He has, perhaps, less affection for the human species than any other dog, except the greyhound and the bull-dog; he has less sagacity than most others, and certainly less courage. He is attached to the stable; he is the friend of the horse; they live under the same roof; they share the same bed; and, when the horse is summoned to his work, the dog accompanies every step. They are certainly beautiful dogs, and it is pleasing to see the thousand expressions of friendship between them and the horse; but, in their continual excursions through the streets, they are exposed to some danger, and particularly to that of being bitten by rabid dogs. It is a fearful business when this takes place. The coachman probably did not see the affray; no suspicion has been excited. The horse rubs his muzzle on the dog, and the dog licks

the face of the horse; and in a great number of cases the disease is communicated from the one to the other. The dog in process of time dies, the horse does not long survive, and, frequently too, *the coachman shares their fate*. I have known at least twenty horses destroyed in this way."¹

Many cases of detailed history might be quoted from the vast literature of this subject—a literature, the extent of which, from Aristotle to Sir Thomas Watson, would surprise many. I would refer the reader to Youatt's charming book on the dog, and to the admirable and exhaustive writings of Fleming, the industrious advocate of the study of Comparative Pathology, whence I will give two passages that will show the havoc which may be caused, and how it is caused. And first, by one dog:

"If the mad dog is not confined in a cage, but kept in a room where there is more liberty, it wanders about in every direction, and with all the greater agitation—if not accustomed to be separated from its human companions. It is continually on the move, and rambles, seeks, sniffs, howls at the walls, flies at the phantoms that seem to pursue it, gnaws at the bottoms of doors, and furniture, and may at last make an escape through glass doors or windows. If persons are only separated from it by glass it does not hesitate to smash the fragile barrier: being all the more determined to get through it when excited by seeing them, and moved by the fatal desire to bite, which now entirely dominates it. The larger the obstacles the wilder its fury, and no sacrifice is too great to obtain liberty. House-dogs are trying every moment to escape from their dwelling; and those which are kept tied up or shut in a room are constantly endeavoring to break their attachment, or to destroy the doors or partitions that confine them, in order to satisfy their longing to be at large.

"When a rabid dog makes its escape it goes freely forward, as if impelled by some irresistible force—traveling considerable distances in a short time, and attacking every living being it meets on its way; preferring dogs, however, to other animals, and the latter rather than mankind. Cats also appear to be, next to dogs, most liable to be injured. A mad dog that had done a considerable amount of mischief in Lancashire, in 1869, was seen, in one part of its career, trotting along the road with a cat in its mouth, which it had picked up from a cottage, and which, some time afterward, it dropped to attack a cow. Fowls, likewise, are particularly exposed to the assaults of the rabid dog. When it attacks, and endeavors to tear its victims, it does so in silence, never uttering a snarl or a cry of anger; and, should it chance to be injured in return, it emits no cry or yell of pain. Though it will not so readily assault mankind as it will

¹ Youatt, "The Dog," pp. 140, 141.

¹ Youatt, "The Dog," p. 134.

other creatures, yet it is most prudent, when in the presence of a mad dog, to allow it to pass, instead of attacking it, unless there is a certainty of killing it without the risk of being wounded by its teeth. The degree of ferocity would appear to be influenced very much by the natural disposition of the dog, and the training it has received. Some, for instance, only snap or give a slight bite in passing; while others, on the contrary, bite furiously and tear the objects presented to them or which they meet in their way, and sometimes with such an extreme degree of violence as to injure their mouths and break their teeth, or even their jaws. If chained up, they will gnaw the chain until their teeth are worn away and the jawbones laid bare.

"The rabid dog does not continue its progress very long. Exhausted by fatigue, by the fits of madness excited in it by the objects it meets in its way, by hunger, thirst, and also, no doubt, as a consequence of the disease itself, its limbs soon become feeble. Then it slackens its rate of traveling, and walks unsteadily; its drooping tail, its head inclined toward the ground, the mouth open, and the protruded tongue of a lead-blue color, and covered with dust—all this gives the distressed creature a very striking and characteristic physiognomy. In this condition, however, it is much less to be dreaded than in its early fits of fury. If it is still bent on attacking, it is only when it meets with anything directly in its track that it seeks to satisfy its rage; but it is no longer sufficiently excitable to change its direction, or go out of its course to attack an animal or a man not immediately in its path. It is extremely probable, also, that its fast-failing vision and deadened scent prevent its being so easily impressed by surrounding objects as it previously was."¹

The incident which is selected by Fleming concerning the Durham pack, though well known, is too instructive to be unnoticed:

"For the last seven or eight years the Durham County hounds, under the management of a committee, have had Thomas Dowdswell, from Lord Macclesfield's, as their huntsman; and it is not too much to say that by careful breeding, with the advantage of some of the best blood, the pack has been brought to a state of perfection never surpassed since the time of Mr. Ralph Lambton, who for so many years hunted the country at present occupied by these unfortunate hounds. The pack of forty-one couples commenced the season under the most promising auspices, with a country well stocked with foxes, and every prospect of success; but, alas for men's calculations! a check has come, and every hope apparently so well founded has been destroyed by a visitation as sudden as it was unexpected.

"About five weeks ago, after a very good and

severe run, in breaking up their fox, Dowdswell observed a fine young hound, called Carver, by Lord Macclesfield's Foiler, going from hound to hound in a very unusual manner. Taking alarm, he had the hound led home, and by direction kept confined in a place by himself for a few days, in order to prove the nature of the disease, which increased in intensity, and on the third day the dog was perfectly mad, biting and gnawing everything he could reach. Four hounds he had bitten previously were at once put down. . . .

"A few days elapsed, and other hounds were seized in precisely the same manner, all dying in about three or four days. As a rule, the hounds so attacked were quite harmless, following the huntsman, and apparently grateful for anything done for them. The attacks continued, and some few began to show signs of rabies. The general features of the disease were, however, what is generally called dumb madness, which, beyond doubt, is contagious in its character; and seeing that no hound, once attacked, ever recovered, the decision came to was to put them down immediately on the first appearance of the symptoms, in order to avoid infection.

"Up to last week about nine couples had been attacked and died, the disease still running on. Of course, hunting was dropped, and the committee, feeling deeply their responsibility, called a meeting of the subscribers in Durham, on Monday last, to take into consideration the proper course to be adopted under these painful circumstances.

"The question to be decided was, whether, looking at the danger to life, and the uncertainty as to any known mode of cure, the pack should be destroyed, or an attempt be made to stamp out the disease by isolating every hound. Up to Saturday it was thought the latter plan might be adopted and tried with safety; but the Monday morning's report showed the attack on several more hounds had assumed unmistakable symptoms of rabies. This fact induced the meeting to come to a unanimous resolution: 'That it was a duty they owed to the country to sacrifice the whole of their gallant pack, and to appeal to masters of hounds for a few bounds to enable them to finish the season so disastrously cut short.' . . .

"The remarkable feature in the history of the outbreak, however, consisted in the fact that *some drafts of the pack were sent to India* toward the end of July, and it was reported in Durham, at the commencement of December, that many of these had been attacked by a 'disease of the throat,' as the reporters termed it, and 'hanging of the lower jaw,' and that 'all died.'"¹

Thus it is that fowls, cattle, horses, wild animals, and men, are inoculated, and thus the virus

¹ Fleming, "Rabies and Hydrophobia," pp. 227-230.

¹ Fleming, "Rabies and Hydrophobia," pp. 65-67.

is carried across Europe to the plains of India! We must apply to death brought about by rabies the same general principles as to death from snake-bite; but in the one case the poison works its fatal end at once, in the other it may lie dormant for years. It lies dormant probably by being entangled at the head of the wound, and there held in its place till some new action liberates it, and lets it loose into the circulation: the view advanced by Sir Thomas Watson some years since, and now also held by others.

We have briefly considered the effect of the poison of rabies inflicted by one dog upon another, as well as the effect of virulent snake-poison inflicted on a man. It remains to compare the effects of the dog-poison on a man with that of the cobra upon him.

There are points of similarity and points of divergence.

The points of similarity are—first, that the poison, if allowed to enter the circulation in sufficient quantity, is uniformly fatal; and, secondly, that the fatal termination seems certainly to be by way of the nervous system.

We are not yet in a condition to say with absolute precision what are the anatomical changes in the nervous system either in man, or in animals not man. But observations are rapidly accumulating.¹ It is certain that in each case the injury arises from the introduction of the animal poison into the blood. In each case, therefore, the end can be averted only by keeping the poison out of the circulation; or, if in it (in a moderate quantity), *by maintaining life till it can be eliminated*: the way by which alone the wourali can effect a cure; and this only if the poison has not wrought or set up changes destructive to the vitality or regenerative power of the nerve-elements.

The nervous symptoms in man, when once the poison has fairly entered the system, gradually

increase until thirst and inability to drink remove all doubt as to the only result. The inability to drink is only a sign of deep-seated changes in the nerve-structure.

Prof. Rolleston has pointed out to me that these changes, though hardly discernible, may be so great (having regard to the actual character of the force-producing nerve-cell) as to explain entirely, first, the excitement, and, second, the destruction of the ordinary functions of the nerve-centres, which regulate life. In a paper to which the professor has referred me, by Dr. Mayor, I find it noticed that "there may be differences between these delicate structures in man and other animals so slight as to be nearly inappreciable," but still differences of the widest significance and importance; and so it may quite be that fundamental changes shall take place by sudden shock or otherwise in the fine structures by which the nerve-force is developed in man, and yet the physical changes may be wholly outside the reach of our observation. It is right to add that already these changes have been observed by Dr. Gowers, though their exact import cannot yet be declared.

Hydrophobia occurring in man, after communication of the poison of rabies, is thus shown to be a "toxoneurosis." It would not be desirable, nor would it be of any use in a paper of this kind, to enter into a detailed description of the symptoms of this mode of death.¹ I have thought it best rather to illustrate the character of the malady in other ways. We must admit that there is, as yet, no cure known for the disease when once established in man. The most extravagant remedies have been suggested. Every form of pharmacy and charlatanism has expended itself throughout all generations—advocated sometimes by otherwise great names. The pages of Cælius Aurelianus, Morgagni, and a host of others, would create considerable interest, and one may say even amazement, on this subject. The danger is generally preventable by prompt measures taken at the time when the injury is inflicted. The weight of evidence seems to show that the actual cautery is the most efficacious means, excision the next, and caustics, though sometimes sufficient, are the least to be relied upon. This much said, I must advert to statements in various journals to the effect that a case had been cured by means of wourali-poison by

¹ Many persons are engaged in prosecuting researches into the actual alteration of structure which can be detected after death from hydrophobia, among whom may be named Dr. Gowers, of University College Hospital, Dr. Greenfield, of St. Thomas's, and Dr. Savage, to whom I am indebted for valuable microscopic preparations. All available knowledge will shortly be collected, under the best auspices, by a committee of the British Medical Association, including Dr. Birdon-Sanderson, Dr. Lauder Brunton, Dr. Gowers, Mr. Ernest Hart, and Mr. Callender. Whether the knowledge they will certainly gain as to the *modus operandi* of the poison, and the changes it effects in vessels and nerves, will help the cure when the changes have been set up, is in the womb of the future.

¹ Those who desire a graphic account of a case of hydrophobia, should consult Sir Thomas Watson's "Lectures on the Practice of Medicine," vol. i., p. 590, sixth edition, 1871.

Dr. Offenburg. This is not the only case adduced. Another is reported from America, with an excellent but cautious commentary by a great American physician, Dr. Austin Flint.

With respect to Offenburg's case, I must own that from information I have received from Germany, through the kindness of Dr. Victor Carus, the distinguished professor of Leipsic, I am by no means satisfied that it was a true case of developed hydrophobia. Of this, as of the American case, I can only say that there is enough to justify and demand the trial of the remedy. Of all the efforts of scientific medicine, it would be one of the most remarkable should it turn out to be successful. The remedy itself is a terrible instrument, and requires the greatest skill in its use. That skill will not be wanting, the result of trained powers in experiment.

Late one evening a few weeks ago, a boy was brought to the Radcliffe Infirmary, Oxford, with the dread, if not with the signs, of hydrophobia. He had been bitten by a dog, five years before, in the hand, and again, two years before, in the leg. A pustular eruption, the size of a shilling, had just appeared at the seat of the bite on the hand, where there always had been a small scar. All connected with the lad were in great alarm. Now on this doubtful and slight symptom various difficult questions arose :

1. Could the period of incubation, if the dog had been mad, be five or even two years? On the historical evidence, Yes.

2. Would an eruption so occurring be likely to be the precursor of true hydrophobia? Yes.

3. If the genuine symptoms appeared, would the boy recover? Unless the alleged cases of cure by giving the wourali-poison were true, then, after the symptoms arose, his death within four or perhaps five days was certain.

4. Can a person die of fright, with spurious symptoms of hydrophobia? Yes.

How strange these simple questions and answers! Yet this is the issue raised in every case that occurs of dog-bite, where the condition of the dog, as in this instance, could not be ascertained. To meet the symptoms, should they arise, Mr. Yule, Fellow of Magdalen College, prepared for me a solution of wourali, *whose mode of action he was able accurately to determine*. But the sore healed, and nothing remained but the old scar; and the experiment of wourali was not called for.

This brief outline of the general character of the much-discussed malady, in our four-footed friend, and of the relation in which we stand

toward it, naturally suggests the inquiry, What should be done by every state which is sufficiently organized to have an intelligent system of sanitary police?

If the state is in earnest to put an end to hydrophobia, it would not be worth while to do less than this, that follows :

1. To have a rigid dog-tax, i. e., one which permits no unowned, unregistered dogs. Every dog should have a collar, with the name of the owner and the number of the license.

2. Dogs which cannot be identified by these means should be destroyed by the sanitary authority of the district where they are found.

3. No dogs should, for a certain period, be imported from abroad, except under conditions.

4. Mr. Fleming's suggestion that on every dog's license should be printed precise instructions as to the signs of rabies, and as to what should be done in case of dog-bite, should be carried out.

Practical statesmen and debates in the Houses of Parliament will doubtless suggest difficulties in these propositions. But it is hard to think that there is no agency among the excise, the police, the Board of Trade, the sanitary authorities, for carrying out, with but little trouble or expense, these or any other regulations of police for this end. Cattle, sheep, pigs, horses, do not stray unowned in the streets. I am by no means sure that there might not be cases of exemption on payment of a much higher tax. Indeed, for the sake of the poor, the cost of mere registration should be low enough to be hardly a productive tax. Packs of hounds, and some other dogs under responsible keeping, might earn immunity from the hated collar on payment of a sum quite profitable to the state, though little felt by the owners. The owner of such dogs might be safely trusted to destroy them on due cause. It has to be borne in mind that the disease may exist in all domestic animals, and notably in the wild one reserved for sport—the fox. He may perchance communicate it to the dog.

Space will not allow the distribution of rabies throughout the globe to be fully considered. Fleming has ransacked many writers in every country for records of its existence. If one should take a map of the world and mark on it with a blue wafer the countries where it is prevalent; with a red one where it exists, but is rare; and with a yellow one where it is absent, he would see, in a graphic way, that the temperate and central zones of latitude are generally occu-

pied, rather than the extremes toward either pole. This seems to depend not upon the temperature, but upon comparative isolation of the northern and southern countries, such as Greenland, where there are many dogs and no rabies, and such as New Zealand, Australia, notwithstanding their communication with England, and the islands generally of the great oceans. But this matter requires more precise elucidation. Experiments at Alfort seem to show that neither thirst nor heat will originate it, and go far to prove that it is a simple case of communicable virus. Great pains have been taken in France to collect a record of all known cases of persons bitten by mad dogs. M. Bouley, the learned veterinarian of France, has given in the *Comptes Rendus* for 1870 a careful and instructive abstract of reports on the subject. It will well repay perusal. In forty-nine departments where rabies existed, 320 persons had been bitten by mad dogs in six years. Only 129 had hydrophobia, and 123 were known to have died. No one of these 129 had the disease latent for more than six months. Most of them died on the second or third day after the symptoms appeared. Of 134 persons 92 recovered whose wounds were cauterized, and of 66 not cauterized 56 died, only 10 recovering. These statements prove the almost complete immunity through the use of actual cautery.

In the case of 785 dogs that were bitten, 527 were killed; and of 25 not killed but observed, 13 became mad. But let this be noted: of 785 thus bitten, 552 were accounted for. The authorities let 233 escape. And if these went mad in the proportion of those who were observed, there would remain 116 dogs *left at large mad*.

Statistics of this kind have been unattainable for England. But we have enough through the splendid tables of mortality, monuments alike of English civilization and of official zeal, prepared by Major Graham and Dr. Farr at Somerset House, to show that the present panic in this country depends on the horror of the complaint, not on

its frequency, and upon the just conviction that it is high time to prevent its increase.

There are 22,000 cases of snake-bite annually in India, or 1 to every 10,000 of the population. In England there were in the years 1850 to 1876, 538 deaths from hydrophobia out of 12,457,265 total deaths. These occurred in 27 years, at the rate of 20 annually in a mean population of 20,781,799 persons. The annual deaths to a million persons living were 22,201, one being from hydrophobia. The cholera in Oxford, in 1854, destroyed in a few weeks 115 persons out of 26,000, which, if expressed in the proportions of the people in India, would amount to 973,077 deaths. The maximum of deaths from hydrophobia in one year, in England, from 1850 till 1876, was in 1874, viz., 61 in a population of 23,648,609; and the minimum in 1862, 1 out of 436,566 deaths among 20,371,013 persons. In the year 1876 the deaths from hydrophobia were 53, out of 510,303 deaths; or 1 in 9,628 deaths occurring among 24,244,010 persons: in other words, *one* death in a year¹ from hydrophobia among 457,432 living. These figures, together with the fact of the immunity after cautery, and the thorough attention now paid to the subject, should reduce the alarm to its natural proportions and place.

Thus I have endeavored to present a rough sketch of a disorder which has caused too much anxiety to many. Nothing can divest the subject of its wide and weird interest. Yet nothing can be more reassuring than the knowledge of how nearly it is under our own control. The marvel is that we are and have been so careless. Often we may *prevent* where we cannot *cure*. This has been the message of Medicine, in the present age, to man, in more things than the poison of rabies.

¹ Meanwhile there was, during the eight years 1869-'76, an annual average of 212 deaths among the 3,333,345 persons estimated to constitute the average population of London in the same period, by being run over or knocked down in the streets.

ON THE TEACHING OF NATURAL PHILOSOPHY.¹

BY PROFESSOR P. G. TAIT.

AT the very outset of our work two questions of great importance come prominently forward. One of these, I have reason to conclude from long experience, is probably a puzzling one to a great many of you; the other is of paramount consequence to us all. And both are of consequence not to us alone but to the whole country, in its present feverish state of longing for what it but vaguely understands and calls *science-teaching*. These questions are, *What is Natural Philosophy?* and, *How is it to be taught?*

A few words only on the first question must suffice for the present. The term *Natural Philosophy* was employed by Newton to describe the study of the powers of Nature: the investigation of forces from the motion they produce, and the application of the results to the explanation of other phenomena. It is thus a subject to whose proper discussion mathematical methods are indispensable. The "*Principia*" commences with a clear and simple statement of the fundamental laws of motion, proceeds to develop their more immediate consequences by a powerful mathematical method of the author's own creation, and extends them to the whole of what is now called *Physical Astronomy*. And in the preface Newton obviously hints his belief that in time a similar mode of explanation would be extended to the other phenomena of external Nature.

In many departments this has been done to a remarkable extent during the two centuries which have elapsed since the publication of the "*Principia*." In others scarcely a single step of any considerable magnitude has been taken; and, in consequence, the boundary between that which is properly the subject of the natural philosopher's inquiries and that which is altogether beyond his province is at present entirely indefinite. There can be no doubt that, in many important respects, even life itself is dependent upon purely physical conditions. The physiologists have quite recently seized, for their own inquiries, a great part of the natural philosopher's apparatus, and with it his methods of experimenting. But to say that even the very lowest form of life, not to speak of its higher forms, still less of volition

and consciousness, can be fully *explained* on physical principles alone—i. e., by the mere relative motions and interactions of portions of inanimate matter, however refined and sublimated—is simply unscientific. There is absolutely nothing known in physical science which can lend the slightest support to such an idea. In fact, it follows at once from the *Laws of Motion* that a material system, left to itself, has a perfectly determined future, i. e., that upon its configuration and motion at any instant depend all its subsequent changes; so that its whole history, past and to come, is to be gathered from one almost instantaneous, if sufficiently comprehensive, glance. In a purely material system there is thus *necessarily* nothing of the nature of a free agent. To suppose that life, even in its lowest form, is wholly material, involves therefore either a denial of the truth of Newton's laws of motion, or an erroneous use of the term "matter." Both are alike unscientific.

Though the sphere of our inquiries extends wherever matter is to be found, and is therefore coextensive with the physical universe itself, there are other things, not only without but within that universe, with which our science has absolutely no power to deal. In this room we simply recognize them, and pass on.

Modern extensions of a very general statement made by Newton enable us now to specify much more definitely than was possible in his time the range of physical science. We may now call it the *Science of Matter and Energy*. These are, as the whole work of the session will be designed to prove to you, *the two real things* in the physical universe; both unchangeable in amount, but the one consisting of parts which preserve their identity, while the other is manifested only in the act of transformation, and though measurable cannot be identified. I do not at present enter on an exposition of the nature or laws of either; that exposition will come at the proper time; but the fact that so short and simple a definition is possible is extremely instructive, showing, as it unquestionably does, what very great advances physical science has made in recent times. The definition, in fact, is but little inferior in simplicity to two of those with which most of you are no doubt already to a certain extent

¹ Extended from Notes of the Introductory Lecture to the ordinary course of Natural Philosophy in Edinburgh University, October 31, 1877.

familiar—that of geometry as the *Science of Pure Space*, and of algebra as the *Science of Pure Time*.

But, for to-day at least, our second question, viz., *How is Natural Philosophy to be taught?* is of more immediate importance. The answer, in an elementary class like this, must of course be, “popularly.” But this word has many senses, even in the present connection—one alone good, the others of variously-graduated amounts of badness.

Let us begin with one or two of the bad ones. The subject is a very serious one for you, and therefore must be considered carefully, in spite of the celebrated dictum of Terence, *Obsequium amicos, veritas odium parit*. (In other words, flatter your audience and tickle their ears, if you seek to ingratiate yourself with them; tell them the truth, if you wish to raise enemies.) But science is one form of truth. When the surgeon is convinced that the knife is required, it becomes his *duty* to operate. And Shakespeare gives us the proper answer to the time-serving caution of Terence and Cicero in the well-known words, “Let the *galled* jade wince.”

One of these wholly bad methods was recently very well put by a *Saturday* critic, as follows:

“The name of ‘Popular Science’ is, in itself, a doubtful and somewhat invidious one, being commonly taken to mean the superficial exposition of results by a speaker or writer who himself understands them imperfectly, to the intent that his hearers or readers may be able to talk about them without understanding them at all.”

This, I need hardly say, is not in any sense science-teaching. It appears, however, that there is a great demand for it, more especially with audiences which seek amusement rather than instruction; and this demand, of course, is satisfied. Such an audience gets what it wants, and, I may add, exactly what it deserves.

Not quite so monstrous as that just alluded to, yet far too common, is the essentially vague and highly-ornamented style of so-called science-teaching. The objections to this method are of three kinds at least—each independently fatal:

1. It gives the hearer, if he have no previous acquaintance with physics, an altogether erroneous impression of the intrinsic difficulty of the subject. He is exhorted, in grandiloquent flights of labored earnestness, to exert his utmost stretch of intellect, that he may comprehend the great step in explanation which is next to be given; and when, after this effort, the impression on his mind is seemingly quite inadequate, he begins to fancy that he has not understood at all

—that there must be some profound mystery in the words he has heard which has entirely escaped his utmost penetration. After a very few attempts he gives up in despair. How many a man has been driven away altogether, whose intellect might have largely contributed to the advance of physics, merely by finding that he can make nothing of the pompous dicta of his teacher or text-book, except something so simple that he fancies it cannot possibly be what was meant!

2. It altogether spoils the student’s taste for the simple facts of true science. And it does so just as certainly as an undiluted course of negro melodies or music-hall comic songs is destructive of all relish for the true art of Mozart or Haydn, or as sensation novels render Scott’s highest fancies tame by contrast. And—

“ . . . as if increase of appetite

Had grown by what it fed on, . . . ”

the action on the listener is made to react on the teacher, and he is called upon for further and further outrages on the simplicity of science. Sauces and spices not only impair the digestion, they create a craving for other stimulants of ever-increasing pungency and deleteriousness.

But, 3. No one having a true appreciation of the admirable simplicity of science could be guilty of these outrages. To attempt to introduce into *science* the meretricious adjuncts of “word-painting,” etc., can only be the work of dabblers—not of scientific men, just as—

“To gild refined gold, to paint the lily,
To throw a perfume on the violet,
To smooth the ice, or add another hue
Unto the rainbow; or with taper light
To seek the beauteous eye of heaven to garnish,
Is wasteful and ridiculous excess.”

None could attempt such a work who had the smallest knowledge of the true beauty of Nature. Did he know it, he would feel how utterly inadequate, as well as uncalled for, were all his greatest efforts. For, again, in Shakespeare’s words, such a course—

“Makes sound opinion sick, and truth suspected.
For putting on so new a fashioned robe.”

“In the great majority of ‘popular’ scientific works the author, as a rule, has not an exact knowledge of his subject, and does his best to avoid committing himself, among difficulties which he must at least try to *appear* to explain. On such occasions he usually has recourse to a flood of vague generalities, than which nothing can be conceived more pernicious to the really intelligent student. In science ‘fine language’ is entirely out of place; the stern truth, which is

its only basis, requires not merely that we should never disguise a difficulty, but, on the contrary, that we should call special attention to it, as a probable source of valuable information. If you meet with an author who, like the cuttle-fish, endeavors to escape from a difficult position by darkening all around him with an inky cloud of verbiage, close the book at once and seek information elsewhere."

But I must come back to the really important point, which is this :

True science is in itself simple, and should be explained in as simple and definite language as possible.

Word-painting finds some of its most appropriate subjects when employed to deal with human snobbery or human advice—where the depraved tastes and wills of mortals are concerned—not the simple and immutable truths of science. Battles, murders, executions; political, legal, and sectarian squabbles; gossip, ostentation, toadysim, and such like, are of its proper subjects. Not that the word-painter need be himself necessarily snobbish or vicious—far from it. But it is here, as our best poets and satirists have shown, that his truest field is to be found. Science sits enthroned, like the gods of Epicurus, far above the influence of mere human passions, be they virtuous or evil, and must be treated by an entirely different code of rules. And a great deal of the very shallowest of the pseudo-science of the present day probably owes its origin to the habitual use, with reference to physical phenomena, of terms or synonyms whose derivation shows them to have reasonable application to human beings and their actions alone—not at all to matter and energy. In dealing with such pseudo-science it is, of course, permissible to me, even after what I have said, to use word-painting as far as may be thought necessary.

The Pygmals of modern days do not require to beseech Aphrodite to animate the ivory for them. Like the savage with his *totem*, they have themselves already attributed life to it. "It comes," as Helmholtz says, "to the same thing as Schopenhauer's metaphysics. The stars are to love and hate one another, feel pleasure and displeasure, and to try to move in a way corresponding to these feelings." The latest phase of this peculiar non-science tells us that all matter is *ALIVE*; or, at least, that it contains the "promise and potency" (whatever these may be) "of all terrestrial life." All this probably originated in the very simple manner already hinted at; viz.,

in the confusion of terms constructed for application to thinking beings only, with others applicable only to brute matter, and a blind following of this confusion to its necessarily preposterous consequences. So much for the attempts to introduce into science an element altogether incompatible with the fundamental conditions of its existence.

When simple and definite language cannot be employed, it is solely on account of our ignorance. Ignorance may, of course, be either *unavoidable* or *inexcusable*.

It is unavoidable only when knowledge is not to be had. But that of which there is no knowledge is not yet part of science. All we can do with it is simply to confess our ignorance and seek for information.

As an excellent illustration of this we may take two very common phenomena—a *rainbow* and an *aurora*—the one, to a certain extent at least, thoroughly understood; the other scarcely understood in almost any particular. Yet it is possible that, in our latitudes at least, we see the one nearly as often as the other. For, though there are probably fewer auroras to be seen than rainbows, the one phenomenon is in general much more widely seen than the other. A rainbow is usually a mere local phenomenon, depending on a rain-cloud of moderate extent; while an aurora, when it occurs, may extend over a whole terrestrial hemisphere. Just like total eclipses, lunar and solar. Wherever the moon can be seen, the lunar eclipse is visible, and to all alike. But a total solar eclipse is usually visible from a mere strip of the earth—some 50 miles or so in breadth.

The branch of natural philosophy which is called *Geometrical Optics* is based upon three experimental facts or laws, which are assumed as exactly true, and as representing the whole truth—the rectilinear propagation of light in any one uniform medium, and the laws of its reflection and refraction at the common surface of two such media—and as a science it is nothing more than the developed mathematical consequences of these three postulates.

Hence, if these laws were rigorously true, and represented *all* the truth, nothing but mathematical investigation based on them would be required for the complete development of the phenomena of the rainbow—except the additional postulate, also derived from experiment, that falling drops of water assume an exact spherical form—and, as data for numerical calculation, the experimentally-determined refractive index for each ray of light at the common surface of air and water.

Thus, for instance, we can tell why the rainbow has the form of a portion of a circle surrounding the point opposite to the sun; why it is red on the outer edge; what is the order of the other colors, and why they are much less pure than the red; why the whole of the background inclosed within it is brighter than that just outside, and so on. Also, why there is a second (also circular) rainbow; why it is concentric with the first, and why its colors are arranged in the reverse order, etc.

But, so long at least as we keep to *geometrical* optics, we cannot explain the spurious bows which are usually seen, like ripples, within the primary and outside the second rainbow; nor why the light of both bows is polarized, and so forth. We must apply to a higher branch of our science; and we find that *Physical Optics*, which gives the results to which those of geometrical optics are only approximations, enables us to supply the explanation of these phenomena also.

When we turn to the aurora we find nothing so definite to explain. This may, to some extent at least, account for our present ignorance. We remark, no doubt, a general relation between the direction of the earth's magnetic force and that of the streamers; but their appearance is capricious and variable in the extreme. Usually they have a pale-green color, which the spectroscope shows to be due to homogeneous light; but in very fine displays they are sometimes blood-red, sometimes blue. Auroral arches give sometimes a sensibly continuous spectrum, sometimes a single bright line. We can *imitate* many of the phenomena by passing electric discharges through rarefied gases; and we find that the streamers so produced are influenced by magnetic force. But we do not yet know for certain the source of the discharges which produce the aurora, nor do we even know what substance it is to whose incandescence its light is due. We find by a statistical method that auroras, like cyclones, are most numerous when there are most spots on the sun; but the connection between these phenomena is not yet known. Here, in fact, we are only *beginning* to understand, and can but confess our ignorance.

But do not imagine that there is nothing about the rainbow which we cannot explain, even of that which is seen at once by untrained observers. All the phenomena connected with it which we can explain are mathematical deductions from observed facts which are assumed in the investigation. But these facts are, in the main, themselves not yet explained. Just as

there are many exceedingly expert calculators who habitually and usefully employ logarithmic tables without having the least idea of what a logarithm really is, or of the manner in which the tables themselves were originally calculated; so the natural philosopher uses the observed facts of refraction and reflection without having as yet anything better than guesses as to *their* possible proximate cause. And it is so throughout our whole subject: assuming one result, we can prove that the others *must* follow. In this direction great advances have been made, and every extension of mathematics renders more of such deductions possible. But when we try to reverse the process, and thus to explain our hitherto assumed results, we are met by difficulties of a very different order.

The subject of *Physical Astronomy*, to which I have already alluded, gives at once one of the most striking and one of the most easily intelligible illustrations of this point. Given the law of gravitation, the masses of the sun and planets, and their relative positions and motions *at any one instant*—the investigation of their future motions, until new disturbing causes come in, is entirely within the power of the mathematician. But how shall we account for gravitation? This is a question of an entirely different nature from the other, and but one even plausible attempt to answer it has yet been made.

But to resume. The digression I have just made had for its object to show you how closely full knowledge and absolute ignorance may be and are associated in many parts of our subject—absolute command of the necessary consequences of a phenomenon, entire ignorance of its actual nature or cause.

And in every branch of physics the student ought to be most carefully instructed about matters of this kind. A comparatively small amount of mathematical training will often be found sufficient to enable him to trace the consequences of a known truth to a considerable distance; and no such training is necessary to enable him to see (provided it be properly presented to him) the boundary between our knowledge and our ignorance—at least when that ignorance is not directly dependent upon the inadequacy of our deductive powers.

The work of Lucretius is perhaps the only really successful attempt at scientific poetry. And it is so because it was written before there was any true physical science. The methods throughout employed are entirely those of *a priori* reasoning, and therefore worse than worthless,

altogether misleading. Scientific poetry, using both words in their highest sense, is now impossible. The two things are in their very nature antagonistic. A scientific man *may* occasionally be a poet also; but he has then two distinct and almost mutually incompatible natures; and, when he writes poetry, he puts science aside. But, on the other hand, when he writes science, he puts poetry and all its devices aside. Mark this well! A poet may, possibly with great effect on the unthinking multitude, write of

" . . . the huger orbs which wheel
In circuits vast throughout the wide abyss
Of unimagined chaos—till they reach
Ethereal splendor . . . "

(The word "unimagined" may puzzle the reader, but it probably alludes to Ovid's expression "*sine imagine*." For this sort of thing is nothing if not *classical*! The contempt in which "scholars" even now hold mere "physicists" is proverbial. And they claim the right of using at will new words of this kind, in whose company even the "tremendous empyrean" would, perhaps, not be quite out of place.)

But, whether this sort of thing be poetry or not, it is in no sense science. "Huge," and "vast," and such like (for which, if the rhythm permit, you may substitute their similars, "Titanic," "gigantic," etc.), good honest English though they be, are utterly unscientific words. In science we restrict ourselves to *small* and *great*, and these amply suffice for all our wants. But even these terms are limited with us to a mere relative sense; and it can only be through ignorance or forgetfulness of this that more sonorous terms are employed. The size of every finite object depends entirely upon the unit in terms of which you measure it. There is nothing absolutely great but the Infinite.

A few moments' reflection will convince you of the truth of what I have just said. Let us go by easily comprehensible stages from one (so-called) extreme to the other. Begin with the smallest thing you can see, and compare it with the greatest. I suppose you have all seen a good barometer. The vernier attached to such an instrument is usually read to the thousandths of an inch, but it sometimes leaves you in doubt which of two such divisions to choose. This gives the limit of vision with the unaided eye. Let us therefore begin with an object whose size is about $\frac{1}{20,000}$ of an inch. Let us choose as our scale of relative magnitude 1 to 250,000 or thereabouts. It is nearly the proportion in which each of you individually stands to the whole pop-

ulation of Edinburgh. (I am not attempting anything beyond the rudest illustration, because that will amply suffice for my present purpose.) Well, 250,000 times the diameter of our *minimum visibile* gives us a length of ten feet or so—three or four paces. Increased again in about the same ratio, it becomes more than 400 miles, somewhere about the distance from Edinburgh to London. Perform the operation again, and you get (approximately enough for our purpose) the sun's distance from the earth. Operate once more, and you have got beyond the nearest fixed star. Another such operation would give a distance far beyond that of anything we can ever hope to see. Yet you have reached it by repeating, at most *five* times, upon the smallest thing you can see, an operation in itself not very difficult to imagine. Now, as there is absolutely nothing known to science which can preclude us from carrying this process further, so there is absolutely no reason why we may not in thought *reverse* it, and thus go back from the smallest visible thing to various successive orders of smallness. And the *first* of these that we thus reach has already been pointed to by science as at least a rough approximation to that coarse-grainedness which we *know* to exist (though we shall never be able to see it) even in the most homogeneous substances, such as glass and water. For several trains of reasoning, entirely independent of one another, but based upon experimental facts, enable us to say with certainty that all matter becomes heterogeneous (in some as yet quite unknown way) when we consider portions of it whose dimensions are somewhere about $\frac{1}{100,000,000}$ of an inch. We have, as yet, absolutely no information beyond this, save that, if there be ultimate atoms, they are at least considerably more minute still.

Next comes the very important question—*How far is experimental illustration necessary and useful?* Here we find excessively wide divergence, alike in theory and in practice.

In some lecture-theatres, experiment is everything; in others, the exhibition of gorgeous displays illustrative of nothing in particular is said occasionally to alternate with real or imagined (but equally sensational) danger to the audience, from which they are preserved (or supposed to be preserved) only by the extraordinary presence of mind of the presiding performers—a modern resuscitation of the ancient after-dinner amusement of tight-rope dancing, high above the heads of the banqueters, where each had thus a very

genuine, if selfish, interest in the nerve and steadiness of the artists.

Contrasted in the most direct manner with these, is the dictum not long ago laid down :

"It may be said that the fact makes a stronger impression on the boy through the medium of his sight—that he believes it the more confidently. I say that this ought not to be the case. If he does not believe the statements of his tutor—probably a clergyman of mature knowledge, recognized ability, and blameless character—his suspicion is irrational, and manifests a want of the power of appreciating evidence—a want fatal to his success in that branch of science which he is supposed to be cultivating."

Between such extremes many courses may be traced. But it is better to dismiss the consideration of both, simply on the ground that they *are* extremes, and therefore alike absurd.

Many facts cannot be made thoroughly intelligible without experiment; many others require no illustration whatever, except what can be best given by a few chalk-lines on a blackboard. To teach an essentially experimental science without illustrative experiments may conceivably be possible in the abstract, but certainly not with professors and students such as are to be found on this little planet.

And, on the other hand, you must all remember that we meet here to discuss science, and science alone. A university class-room is not a place of public amusement, with its pantomime displays of red and blue fires, its tricks whether of prestidigitation or of prestidigitation, or its stump-oratory. The best and greatest experimenter who ever lived used none of these poor devices to win cheap applause. His language (except, perhaps, when non-experimenting pundits pressed upon him their fearful Greek names for his splendid discoveries) was ever the very simplest that could be used: his experiments, whether brilliant or commonplace in the eyes of the mere sight-seer, were chosen solely with the object of thoroughly explaining his subject; and his whole bearing was impressed with the one paramount and solemn feeling of duty, alike to his audience and to science. Long ages may pass before his equal, or even his rival, can appear; but the great example he has left should be imitated by us all as closely as possible.

Nothing is easier in extempore speaking, as I dare say many of you know by trial, than what is happily called "piling up the agony." For, as has been well said :

" . . . men there be that make
Parade of fluency, and deftly play

With points of speech as jugglers toss their balls;
A tinkling crew, from whose light-squandered wit
No seed of virtue grows."

Every one who has a little self-confidence and a little readiness can manage it without trouble. But it is so because in such speaking there is no necessity for precision in the use of words, and no objection to any epithet whatever, unless it be altogether misplaced. But the essence of all such discourse is necessarily *fancy*, and not *fact*. Here, during the serious work of the session, we are tied down almost exclusively to facts. Fancies *must* appear occasionally; but we admit them only in the carefully-guarded form of a reference to old opinions, or to a "good working hypothesis." Still, facts are not necessarily dry: not even if they be mere statistics. All depends on the way in which they are put. One of the most amusing of the many clever songs, written and sung by the late Prof. Rankine in his moments of relaxation, was an almost literal transcript of a prosaic statistical description of a little Irish town, taken from a gazetteer! He was a truly original man of science, and therefore exact in his statements; but he could be at once both exact and interesting. And I believe that the intrinsic beauty of science is such that it cannot suffer in the minds of a really intelligent audience, however poor be the oratorical powers of its expounder, provided only he can state its facts with clearness. Oratory is essentially *art*, and therefore essentially *not science*.

There is nothing false in the *theory*, at least, of what are called Chinese copies. If it could be *fully* carried out, the results would be as good as the original—in fact, undistinguishable from it. But it is solely because we cannot have the theory carried out in perfection that true artists are forced to slur over details, and to give "broad effects," as they call them. The members of the pre-Raphaelite school are thoroughly right in one part at least of their system: unfortunately, it is completely unrealizable in practice. But the "broad effects" of which I have spoken are true *art*, though perhaps in a somewhat modified sense of the word (which, not being a scientific one, has many shades of meaning). To introduce these "broad effects" into science may be artful, but it is certainly unscientific. In so-called "popular science," if anywhere, *Ars est clare inscientiam*. The "artful dodge" is to conceal want of knowledge. Vague explanations, however artful, no more resemble true science than do even the highest flights of the imagination, whether in "Ivanhoe" or "Quentin Durward," "Knicker-

bocker's New York" or Macaulay's "England," resemble history. And when the explanation is bombastic as well as vague, its type is the same as that of the well-known speech of Sergeant Buzfuz.

One ludicrous feature of the "high-falutin" style is that if you adopt it you throw away all your most formidable ammunition on the smaller game, and have nothing proportionate left for the larger. It is as if you used a solid shot from an 81-ton gun upon a single skirmisher! As I have already said, you *waste* your grandest terms, such as huge, vast, enormous, tremendous, etc., on your mere millions or billions; and then what is left for the poor trillions? The true lesson to be learned from this is, that such terms are altogether inadmissible in science.

But even if we could suppose a speaker to use these magnificent words as a genuine description of the impression made on himself by certain phenomena, you must remember that he is describing *not* what is known of the objective fact (which, except occasionally from a biographic point of view, is what the listener really wants), but the more or less inadequate subjective impression which it has produced, or which he desires you to think it has produced, on "what he is pleased to call his mind." Whether it be his own mind, or that of some imaginary individual, matters not. To do this, except perhaps when lecturing on psychology, is to be unscientific. True scientific teaching, I cannot too often repeat, requires that the facts and their *necessary* consequences alone should be stated (and illustrated if required) as simply as possible. The impression they are to produce on the mind of the reader, or hearer, is then to be left entirely to himself. No one has any *right* to suppose, much less to take for granted, that his own notions, whether they be "so-called poetic instincts" (to use the lowest term of contempt) or half-comprehended and imperfectly-expressed feelings of wonder, admiration, or awe, are either more true to fact or more sound in foundation than those of the least scientific among his readers or his audience. When he does so he resembles a mere leader of a *claque*. "Hiss here, my friends; applaud there! Three cheers more! Three groans! Nine times nine!" And so forth *ad nauseam*. If your minds cannot relish simple food, they are not in that healthy state which is required for the study of science. Healthy mental appetite needs only hunger-sauce. That it always has in plenty, and repletion is impossible.

But you must remember that language cannot

be simple unless it be definite; though sometimes, from the very nature of the case, it may be very difficult to understand, even when none but the simplest terms are used. Multiple meanings for technical words are totally foreign to the spirit of true science. When an altogether new idea has to be expressed, a new word must be coined for it. None but a blockhead could object to a new word for a new idea. And the habitual use of non-scientific words in the teaching of science betrays ignorance, or (at the very least) willful indefiniteness.

Do not fancy, however, that you will have very many new words to learn. A month of *Botany* or of *Entomology*, as these are too often taught, will introduce you to a hundred-fold as many new and strange terms as you will require in the whole course of natural philosophy; and, among them, to many words of a far more "difficult complexion" than any with which, solely for the sake of definiteness, we find ourselves constrained to deal.

But you will easily reconcile yourselves to the necessity for new terms if you bear in mind that these not only secure to us that definiteness without which science is impossible, but at the same time enable us to get rid of an enormous number of wholly absurd stock-phrases which you find in almost every journal you take up, wherever at least common physical phenomena are referred to. When we are told that a building was "struck by the *electric fluid*" we may have some difficulty in understanding the process; but we cannot be at all surprised to learn that it was immediately thereafter "seized upon by the *devouring element*, which raged unchecked till the whole was reduced to ashes." I have no fault to find with the penny-a-liner who writes such things as these: it is all directly in the way of his business, and he has been trained to it. Perhaps his graphic descriptions may occasionally rise even to poetry. But when I meet with anything like this—and there are but too many works, professedly on natural philosophy, which are full of such things—I *know* that I am not dealing with science.

A wild and plaintive wail for definiteness often comes from those writers and lecturers who are habitually the most vague. A few crocodile tears are shed, appearances are preserved, and they plunge at once into greater mistiness of verbosity than before.

Considering the actual state of the great majority at least of our schools and our elementary text books, I should prefer that you came here completely untaught in physical science. You

will then have nothing to *unlearn*. This is an absolutely incalculable gain. Unlearning is by far the hardest task that was ever imposed on a student, or on any one else. And it is also one of those altogether *avoidable* tasks which, when we have allowed them to become necessary, irritate us as much as does a perfectly unprofitable one—such as the prison-crank or shot-drill. And in this lies by far the greatest responsibility of all writers and teachers. Merely to fail in giving instruction is bad enough, but to give false information can be the work only of utter ignorance or of carelessness, amounting, so far as its effects go almost to diabolical wickedness.

Every one of you who has habitually made use of his opportunities of observation must have already seen a great deal which it will be my duty to help him to understand. But I should prefer, if possible, to have the entire guidance of him in helping him to understand it. And I should commence by warning him in the most formal manner against the study of books of an essentially unscientific character. By all means let him read fiction and romance as a relaxation from severer studies; but let the fiction be devoted to its legitimate object, human will and human action; don't let it tamper with the truths of science. From the "Arabian Nights," through "Don Quixote," to Scott, the student has an ample field of really profitable reading of this kind; but when he wishes to *study*, let him carefully eschew the unprofitable, or rather pernicious, species of literary fiction which is commonly called "popular science."

As I have already said, in this elementary class, you will require very little mathematical knowledge, but such knowledge is in itself one of those wholly good things of which no one can ever have too much. And, moreover, it is one of the few things which it is not very easy to teach badly. A really good student will learn mathematics *in spite of* the badness of his teaching. No pompous generalities can gloss over an incorrect demonstration; at least in the eyes of any one competent to understand a correct one. Can it be on this account that there are so many more aspirants to the teaching of physics than to that of the higher mathematics? If so, it is a very serious matter for the progress of science in this country; as bad, at least, as was the case in those old days when it was supposed that a man who had notoriously failed in everything else must have been designed by Nature for the vocation of schoolmaster; a truly wonderful application of teleology.

But even this queer kind of dominion was not so strange a monstrosity as the modern manikins of *paper science*, who are always thrusting their crude notions on the world; the anatomists who have never dissected, the astronomers who have never used a telescope, or the geologists who have never carried a hammer! The old metaphysical pretenders to science had at least some small excuse for their conduct in the fact that true science was all but unknown in the days when *they* chiefly flourished, and when their *a priori* dogmatism was too generally looked upon as science. But that singular race is now wellnigh extinct, and in their place have come the paper-scientists (the barbarous word suits them exactly)—those who, with a strange mixture of half-apprehended fact and thoroughly appreciated nonsense, pour out continuous floods of information of the most self-contradictory character. Such writers loudly claim the honors of *discovery* for any little chance remark of theirs which research may happen ultimately to substantiate, but keep quietly in the background the mass of unreason in which it was originally enveloped. This species may be compared to midges, perhaps occasionally to mosquitoes, continually pestering men of science to an extent altogether disproportionate to its own importance in the scale of being. Now and then it buzzes shrilly enough to attract the attention of the great sound-hearted but unreasoning because non-scientific public, which, when it *does* interfere with scientific matters, can hardly fail to make a mess of them.

Think, for a moment, of the late *vivisection crusade* or of the *anti-vaccinators*. What absolute fiends in human form were not the whole race of really scientific medical men made out to be, at least in the less cautious of these heated denunciations? How many camels are unconsciously swallowed while these gnats are being so carefully strained out, is obvious to all who can take a calm, and therefore a not necessarily unreasonable, view of the matter.

But the victims of such people are not in scientific ranks alone. Every man who occupies a prominent position of any kind is considered as a fit subject for their attacks. By private letters and public appeals, gratuitous advice and remonstrance are perpetually intruded upon him. If he succeed in anything, it is of course because these unsought hints were taken; if he fail, it is because they were contemptuously left unheeded!

Enough of this necessary but unpleasant digression. I *know* that it is at least quite as easy to understand the most recondite mathematics

as to follow the highest of genuine physical reasoning; and therefore, when I find apparently profound physical speculation associated with incapacity for the higher mathematics, I feel convinced that the profundity cannot be real. One very necessary remark, however, must be made here: not in qualification, but in explanation, of this statement. One of the greatest of physical reasoners, Faraday, professed, as most of you are aware, to know very little of mathematics. But in fact he was merely unacquainted with the technical use of symbols. His modes of regarding physical problems were of the highest order of mathematics. Many of the very best things in the recent great works on *Electricity* by Clerk-Maxwell and Sir William Thomson are (as the authors cheerfully acknowledge) little more than well-executed *translations* of Faraday's conceptions into the conventional language of the higher analysis.

I hope that the time is not far off when no one who is not (at least in the same sense as Faraday) a genuine mathematician, however he may be otherwise qualified, will be looked upon as even a *possible* candidate for a chair of Natural Philosophy in any of our universities. Of course such a danger would be out of the question if we were to constantly bear in mind the sense in which Newton understood the term natural philosophy. There is nothing so well fitted as mathematics "to take the nonsense out of a man," as it is popularly phrased. No doubt a man may be an excellent mathematician, and yet have absolutely no knowledge of physics; but he cannot possibly *know* physics as it is unless he be a mathematician. Much of the most vaunted laboratory work is not nearly of so high an order of skilled labor as the every-day duty of a good telegraph-clerk, especially if he be in charge of a siphon-recorder. And many an elaborate memoir which fills half a volume of the transactions of some learned society is essentially as unsightly and inconvenient an object as the mounds of valueless dross which encumber the access to a mine, and destroy what otherwise might have been an expanse of fruitful soil.

There are many ways in which these mounds may grow. The miner may be totally ignorant of geology, and may thus have bored and excavated in a locality which he ought to have known would furnish nothing. Or he may have, by chance or by the advice of knowing friends, hit upon a really good locality. Even *then* there are many modes of failure, two of which are very common. He may fail to recognize the ore when he has got it;

and so it goes at once to the refuse-heap, possibly to be worked up again long after by somebody who has a little more mineralogical knowledge—as in the recent case of the mines of Laurium. Here he *may* be useful—at second-hand. Or, if it be fossils or crystals, for instance, for which he is seeking, his procedure may be so rough as to smash them irreparably in the act of mining. This is dog in the manger with a vengeance. But, anyhow, he generally manages to disgust every other digger with the particular locality which he has turned upside down; and thus exercises a *real*, though essentially *negative*, influence on the progress of mining.

The parallel here hinted at is a very apt one, and can be traced much further. For there are other peculiarities in the modes of working adopted by some miners, which have their exact counterparts in many so-called scientific inquiries; but, for the present, we must leave them unnoticed.

There is but one way of being scientific: but the number of ways of being unscientific is infinite, and the temptations alluring us to them are numerous and strong. Indolence is the most innocent in appearance, but in fact probably the most insidious and dangerous of all. By this I mean, of course, not mere idleness, but that easily acquired and fatal habit of just stopping short of the final necessary step in each explanation. Faraday long ago pointed this out in his discourse on "Mental Inertia." Many things which are excessively simple when thoroughly understood are by no means easy to acquire; and the student too often contents himself with that *half* learning which, though it costs considerable pains, leaves no permanent impression on the mind, while "one struggle more" would have made the subject his own forever after.

Science, like all other learning, can be reached only by continued exertion. And, even when we have done our utmost, we always find that the best we have managed to achieve has been merely to avoid straying very far from the one true path.

For, though science is in itself essentially simple, and is ever best expressed in the simplest terms, it is my duty to warn you in the most formal manner that the study of it is beset with difficulties, many of which cannot but constitute real obstacles in the way even of the mere beginner. And this forms another of the fatal objections to the school-teaching of physical science. For there is as yet absolutely no known road to science except through or over these obstacles, and a certain amount of maturity of mind is required to overcome them.

If any one should deny this, you may at once conclude either that his mental powers are of a considerably higher order than those of Newton (who attributed all his success to close and patient study), or, what is intrinsically at least somewhat more probable, that he has not yet traversed the true path himself. But it would be a mere exercise of unprofitable casuistry to inquire which is the less untrustworthy guide, he who affirms that the whole road is easy, or he who is contin-

ually pointing out fancied difficulties. Here, as in everything to which the human mind or hand can be applied, nothing of value is to be gained without effort; and all that your teacher can possibly do for you is to endeavor, so far as in him lies, to make sure that your individual efforts shall be properly directed, and that as little energy as possible shall be wasted by any of you in a necessarily unprofitable direction.—*Contemporary Review.*

THE LITTLE HEALTH OF LADIES.¹

By FRANCES POWER COBBE.

IN the following pages I propose to speak, not of any definite form of disease, but of that condition of *petite santé*, valetudinarianism, and general readiness to break down under pressure, wherein a sadly large proportion of women of the higher classes pass their years. It is unnecessary, I think, to adduce any evidence of the prevalence of this semi-invalidism among ladies in England, or its still greater frequency abroad, and (emphatically) in America. In a very moderate circle of acquaintance, every one knows a score of cases of it, of that confirmed kind which has scarcely any analogue in the physical condition of men. If we take a state of perfect soundness to be represented by 100, the health of few ladies will be found to rise above 80 or 90—that of the majority will be, I fear, about 75—and a large contingent, with which we are now specially concerned, about 50 or 60. In short, the health of women of the upper class is, I think, unquestionably far *below par*. Whatever light their burners were calculated to shed on the world, *the gas is half turned down*, and cannot afford anything beyond a feeble glimmer.

Of the wide-extending wretchedness entailed by this *petite santé* of ladies it would be easy to speak for hours. There are the husbands whose homes are made miserable by unsettled habits, irregular hours, a cheerless and depressed, or else, perhaps, an hysterically excitable or peevish companion; the maximum of expenditure in their households, with the minimum of enjoyment. I

think men, in such cases, are most sincerely to be pitied, and I earnestly wish that the moans which they, and also their mothers and sisters, not unnaturally spend over their hard lot, could be turned into short, sharp words, resolutely providing that their daughters should not adopt the unhealthful habits and fall into the same miserable state, perpetuating the evil from generation to generation.

As to the poor children of a feeble mother, their case is even worse than that of the husband, as any one may judge who sees how delightful and blessed a thing it is for a mother to be the real, cheerful, energetic companion of her sons and daughters. Not only is all this lost, but the presence of a nervous, *exigante* invalid in the dwelling-room of the family is a perpetual damper on the healthful spirits of the children; and, in the case of the girls, the mother's demands on their attention (if she be not a miracle of unselfishness) often break up their whole time for study into fragments too small to be of practical use. The *desultoriness* of a home wherein the mistress spends half the day in bed is ruinous to the young, unless a most unusual degree of care be taken to secure them from its ill effects.

Pitiable, however, as are the conditions of the husband and children of the Lady of Little Health, her own lot—if she be not a mere malingering—is surely still more deserving of sympathy. She loses, to begin with, all the keen happiness of health, the inexplicable, indefinable *bien-être* of natural vigor—

¹ To avoid misapprehension, it may be well to say that this word is here used in its older sense of the "*Loaf-givers*." The ill-health of women who are *loaf-winners* is, alas! another and still more sorrowful subject.

"the joy of morning's active zeal,
The calm delight, blessing and blest,
To sink at night to dreamless rest."

She knows nothing of the glorious freedom of the hills and woods and rocky shore; she misses all the relief which lonely rides and walks afford from those petty worries which, like the wasps and ants in the dreadful old Persian torture, are sure to fasten on the poor wretch pinned to the ground. "To be weak is to be miserable." There is no truer maxim; and, when we reflect how many women are weak—not merely in comparison to men, which is nothing to the purpose, but weak absolutely and judged by the standard of Nature—we have before us a vast, low-lying field of dull wretchedness profoundly mournful to contemplate. Out of it, what evil vapors of morbid feelings, jealousies, suspicions, hysterical passions, religious terrors, melancholy, and even insanity, are generated, who shall estimate? To preserve the *mens sana* elsewhere than in the *corpore sano* is a task of almost superhuman wisdom and conscientiousness. The marvel is, not that so many fail, as that a few succeed in performing it.

Be it noted, further, that it is the chronic *petite santé* much more than any positive disease, which is morally so injurious to the sufferer and all around her. I have heard one whose long years of pain seem each to have lifted her nearer to heaven remark with a smile, that "actual pain is always, in a sense, *entertaining!*" She intended, no doubt, to say that it tasked the powers of will and religious trust to bear it firmly. Out of such contests and such triumphs over either bodily or mental suffering, springs (as we all recognize) that which is most precious in human experience, the gold purified in the furnace, the wheat thrashed with the flail:

"Only upon some cross of pain and woe

God's son may lie,

Each soul redeemed from self and sin must know
Its Calvary."

But the high moral results of positive pain and danger seem unattainable by such a mere negation of health as we are considering. The sunshine is good and the storm is good, but the gray, dull drizzle of November—how is any one to gain much from it? Some beautiful souls do so, no doubt; but far more often chronic *petite santé* leads to self-indulgence; and self-indulgence to selfishness; and selfishness (invariably) to deceit and affectation, till the whole character crumbles to pieces with dry rot.

Now, I must say at once that I consider the frequency of this valetudinarianism among women to be a monstrous state of things, totally opposed to any conception I can form of the intentions of

Providence or the laws of beneficent Nature; and the contented way in which it is accepted, as if it were a matter of course, by society and the poor sufferers themselves, and even by such well-meaning friends of women as M. Michelet, strikes me as both absurd and deplorable. That the Creator should have planned a whole sex of patients—that the normal condition of the female of the human species should be to have legs which walk not, and brains which can only work on pain of disturbing the rest of the ill-adjusted machine—this is to me simply incredible. The theory would seem to have been suggested by a study, not of the woman's *body*, framed by the great Maker's wisdom, but from that of her silly *clothes* sent home from the milliner, with tags, and buttons, and flounces, meant for show, not use; and a feather and an artificial flower by way of a head-gear.

Nay, my skepticism goes further, even into the stronghold of the enemy. I do not believe that even the holy claims of motherhood ought to involve—or, if women's lives were better regulated, *would* involve—so often as they do, a state of invalidism for the larger part of married life; or that a woman ought to be disabled from performing the supreme moral and intellectual duties of a parent toward her first-born children, when she fulfills the lower physical part of her sacred office toward those who come afterward. Were this to be inevitably the case, I do not see how a woman who has undertaken the tremendous responsibilities of a mother toward the opening soul of a child could venture to burden herself with fresh duties which will incapacitate her from performing them with all her heart and soul, and strength.

One of the exasperating things about this evil of female valetudinarianism is, that the women who are its victims are precisely the human beings who, of our whole mortal race, seem naturally most exempt from physical want or danger, and *ought* to have enjoyed immunity from disease or pain of any kind. Such ladies have probably never from their birth been exposed to hardship, or toil, or ill-ventilation, or bad or scanty food, fuel, or raiment. They have fed on the fatness of the earth, and been clothed in purple and fine linen. They are the true lotos-eaters whom the material cares of the world reach not. They

"live and lie reclined,"

in a land where (in a very literal sense)

"It seemeth always afternoon,"

and where they find a certain soothing, æsthetic

emotion in reading in novels the doleful tale of wrong of the "ill-used race of men that cleave the soil"—without dreaming of going down among them to make that tale less dismal.

That these women, these Epicurean goddesses of the drawing-room, should be so often the poor, fragile, suffering creatures we behold them, unable to perform half the duties of life, or taste a third part of its pleasures—this is a pure perversion of things which ought surely to provoke revolt.

What are the causes of the valetudinarianism of ladies?

First, of course, there is a considerable class of inherited mischief, feeble constitutions, congenital tendencies to chronic troubles, gout, dyspepsia, and so on, due to the errors of either parent, or to their evil heritage of the same. All that need be said here on this topic is that such cases must necessarily go on multiplying *ad infinitum* till mothers regain the vigor which alone permits them to transmit a healthy constitution to their children.

Next to hereditary *petite santé*, we come to cases where the habits of the sufferers themselves are the cause of the mischief; and these are of two kinds—one resulting from what is good and unselfish, and one from what is bad and frivolous, in the disposition of women.

Women are generally prudent enough about their money; that is, of their own money, not that of their husbands. I have heard an observant man remark that he never knew a well-conducted woman who, of her own fault, became bankrupt. But, as regards their health, the very best of women have a propensity to *live on their capital*. Their nervous energy, stimulated either by conscience or affection or intellectual interests, suffices to enable them to postpone perpetually the calls of their bodies for food, sleep, or exercise. They draw large drafts on their physical strength, and fail to lodge corresponding sums of restoring rest and nutriment. Their physical instincts are not imperious, like those of men; and they habitually disregard them when they make themselves felt, till poor Nature, continually snubbed when she makes her modest requests, ceases to press for daily settlement of her little bill, and reserves herself to put in an execution by-and-by. The vegetative and the spiritual part of these women flourish well enough; but (as Kingsley's Old Sandy says) "There is a lack of healthy animalism" between the two. They seem to consider themselves as fire-flies issuing

out of a rose, flitting hither and thither to brighten the world, not creatures of flesh and blood, needing to go to bed and eat roast-mutton.

If we study the condition of Mr. John Bull in his robust middle age, we shall notice that for forty years, with few interruptions, he has enjoyed those "reg'lar meals," on which Tennyson's Northern Farmer lays such stress as the foundation of general stability of character. He has also walked, ridden, rowed, skated, smoked his cigar, and gone to his bed (as nearly as circumstances permitted) when the inclination seized him. If now and again he has omitted to gratify his instincts, it has been for a business-like reason, and not merely because somebody did not happen to wish to do the same thing at the same time. He has not often waited for an hour, half-fainting for want of his breakfast, from motives of mere domestic courtesy; nor sat moped in a hot room through a long, bright day to keep some old person company; nor resolved his dinner into tea and muffins because he was alone and it was not worth while to trouble the servants; nor sat up cold and weary till three in the morning to hear about a parliamentary debate wherein he took only a vicarious interest. At the end of the forty years of wholesome indulgence, the man's instincts are more imperious and plain-spoken than ever, and, as a reward for his obedience to them, his organs perform their respective offices with alacrity, to the great benefit of himself and of all dependent upon him. Pretty nearly the reverse of this has happened in the case of Mrs. Bull. Almost her first lesson in childhood was to check, control, and conceal her wants and miseries; and by the time she has grown up she has acquired the habit of postponing them, as a matter of course, to the smallest convenience of A, B, C, and D, father, mother, brothers, even servants, whom she will not "put out of their way" for herself, though no one would so much as think whether they had a way to be put out of, for her brothers. The more strain there is upon her strength, by sickness in the house or any misfortune, the more completely she effaces and forgets herself and her physical wants, recklessly relinquishing sleep and neglecting food. When the pressure is relieved, and the nervous tension which supported her relaxed, the woman breaks down, as a matter of course, perhaps never to enjoy health again.

It must be borne in mind, also, in estimating a woman's chances of health, that, if she neglect to think of herself, there is seldom anybody to do for her what she does for her husband. No-

body reminds her to change her boots when they are damp; nobody jogs her memory as to the unwholesomeness of this or that beverage or comestible, or gives her the little cossetings which so often ward off colds and similar petty ills. Unless the woman live with a sister or friend, it must be scored one against her chances as compared to a man, that she *has no wife*.

There must, of course, be set against all this the two facts that the imperiousness of men's wishes and wants leads them often not *only* to do such wholesome things as those of which we have been speaking, but into sundry unwholesome excesses besides, for which in due time they pay by various diseases, from gout up to *delirium tremens*. And correspondingly, women's comparative indifference to the pleasures of the table keeps them clear of the ills to which gormandizing and bibulous flesh is heir. We all know scores of estimable gentlemen who can scarcely be prevailed on, by the prayers and tears of their wives, to refrain from drinking a glass of beer or port wine which will in all probability entail a fit of the gout next day; but in my whole life I have never known a woman who consciously ate or drank things likely to make her ill, save one mild and sweet old lady, whose predilection for buttered toast overcame every motive of prudence, and, alas! even of religion, which I have reason to believe she endeavored to bring to bear against the soft temptation. But for the purpose we have now in hand, namely, that of tracing the origin, not of acute diseases, but of general *petite santé*, this aspect of the subject is unimportant. It is precisely *petite santé* which comes of the perpetual neglect of Nature's hints—that she wants air, bread, meat, fruit, tea, wine, sleep, a scamper or a canter. It is definite *disease* which results from over-exercise, over-feeding, and over-drinking.

Would it not be possible, I venture to ask, to cut off *this* source of feminine invalidism, at all events, by a somewhat more respectful attention to the calls of healthful instinct? I am very far from wishing that women should grow more selfish, or less tenderly regardful of the convenience and pleasure of those around them. Even sound health of body—immeasurable blessing that it is—would be purchased too dearly if this should happen. But there ought surely to be an adequate reason, not a mere excuse of whim and caprice of her own or of anybody else, why a woman should do herself hurt or incapacitate herself for future usefulness.

Another source of *petite santé*, I fear, may be

found resulting from a lingering survival among us of the idiotic notion that there is something peculiarly “lady-like” in invalidism, pallor, small appetite, and a languid mode of speech and manners. The very word “delicacy,” properly a term of praise, being applied vulgarly to a valetudinary condition, is evidence that the impression of the “dandies” of sixty years ago, that refinement and sickness were convertible terms, is not yet wholly exploded. “Tremaïne” thought *morbidezza*—a “*eharming morbidezza*”—the choicest epithet he could apply to the cheek of beauty; and the heroines in all the other fashionable novels of the period drank hartshorn almost daily, and died of broken hearts, while the pious young Protestants who converted Roman Catholics in the religious tales, uniformly perished of consumption. Byron's admiring biographer records how, at a large dinner-party, he refused all viands except potatoes and vinegar (horrid combination!), and then retired to an eating-house to assuage with a beef-steak those cravings which even Childe Harold could not silence with “chameleon's food” of “light and air.”

We have advanced indeed somewhat beyond this wretched affectation in our day, and young ladies are not required by *les bienséances* to exhibit at table the public habits of a ghoul. In a few cases, perhaps, we may opine that women have gone to the opposite extreme, and both eat and drink more than is desirable. But yet we are obviously not wholly free from the “delicacy” delusion. We are not so clear as we ought to be on the point that, though beauty includes *other* elements, yet health is its *sine qua non*, and that no statueque nobility of form (much less a pinched waist and a painted face) can constitute a beautiful living human creature, who lacks the tokens of health—clear eyes, clear skin, rich hair, good teeth, a cool, soft hand, a breath like a bunch of cowslips, and a free and joyous carriage of the head and limbs.

Have we not, in the senseless admiration of feebleness and pallor (to obtain which a fashionable lady not long ago literally bled herself by degrees to death), an illustration of the curious fact pointed out by Miss de Rothschild in her admirable essay on the “Hebrew Woman,” namely, that the homage which Christianity won for weakness has tempted women to cultivate weakness to secure the homage? Just as Christian charity to the poor has fostered mendicancy, so has chivalrous tenderness to the feeble inspired a whole sex with the fatal ambition of becoming feeble

(or of simulating feebleness) to obtain the tenderness. The misconstruction and abuse of the attitudes of the gospel, as manifested in the rise of the mendicant order of friars, is notoriously a sad chapter of history. I do not think it a less sorrowful one that an analogous abuse has led to a sort of canonization of bodily and mental feebleness, cowardice, and helplessness, among women. Can we question which is the nobler ideal—the modern, nervous, pallid, tight-laced, fine Lady of Little Health—or the “valiant woman” (as the Vulgate calls her) of whom King Lemuel saith, “She girdeth her loins with strength, and strengtheneth her arms. Strength and honour are her clothing; and she shall rejoice in time to come?”¹

We have now touched on the subject of dress, which plays so important a part in the health of women that it must here be treated somewhat at length. A little girl in a London Sunday-school, being asked by a visitor “why God made the flowers of the field?” replied (not unconscious of the gorgeous paper poppy in her own bonnet), “Please, ma’am, I suppose for patterns for artificial flowers.” One might anticipate some answer scarcely less wide of the mark than that of this sophisticated little damsel, were the question to be put to not a few grown women, “Why do you wear clothes?” Their most natural response would obviously be, “To be in the fashion.” When we have visibly wandered a long way from the path of reason, the best thing we can do is to look back to the starting-point and find out, if possible, where we have diverged. In the matter of raiment that starting-point is not hard to find—indeed, to mark it is only to state a series of truisms.

Human clothing has three *raison d'être*, which, in order of precedence, are these:

I. HEALTH.

II. DECENCY.

III. BEAUTY.

HEALTH demands—

1. Maintenance of proper temperature of the body by exclusion of excessive heat and cold.
2. Protection from injury by rain, snow, dust, dirt, stones to the feet, insects, etc.
3. Preservation of liberty of action to all the organs of the body and freedom from pressure.

DECENCY demands—

4. Concealment of some portions of the human frame.
5. Distinction between the habiliments of men and women sufficient to avert mistake.

6. Fitness to the age and character of the wearer.

7. Concealment, when possible, of any disgusting personal defect.

BEAUTY demands—

8. Truthfulness. The dress must be genuine throughout, without any false pads, false hair, or false anything.

9. Graceful forms of drapery.

10. Harmonious colors.

11. Such moderate consistency with prevailing modes of dress as shall produce the impression of sociability and suavity, and avoid that of self-assertion.

12. Individuality: the dress suiting the wearer as if it were an outer body belonging to the same soul.

(Be it noted that the fulfillment of this highest condition of tasteful dress necessarily limits the number of costumes which each person should wear on similar occasions. No one body can be adorned in several *equally suitable* suits of clothes, any more than one soul could be fittingly housed in twenty different bodies.)

Glancing back over the above table, we find this curious fact: The dress of *men* in all Western nations meets fairly all the conditions of health and decency, and fails only on the side of beauty. The dress of *women*, on the contrary, ever variable as it is, persistently misses the conditions of health; frequently violates the rules of decency; instead of securing beauty, at which it aims first instead of last, achieves, usually, ugliness.

It is to be remembered for our consolation and encouragement that men have arrived at their present good sense in dress only within two or three generations. A hundred years ago the lords of creation set beauty above health or convenience, just as the ladies do now, and peacocked about in their peach blossom coats and embroidered waistcoats, surmounted by wigs, for whose stupendous discomfort even a seat on the judicial bench can scarcely reconcile the modern Englishman. Now, when the men of every European nation have abjured such fantastic apparel, we naturally ask, Why have not the women followed their example? Why is the husband, father, and brother, habited like a being who has serious interests in life, and knows that his personal dignity would be forfeited were he to dress himself in party-colored, be-ribboned garments, and why is the wife, mother, or sister, bedizened like a macaw, challenging every observer to note how much of her time, thoughts, and money, must

¹ Proverbs xxxi.

have been spent on this futile object? The answer is one which it is not pleasant to make, discreditable as it is to both sexes. The women who set the fashions dress for admiration; and men like women who dress to be admired; and the admiration given and received is a very poor and unworthy admiration, not much better than a salmon gives to a glittering artificial fly, and having very little more to do with any real æsthetic gratification—as is proved too clearly by the thoroughly un-beautiful devices to which fashion has recourse. It is the *well-got-up* woman (to borrow a very expressive phrase), not the really well-dressed woman, who receives by far the largest share of homage.

And now let us see how all this concerns the health of women—how much of their *petite santé* is due to their general neglect to make health the first object of dress, or even an object at all compared to fashion.

Tight-lacing among habits resembles envy among the passions. We take pride in all the rest, even the illest and worst, but tight-lacing and an envious heart are things to which no one ever confesses. A small waist, I suppose, is understood to belong to that order of virtues which Aristotle decides ought to be natural and not acquired, and the most miserable girl who spends her days in a machine more cruel (because more slowly murderous) than the old “Maiden” of Seville, yet always assures us, smiling through her martyrdom, that her clothes are “really hanging about her!” It would be waste of time to dwell on this supreme folly. Mrs. Haweis, in her very noteworthy new book, “The Art of Beauty,” has given some exceedingly useful diagrams, showing the effects of the practice on the internal organs and skeleton¹—diagrams which I earnestly recom-

mend to the study of ladies who may feel a “call” to perform this sort of English suttee for a *living* husband. Mrs. Haweis says that sensible men do not love wasps, and have expressed to her their “overallishness” when they behold them. Considering how effectively they have hitherto managed to display their disapproval whenever women have attempted to introduce rational attire, it is a pity, I think, that they do not “pronounce” a little more distinctly against this literally mortal folly.

I have already alluded to the brain-heating chignons, just gone out of fashion after a long reign of mischief; and along with them should be classed the bonnets which expose the forehead to the cold, while the back of the head is stewed under its cushion of false hair, and which have the still more serious disadvantage of affording no shelter to the eyes. To women to whom the glare of the sun is permanently hurtful to the sight, the necessity of wearing these bonnets on pain of appearing singular, or affectedly youthful, constitutes almost a valid reason against living in London. And the remedy, forsooth, is to hold up perpetually a parasol!—a yet further incumbrance to add to the care of the dragging train, so that both arms may be occupied during a whole walk, and of course all natural ease of motion rendered impossible. In this, as in a dozen other silly fashions, the women who have serious concerns in life are hampered by the practice of those who think of nothing but exhibiting their persons; and ladies of limited fortune, who live in small rooms and go about the streets on foot or in cabs, are compelled (if they wish to avoid being pointed at) to adopt modes of dress whose sole *raison d'être* is that they suit wealthy *grandes dames* who lounge in their barouches or display their trains over the carpets of forty-feet-long drawing-rooms. What *snobbery* all this implies in our whole social structure! Some ten millions of women dress, as nearly as they can afford, in the style fit at the most for five thousand!

The practice of wearing *décolletée* dresses, sinning equally as it does against health and decen-

¹ Pp. 49 and 50. The preceding pages on what I conceive to be the *raisons d'être* of dress were written before I had seen this exceedingly clever, brilliant, and learned little book. While giving the authoress thanks for her most sensible reprobation of many senseless fashions, and not presuming for a moment to question her judgment in the matters of taste, on which she speaks with authority, I must here enter my humble but earnest protest against the over-importance which, I think, she is inclined to attach to the art of dress, among the pursuits of women; and (most emphatically) against her readiness to condone—if it be only committed in moderation—the offense against both truth and cleanliness of wearing false hair (*see* page 173). It seems to me quite clear that here the whole principle of honesty in attire is sacrificed. If no woman would wish it to be known that the hair on her head never grew there, but on the scalp of some poor French girl, so poor as to be bribed to part with it, or some unkempt Russian peas-

ant who rarely used a comb in her life—then the wearing of that false hair is an act of *deception*, and in so far, I hold, both morally and even æsthetically wrong. I cannot conceive why the *lamp of truth*, which we are now perpetually told must shine on our architecture and furniture, so that nothing must appear stone that is iron, and so on *ad infinitum*, should not shine equally lucidly over the dress of women. Where no deception is meant, and where the object is to supply a want, not to forge a claim to beauty—e.g., in the case of artificial teeth—there is no harm involved.

ey, seems to be gradually receding—from ordinary dinners, where it was universal twenty years ago, to special occasions, balls, and court drawing-rooms. But it dies hard, and it may kill a good many poor creatures yet, and entail on others the life-long bad health so naturally resulting from the exposure of a large surface of the skin to sudden chills.

The thin, paper-soled boots which leave the wearer to feel the chill of the pavement or the damp of the grass wherever she may walk, must have shortened thousands of lives in Europe, and even more in America. Combined with these, we have now the high heels, which, in a short period, convert the foot into a shapeless deformity, no longer available for purposes of healthful exercise. An experienced shoemaker informed the writer that, between the results of tight boots and high heels, he scarcely knew a lady of fifty who had *what he could call a foot at all*—they had mere clubs. And this is done, all this anguish endured, for the sake of—beauty!

Bad as stays, and chignons, and high heels, and paint, and low dresses, and all the other follies of dress are, I am, however, of opinion that the culminating folly of fashion, the one which has most wide-spread and durable consequences, is the mode in which for ages back women have contrived that their skirts should act as drags and swaddling-clothes, weighing down their hips and obstructing the natural motion of the legs. Two hundred years ago the immortal Perrette, when she wanted to carry her milk-pail swiftly to market, was obliged to dress specially for the purpose:

“Légère et court vêtue, elle allait à grands pas,
Ayant mis ce jour-là, pour être plus agile,
Cotillon simple et souliers plats.”

From that time to this the “cotillon simple”—modest, graceful, and rational—has been the rare exception, and every kind of flounce and furbelow, hoops and crinolines, panniers and trains, “tied-back” costume, and *robe collante*, has been successively the bane of women’s lives, and the slow destroyer of their activity.

It has been often remarked that the sagacity of Romish seminarists is exhibited by their practice of compelling boys destined for the priesthood to flounder along the streets in their long gowns, and never permitting them to cast them aside or play in the close-fitting clothes wherein English lads enjoy their cricket and foot-ball. The obstruction to free action, though perhaps slight in itself, yet constantly maintained, gradually tames down the wildest spirits to the level

of ecclesiastical decorum. But the lengthiest of *soutanes* is a joke compared to the multitudinous petticoats which, up to the last year or two, every lady was compelled to wear, swathing and flowing about her ankles as if she were walking through the sea. Nor is the fashion of these later days much better, when the scantier dress is “tied back”—as I am informed—with an elastic band, much on the principle that a horse is “hobbled” in the field; and to this a tail a yard long is added, which must either be left to draggle in the mud or must occupy an arm exclusively to hold it up. In youth these skirts are bad enough, as exercising a constant check on free and healthful movement; but the moment that the elastic steps begin to give place to the lassitude of middle life, the case is desperate. There is no longer energy to overcome the impediments created by the ridiculous *spancels*, and the poor donkey of a woman hobbles daily round a shorter and shorter course, till at forty or fifty she tells her friends with a sigh that she finds (she cannot imagine why) that she cannot walk at all!

Does decency require such a sacrifice as this? Does the utmost strain of feminine modesty ask for it? If it were so, I, for one, should leave the matter with a sigh, as not to be remedied. But who in his senses dreams that such is the case? Who, in the age of *robes collantes* and *décolletée* dresses, can pretend that a reasonably full, simply-cut silk or cloth skirt, reaching to the ankles and *no longer*, would not fulfill immeasurably *better* than any fashion we have seen for many a day the requirements of true womanly delicacy? It is for *fashion*, not decency, that the activity of women is thus crushed, their health ruined, and (through them) the health of their children. I hold it to be an indubitable fact that if twenty years ago a rational and modest style of dress had been adopted by Englishwomen and encouraged by Englishmen, instead of being sneered down by fops and fools, the health not only of women, but of the sons of women, i. e., of the entire nation, would now be on altogether a different plane from what we find it.¹

¹ The inquiry, “How fashions originate and *with whom?*” would lead us too far from the subject in hand, but some light is thrown on the way in which complicated arrangements of dress are maintained under every variation and in defiance of the true principles of taste, as well as of health and economy, by the reflection that it would never pay drapers and dress-makers that their customers should readily calculate how much stuff they require for each garment. For further criticism of the follies of female dress—the *torrid* and *frigid* zones of body and limbs—the “panniers” or “bustles” creating kidney-disease;

Reviewing all these deplorable follies, we may learn to make excuses for legislators who classify women with "criminals, lunatics, idiots, and minors." It needs a woman's knowledge of the pernicious processes to which the opening minds of girls are commonly subjected—the false and base aims in life set before them, the perverse distribution toward them of approval and blame, admiration and neglect, and even of love and dislike, from parents, teachers, servants, brothers, and finally from the ballroom world into which they are now launched in childhood—to enable us to make allowances for them, and retain faith that there sometimes beats a real woman's heart under the ribs of a tightly-laced corset, and that a head surmounted by a pile of dead women's hair is not invariably devoid of brains.

How is the remedy for this dreary round of silly fashions ever to be attained? No woman who knows the world and how severe is the penalty of eccentricity in attire, will ever counsel her sisters to incur it for any motive short of a distinct duty. But if the hundreds of ladies who recognize the tyranny of senseless and unhealthy fashions were to combine forces to obey those fashions *just as little as may be*, to go as near the wind in the direction of simplicity, wholesomeness, and ease in their dress, as they dare, there would by degrees be formed a public opinion, rising year by year with the numbers and social standing of the representatives of common-sense. It must have been in some such way that our great-grandfathers dropped their swords and bag-wigs and ruffles and embroidery, and took to dressing—as even the silliest and vainest men do in these days—like rational beings.

Next to unhealthy dress, women may lay their *petite santé* at the door of their excessive addiction to pursuits giving exercise neither to the brain nor yet to the limbs. If the problem had been set to devise something, the doing of which would engage the very fewest and smallest powers of the mind or body, I know not whether we should give the prize for solving it to the inventor of knitting, netting, crochet, or worsted-work. Pursued for a reasonable period in the day, these employments are no doubt quite harmless, and even perhaps, as some have urged, may the skewering down of the arms by tight arm-holes; the veils which cause amaurosis, etc.—and also for some excellent suggestions of reform, see "Dress and Health," a little book printed by Dougall & Son, Montreal, to be obtained in London for the present only by sending 1s. 6d. in stamps to B., 15 Belsize Square, N. W.

be useful as sedatives. But that a woman who is driven by no dire necessity to "stitch, stitch, stitch," who has plenty of books to read, and two legs and feet to walk withal, should voluntarily limit the exercise of her body to the little niggling motion of the fingers required by these works, and the labor of her mind to counting stitches, is all but incomprehensible. That the consequences should be sickness and feebleness seems to follow of course. In old times the ever-revolving spinning-wheel had its full justification in its abundant usefulness, and also in the dearth of intellectual pursuits for women. But it is marvelous that a well-educated Englishwoman, not yet sinking into the natural indolence of age, should choose to spend about a fifth or fourth of the hours God has given her on this beautiful earth in embroidery or worsted-work. A drawing-room crammed with these useless fads—chairs, cushions, screens, and antimacassars—is simply a mausoleum of the wasted hours of the female part of the family. Happily, there is a sensible diminution in this perpetual needling, and no future Mrs. Somerville will be kept for the best hours of her girlhood "shewing" her daily seam. More intelligent and more active pursuits are multiplying, and the great philanthropist who invented lawn-tennis has done more to remedy the little health of ladies than ten thousand doctors together.

We have now glanced over a number of causes of *petite santé*, for which the sufferers themselves are more or less responsible. Let us turn to some others regarding which they are merely passive.

It is many years since, in my early youth, I was struck by a singular coincidence. Several of my married acquaintances were liable to a peculiar sort of headache. They were obliged, owing to these distressing attacks, to remain very frequently in bed at breakfast-time, and later in the day to lie on the sofa with darkened blinds and a considerable exhibition of eau-de-Cologne. A singular immunity from the seizures seemed to be enjoyed when any pleasant society was expected, or when their husbands happened to be in a different part of the country. By degrees, putting my little observations together, I came in my own mind to call these the "bad-husband headaches," and I have since seen no reason to alter my diagnosis. On the contrary, I am of opinion that an incalculable amount of feminine invalidism arises from nothing but the depressing influences of an unhappy home. Sometimes, of course, it is positive unkindness and cruelty

which the poor creatures endure. Much more often it is the mere lack of the affection and care and tenderness for which they pine as sickly plants for sunshine. Sometimes it is the simple oppression of an iron will over them which bruises their pleasant fancies, and lops off their innocent whims, till there is no sap left in them to bud or blossom any more. Not seldom the misery comes of frequent storms in the household atmosphere—for which the woman is probably as often to blame as her companion, but from which she suffers doubly, since, when they have passed, he goes out to his field or his merchandise with what spirit he can muster, poor fellow! while she sits still where the blighting words fell on her, to feel all their bitterness. Of course it is not only unkind *husbands* who make women down-hearted. There are unkind people in every relation, and the only specialty of a woman's suffering from unkindness is, that she is commonly almost like a bed-ridden creature, for whom a single thorn or even a hard lump in her bed is enough to create a soreness. To those who can get up and walk away, the importance which she attaches to the thorn or the lump seems inexplicable.

This balking of the heart is, I suppose, the worst evil in life to nine women out of ten, whether it take place after marriage in finding an uncongenial husband, or before marriage when a lover leaves them in the lurch and causes them a "disappointment." This word, I observe, is always significantly used with reference to such events, among a certain class of women, as *the* disappointment *par éminence*. When a lady fails to get her book published or her picture hung at the Academy, nobody speaks of her as having undergone a "disappointment." I have no doubt the grief of losing the lover is generally worse than these; but I wish that pride would teach every woman under such circumstances not to assume the attitude of an Ariadne, or settle down after a course of sal-volatile into languor and little health till she is found at sixty, as M. About deliciously describes an English old maid, "*tant soit peu desséchée par les langueurs du célibat.*" Of this kind of thing I would fain hope we might soon see the end, as well as of the actions for breach of promise, which are a disgrace to the whole womanhood of the country.

But besides heart-sorrows, real and imaginary, there are other departments of women's natures wherein the balking of their activities has a deplorable effect on their physical as well as mental condition. Dr. Bridges once gave an admirable

lecture at the Royal Institution, concerning the laboring and pauper class of Englishmen. He made the remark (which was received with emotion by the audience) that it was not enough to supply a human being with food and shelter. "Man," he said, "does not live by bread alone, he must have *hope*." May we not say likewise, "Woman does not live by bread alone—nay, nor by the richest *cake*?" She, too, must have hope—something to live for, something which she may look to accomplish for herself or others in God's world of work, ere her night shall fall. A Hindoo lady, lately speaking at a meeting in India, compared Mary Carpenter's beneficent existence to a river bearing fertility to many lands, while the life of a woman in the zenana, she said, resembled rather a pond. Surely every woman worthy of the name would desire to be something more than the pool, were it only a little trickling rill! But in endless cases she is *dammed up* on all sides, and none the less effectually that the soft mud of affectionate prejudice forms the dam. If her friends be rich, she is sickened with excess of luxury, but prohibited from stooping down out of the empyrean of her drawing-room to lend a finger to lift the burdens of a groaning world. If the family income be small, and the family pride proportionately great, she is required to spend her life—not in inspiring, honorable money-earning, but in depressing, heart-narrowing money-saving. When the poor soul has borne this sort of pecuniary stay-lacing for a dozen years, and her forehead has grown narrow, and her lips pinched, and her eyes have acquired a certain anxious look (which I often fancy I recognize) as if of concern about sixpences, then, forsooth, the world laughs at her and says, "Women are so stingy!" How gladly, in a hundred cases, would that poor lady have toiled to *earn*—and not to *save*—and have been nobly generous with the proceeds of her industry!

We have heard a great deal of late of the danger to women's health of over-mental strain or intellectual labor. I do not say there is never danger in this direction, that girls never study too much or too early, or that the daughters of women who have never used their brains may not have inherited rather soft and tender organs of cogitation to start with. I am no enthusiast for excessive book-learning for either women or men, though in books read and books written I have found some of the chief pleasures of a happy life. Perhaps if it were my duty to supervise the education of girls I should be rather inclined to say, like the hero of "Locksley Hall:"

"They shall ride and they shall run,
 . . . Leap the rainbows of the brooks,
 Not with blinded eyesight poring over miserable
 books."

But of one thing I am sure, and that is, that for one woman whose health is injured by excessive study (that is, by *study itself*, not the baneful anxiety of examinations superadded to study), there are hundreds whose health is deteriorated by want of wholesome mental exercise. Sometimes the vacuity in the brains of girls simply leaves them dull and spiritless. More often into those swept and empty chambers of their skulls enter many small imps of evil omen. "The exercise of the intellectual powers," says an able lady M. D., "is the best means of preventing and counteracting an undue development of the emotional nature. The extravagances of imagination and feeling engendered in an idle brain have much to do with the ill-health of girls." Another observer, an eminent teacher, says, "I am persuaded, and my experience has been confirmed by experienced physicians, that the want of wholesome occupation lies at the root of the languid debility, of which we hear so much, after girls have left school."¹ And another, the principal of one of the largest colleges for women in England, adds: "There is no doubt whatever that sound study is an eminent advantage to young women's health; provided, of course, that the general laws of health be attended to at the same time."

Let women have larger interests and nobler pursuits, and their affections will become, not less strong and deep, but less sickly, less craving for demonstrative tenderness in return, less variable in their manifestations. Let women have sounder mental culture, and their emotions—so long exclusively fostered—will return to the calmness of health, and we shall hear no more of the intermittent feverish spirits, the causeless depressions, and all the long train of symptoms which belong to Protean-formed hysteria, and open the way to madness on one side and to sin on the other.

And now, in conclusion, I must touch on a difficult part of my subject. Who is to blame for all the misery resulting from the little health of ladies?

Of course, a large portion of the evil must be impartially distributed throughout society, with its false ideals of womanhood. Another portion rests on parents and teachers; and, of course, no inconsiderable part on the actual sufferers, who,

in many cases, might find healthful aims in life if they had the spirit to look for them, and certainly need not carry the destructive fashions of dress to the climax they reach in the red-hot race of vanity. There remains yet a share of guilt with the childish and silly men who systematically sneer down every attempt to make women something better than the dolls they play with (just as if they would be at a loss for toys, were the dolls to be transformed into rational creatures), and those others, even more cruelly selfish, who deliberately bar every door at which women knock in search of honorable employment. After all these, I find one class more.

There is no denying the power of the great medical order in these days. It occupies, with strangely close analogy, the position of the priesthood of former times, assumes the same airs of authority, claims its victims for torture (this time among the lower animals), and enters every family with a latch-key of private information, only comparable to that obtained by the confessional. If Michelet had written for England instead of for France, he should have made a book, not on "Priests, Women, and Families," but on "Doctors, Women, and Families." The influence of the family medical man on wives and mothers, and, through them, on husbands and children, is almost unbounded, and if it were ever to be exerted uniformly in any matter of physical education, there is little doubt that it would be effective.

What, then, we may reasonably ask, have these omnipotent doctors done to prevent the repetition of deadly follies in the training of girls generation after generation? Now and then we have heard feeble cautions, given in an Eli-like manner, against tight lacing, late hours, and excitement; and a grand display of virtuous indignation was, if I remember rightly, exhibited about a year ago in a medical round-robin, against feminine dram-drinking—a vice for which the doctor's own prescriptions are in too many cases responsible. But the steadily-determined pressure on mothers and young women, the insistence on free, light petticoats, soundly-shod feet, loose stays, and well-sheltered heads—when has it been exercised? An American medical lady says that at a *post-mortem* examination of several women killed by accident in Vienna, she found the internal organs of nearly all affected by tight-lacing. "Some ribs overlapped each other; one had been found to pierce the liver; and, almost without exception, that organ was displaced below the ribs. . . . The spleen in some cases was much

¹ "The Education of American Girls," p. 229.

enlarged, in others it was atrophied,"¹ and so on. Do the male doctors, who behold these and other hideous sights continually, go out to warn the mothers who encourage girls to this ghastly self-destruction, as they do denounce the poor, misguided, peculiar people and anti-vaccinators who cheat Science of her dues?

At last, after the follies of luxury and fashion have gone on in a sort of *erescendo* like the descent of Vathek into the hall of Eblis, till we seem nearly to have reached the bottom, a voice of warning is heard! It has pealed across the Atlantic, and been reëchoed on the shores of England with a cordiality of response which our men of science do not often give to American "notions." "Women, beware!" it cries. "Beware! you are on the brink of destruction! You have hitherto been engaged only in crushing your waists; now you are attempting to cultivate your minds! You have been merely dancing all night in the foul air of ballrooms; now you are beginning to spend your mornings in study! You have been incessantly stimulating your emotions with concerts and operas, with French plays and French novels; now you are exerting your understanding to learn Greek and solve propositions in Euclid! Beware—oh, beware! Science pronounces that the woman who—*studies*—is lost!"

Perhaps there are some women, now alive, who did study a little in youth, who even spent their nights occasionally over their books while their contemporaries were running from one evening party to another—who now in middle and advanced life enjoy a vigor which it would be very well for their old companions if they could share. These women know precisely *à quoi s'en tenir* concerning these terrific denunciations.

There is another point on which it seems to me that a suspicion of blame must attach to the medical profession. We all believe that our doctors do the utmost in their power to cure *acute* diseases. When any patient has scarlet fever, or small-pox, or bronchitis, he may be sure that his medical attendant will exert all his skill and care to pull him through. But is it equally certain that out of the 20,000 men, or thereabouts, who are qualified to practise medicine and surgery in this kingdom, there are not a few who feel only a modified interest in the perfect recovery of chronic sufferers who represent to them an annual income of £50 or perhaps £200? A few months ago there appeared an article in one of the magazines expounding the way in which *legal* business was made to grow in hydra-fashion.

¹ "Dress and Health," p. 20.

We have all heard similar accusations against slaters and plumbers, who mend one hole in a roof and leave another. In short, we unhesitatingly suspect almost every other trade and profession of *making work for itself*. Is it clearly proved that doctors are in this respect quite different from lawyers and other men, or that the temptation to keep a wealthy patient coddling comfortably with an occasional *placebo* for twenty years is invariably resisted? The question is not easy to answer unhesitatingly in the affirmative: "Suppose a really radical cure were discovered whereby all the neuralgic, and dyspeptic, and gouty patients could be made in an hour as sound as so many trevets, do we believe implicitly and *au fond du cœur* that that Heaven-sent remedy would be rapturously welcomed by the whole medical profession?" Is there no truth at all in the familiar legend of the elderly lady whose physician, after many years of not unprofitable attendance, advised her to go to Bath, promising to give her a letter to the most eminent local doctor, his intimate friend, to whom he would thoroughly explain her case? The lady, armed with the introductory letter, it is said, proceeded on her way; but the curiosity of a daughter of Eve unhappily overcame her discretion. "It is only about myself after all," she said, to pacify her scruples; "and once for all I will learn what dear Dr. D—— *does* think is my complaint. If I am doomed to die, it is better than this prolonged uncertainty." The seal was broken, and the lady read: "Keep the old fool for six weeks, and be sure to send her back to me at the end. Yours truly."

There are at this day, in Mayfair and Belgravia, in Bayswater and South Kensington, a dozen houses in every street and square at the doors of which the doctor's carriage stops as regularly as the milkman's cart; and apparently there is just as little likelihood that either should cease to stop. If the old Chinese custom were introduced among us, and patients were to pay their physicians a salary *so long as they were in health*, and ceased to pay whenever they required medical attendance, I very much question whether we should see quite so many of those broughams about those doors. I cannot help fancying that if the clock-makers who undertake to wind up our domestic timepieces were to keep them in the same unsatisfactory and perpetually running-down condition as the inner machineries of these doctors' patients, we should in most cases bring our contract with the clock-maker to a close, and wind up our timepieces in future for ourselves.

But more, and in a yet more serious way, the doctors have, I conceive, failed, not only as guardians of the health of women, but as having (as a body) opposed with determined and acrimonious resistance an innovation which—if *medical science be good for anything*—they could scarcely doubt would have been of immense benefit to them.

No one is ignorant how often the most agonizing diseases to which female nature is liable follow from the neglect of early premonitory symptoms, and how often, likewise, life-long invalidism results from disregard of the ailments of youth. It is almost equally notorious how often these deplorable catastrophes are traceable directly to the poor victim's modest shrinking from disclosing her troubles to a male adviser. When such events are spoken of with bated breath among friends, it is sometimes said that it was the sufferer's own fault—that she *ought not* to have felt any shyness about consulting a doctor—and that it is proper for everybody to “look on a doctor as an old woman.” I confess I do not understand precisely such playing fast and loose with any genuine sentiment of modesty. The members of the Royal College of Physicians and Surgeons, and of the Society of Apothecaries, are *not* “old women.” They are not even all old, nor all good men. A few months before they begin to practise—while they are in the “Bob Sawyer” stage—they are commonly supposed to be among the least steady or well-conducted of youths; and where a number of them congregate together—as in Edinburgh, for example—they are apt to obtain an unenviable notoriety for “rowdiness.” I have more than once myself witnessed conduct on the part of these lads at public meetings which every man on the platform denounced as disgraceful. I could not but reflect as I watched them: “*And these youths a year hence will be called to the bedsides of ladies to minister at hours of uttermost trial when the extremest refinement of tact and delicacy must scarcely make the presence of a man endurable! Nay, they now attend in crowds the clinical instructions in the female wards of the hospitals, and are invited to inspect miseries of disease and horrible operations on women, who, if of humbler class, are often as sensitive and modest as the noblest lady in the land!*”

The feelings of Englishwomen on all matters of delicacy are probably keener than those of the women of any other Western country, and in some particulars may possibly be now and then overstrained. But who could wish them to be

changed? Who questions their almost infinite value? In every instance, except the one we are discussing, they receive from Englishmen the respect which they deserve. To propose deliberately to teach girls to set those sacred feelings aside on one point, and that point the one where they are necessarily touched immeasurably more closely than anywhere else, is simply absurd. They could not do it if they would, and they ought not to do it if they could. A girl who would willingly go to a man-doctor and consult him freely about one of the many ills to which female flesh is heir, would be an odious young woman. Violence must be done to her natural instincts, either by the pressure of the mother's persuasion (who has undergone the same *peine forte et dure* before her), or else by unendurable anguish, before she will have recourse to aid which she thinks worse than disease, or even death. And so the time when health and life might be saved is lost by delay, and when the sacrifice is made at last, the doctor observes compassionately, “If you had come to me long ago I might have restored you to health—or an operation could have been performed which might have saved your life. Now, I grieve to say, it is too late.”

That the admission of qualified women to practise medicine is the proper and only effectual remedy for this evil is of course obvious to all. In opposing such admission relentlessly, as they have generally done, medical men have incurred a responsibility which to me seems nothing short of tremendous. Whatever motive we may be willing to assign to them above mere pitiful rivalry for practice and profit, it is scarcely possible to suggest one which is not grossly injurious and insulting to women, or which ought for a moment to weigh in the balance against the cruel woes to which I have referred, or the just claim of all women to receive, if they prefer them, the ministrations of their own sex in their hours of suffering and weakness.

Doctors are wont to speak—apparently with profound feeling—of the sympathy they entertain for their patients, and to express their readiness (in a phrase which has passed into cant) “to sacrifice a hecatomb of brutes to relieve the smallest pain of a human being.” May not women justly challenge them to sacrifice something a little nearer to themselves—their professional pride, their trades-unionism, and a certain fraction of their practice—to relieve their entire sex of enormous pain, mental and physical?

I rejoice to believe that the long contest draws to a close, and that, thanks to men like Mr. Stans-

feld and Mr. Cowper Temple, there will soon be women-doctors, and women's hospitals attended by women-doctors, in every town in the kingdom. I rejoice to know that we possess already a few qualified ladies who every day, without wounding the feelings of the most sensitive, receive the full and free confidence of girls and women, and give

in return counsels to which many attribute the preservation of life and health; and which—if medical science have any practical value—must afford the rising generation a better chance than ever their mothers have had of escaping the endless miseries to themselves and all belonging to them attendant on the Little Health of Ladies.

—*Contemporary Review.*

THE ACTION OF LIGHT UPON THE COLORATION OF THE ORGANIC WORLD.

UNTIL the earlier portion of the present century, light, by the vast majority of civilized persons, was regarded as a medium for the sense of sight, and as very little more. With the discovery of its chemical functions, brought home to the popular mind by the invention of photography, a revolution in opinion took place, and the danger now is, not that its real powers should be overlooked, but that it should be credited with effects in which its part is very doubtful. It has been especially proclaimed to be at once the creator and the destroyer of coloration in the organic world. The superior intensity of the light to which they are exposed has been pronounced the chief cause why diurnal species are more gayly colored than their nearest nocturnal allies, and why the flora and the fauna—especially the insects and the birds—of tropical regions are so rich in hues of a gorgeous character. It may, therefore, be not uninteresting to inquire into this supposed double function of light, and ascertain, if possible, its limits in either direction. In so doing it will be impossible for us to overlook the views put forward by Mr. A. R. Wallace in a recent issue of *Macmillan's Magazine*.

The bleaching power of the sun's rays, and to a less extent of ordinary diffused daylight, has been fully recognized in the affairs of daily life. It has been observed that this same agency, utilized formerly in preparing vegetable fibre for the reception of colors, gradually destroys, in almost every instance, the work of the dyer and the printer, and exerts a corresponding influence upon the hues of plants. There is, however, a distinction by which its effects upon the integuments of animals are limited.

It is well known that what we designate as

color may be produced either by the interference or by the absorption of rays of light, and hence the colors of animals may be divided into two well-marked classes. On the one hand, especially in birds and insects, we find hues which are iridescent, changeable according to the relative positions of the observer and of the light, and are possessed of an intense, so-called, metallic lustre. Such colors—to take familiar examples—may be seen in the plumage of the peacock, of the starling, on the wings of the "purple emperor" butterfly (*Apatura Iris*), on the entire coating of the rose-beetle (*Cetonia aurata*), of the fire-wasp (*Chryseis ignita*), and of many other common native insects. In the vegetable kingdom they may be pronounced unknown. Such colors are due to the interference of certain rays of light, whether reflected from superimposed transparent films or reflected from or refracted through minute striæ. These colors are permanent, even on the most prolonged exposure to air, to atmospheric moisture, or to full sunlight. Unless the very texture of the feather, the wing-scale, the elytron, etc., be destroyed by putrefaction or combustion, the color remains unhurt. Nor can we by any means extract from such colored surfaces a dye or pigment capable of being applied to other objects.

On the other hand, there are colors which do not change their shade from whatever position they are regarded, and which possess little of that intense lustre which marks the former class. To this kind belong the colors of all flowers, of caterpillars, of the great majority of our native butterflies and moths, and, in short, of the vast bulk of organic beings. These colors are due to the absorption of certain of the rays of light, such absorption being effected by sub-

stances known as pigments, and capable, when present in sufficient quantity, of being extracted by solvents, and used to dye or stain other bodies. Such colors have not the permanence of the first-mentioned class. Every entomologist knows that if a case of butterflies be kept constantly exposed to the sun, or even to diffused daylight, then—no matter how completely air, damp, and mites, may be excluded—the specimens fade, even though the minute scales which clothe the wings may still be found in their places. Yet the golden spots on the wings of the *Plusia* and the pearl-moth markings of the “fritillaries” remain unchanged. The colors of most other insects behave in a very similar manner. Beetles are generally supposed to wear a more permanent livery; but every coleopterist must have observed how the reds of lady-birds, of *Aphodius fimetarius*, of *Elatris sanguineus*, etc., lose their purity and brightness on exposure, and to some extent even on preservation in darkness. Even darker and more intense colors are gradually affected. Thus in the collection of native beetles in the British Museum, which have doubtless been exposed to the light for some years, the jet-black *Typhaeus vulgaris*—absurdly known as the “bull-comber”—has taken a decided chestnut-brown, while a similar change has come over the blue-black elytra of the common dung-beetle.

To test the speed of the bleaching power of light upon deep-colored Coleoptera we placed in a glass case, outside a south-western window, specimens of the following species: *Cetonia aurata*, *Eupecilia Australasica*, *Typhaeus vulgaris*, *Geotrupes stereorarius*, *Abax striola*, and *Sternocera orientalis*; and exposed them to the sun during the months of June, July, and August, 1876. The *Cetonia* and the *Sternocera*, whose colors are of the interference class, were unaffected; but the black of the *Typhaeus*, the *Geotrupes*, and the *Abax*, was changed to a brown, and the brown of the *Eupecilia* to a very dirty yellow. Thus we see that even the darkest and most intense pigment or absorption colors are affected by light; and this fact accounts for one class of the variations which are met with in different specimens of one and the same species. An insect that has lived long, and has been much exposed to the sun, may have more degraded colors than such as are captured soon after reaching full perfection.

If we examine the nature of the changes produced by the action of light, we shall notice the following facts: Pigment greens, blues, lilacs, pinks, and roses—shades not very abundant in the

animal kingdom—are the first to fade. Full reds, purples, and blacks, resist longer. Oranges, yellows, fawns, drabs, browns, and olives, have still greater permanence, merely taking a duller or dirtier tone. The changes ensue in a definite direction. Blues and pale greens turn to a gray or a yellowish drab; darker greens to an olive; lilacs, pinks, and roses, to various shades of gray; reds become a reddish or yellowish brown; purples a very dirty brown; yellows and oranges verge more to a pale brown, and may rank as buff or fawns. The alteration is, therefore, from the primary or secondary toward the tertiary colors, accompanied with a decrease in depth. But we have never seen a primary color, when fading under the influence of light, pass into another primary color; nor does any secondary or tertiary color ever pass into a primary. The change which blacks undergo will not seem surprising if we reflect that in Nature, as well as in art, they generally consist of an intense olive or brown to which a deep blue or purple is super-added. The latter hues, being the more fugitive, fade first on exposure to light, and thus a dirty olive or a rusty brown must remain.

These changes are in partial harmony with what we observe in the vegetable kingdom. A dull, dirty brown is the ultimate goal toward which leaves, flowers, and fruits, as well as insects, tend while fading; but those splendid intermediate changes which we find in autumnal foliage have nothing analogous in the decaying colors of insects.

It is curious that in the manufacture of those artificial colors which now play so important a part in tinctorial operations a corresponding rule holds good. If these dyes, during their elaboration, are submitted to a heat too high or too prolonged, the product becomes dusky, and a dirty brownish gray is the final result.

We must further note how, in the animal and vegetable kingdoms, pure and bright colors are connected with the highest vitality only. We plant the dusky seed in the earth amid the dark remains of decomposing organic matter, and as it grows up we see it put on higher and higher colors, till, in the culminating moment of its life, in the act of inflorescence, prismatic hues are all but universal. Then begins the process of decay, attended by a degradation of color. Similar changes may be traced in animals. Externally we need merely compare the dull-colored larva with the brilliant imago, or the sombre-coated nestling with the brighter plumage of the mature bird. Internally we may contrast the intensely-

vitalized scarlet arterial blood with the darker-colored and more contaminated venous blood, and still further with excrementitious matters. The great truth to which we are here calling attention has not altogether escaped the notice of Mr. Wallace, who writes: "The very frequent superiority of the male bird or insect in brightness or intensity of color, even when the general tints and coloration are the same, now seems to me to be due to the greater vigor and activity and the higher vitality of the male. The colors of an animal usually fade during disease or weakness, while robust health and vigor add to their intensity.¹ This intensity of coloration is most manifest in the male during the breeding-season, when the vitality is at a maximum." But we are not aware that either Mr. Wallace or any one else has fully grasped the principle laid down above, or traced its numerous applications, æsthetic as well as biological.

But among the "pigment-colors" there is a very great diversity in permanence due to the nature of the colors themselves, or to that of the tissues in which they inhere. Dr. Hagen divides such colors into epidermal, placed in hair, in feathers, and in the chitinic exo-skeleton of insects; and hypodermal, situate in the softer internal layers of the skin. That the latter are the more easily affected by any external influence is natural.

Alterations and degradations of color similar to those above mentioned may, indeed, under certain circumstances, be produced even in the absence of light. But we have direct experimental evidence to show that, other things being equal, animal matters retain their colors most completely in the absence of light, and fade the more rapidly in proportion to the intensity of the illumination to which they are exposed. Hence we are compelled to recognize light as a destroyer of animal coloration.

But light is generally regarded not merely as a color-destroyer, but as a color-producer, and it is with this its supposed function that we have now to deal. Those who take here the affirmative view rely mainly on two facts, or supposed facts, to which we have already briefly referred—the higher coloration and the superior brilliancy of the tropical fauna, and the sombre hues of nocturnal and subterranean beings. At these facts we must look, and seek to ascertain their

meaning. We must of course admit that Europe produces no humming-birds or trogons, no *Belionote* or *Pachyrhynchi*; but we must also remember that the total number of species of birds, of reptiles, and of insects found, say in South America, is far greater than the sum total existing in Britain or on the European Continent. Hence, even if the tendency to produce a gay coloration were equal in either case, the probability is that South America would be the richer in gorgeous species. Again, travelers who visit tropical countries not unnaturally select the most showy forms, and their collections are therefore not a fair average. Naturalists, such as Mr. Wallace, who have taken the trouble to examine closely, find that even in New Guinea, Borneo, or Brazil, dull-looking species exist in numbers. Had we catalogues of the insects of such countries as complete as those we possess for Britain, France, or Germany, our views as to the general character of a tropical fauna would be doubtless modified. As the insects of warm climates, also, are upon the whole larger than those of our hyperborean latitudes, they necessarily attract attention, and their beauty does not pass unseen; yet every entomologist knows that even in Britain we possess "tiny miracles of Nature" which, if viewed with a lens of low power, display a splendor little—if at all—inferior to the most richly-attired tropical species. We will merely mention, as instances, *Chrysic ignita*, *Chrysomela cerialis*, *Donacia proteus*, *Polydrusus micans* and *flavipes*, *Rhynchites betule* and *populi*, *Lampra rutilans*, and *Anthraxia salicis*. *Calosoma sycophanta*, also, if very rare in Britain, is very common in certain parts of Central Europe, and may be fairly considered one of the most gorgeous species of the entire family of *Carabide* to be met with in any part of the world.

The case, then, seems to stand thus: We have in Britain certain species, small, and it may be rare, which display the very same shades of color and the same brilliancy as we find in the most admired forms of tropical life. This fact seems to us scarcely consistent with the theory that the more intense light of low latitudes is a prominent factor in the production of splendid colors. Were such the case, gayly-colored species in our climate would not merely be fewer and smaller; they would rather be altogether wanting.

Again, different portions of the torrid zone differ very widely as regards the number, and even the beauty, of the richly-attired birds and insects they produce. Thus, as Mr. Wallace has pointed out, in New Guinea 50 per cent. of the

¹ Those who are brought practically in contact with animals have long been familiar with the fact that a "dull coat" is indicative of disease, or at least of weakness.

birds are brilliantly colored, while in the Malay Islands and in the valley of the Amazon the proportion does not exceed 33 per cent. Can this distinction be rationally ascribed to any excess of light enjoyed by New Guinea over and above the amount received by the valley of the Amazon? Both these respective districts lie under the equator; both are fruitful, plentifully supplied with moisture, well-wooded, and exposed, as far as we can perceive, to very similar meteorological conditions. But if excess of light cannot be the cause of the superiority of New Guinea over equinoctial Brazil, why should it be put forward to explain the superiority of Brazil as compared with Britain? Why should the fauna of the Philippine Islands, as is remarked by Mr. Wallace in his invaluable "Glasgow Address," be so rich in species of exceptionally splendid colors? Can there be in those islands either any excess in the quantity or any peculiarity in the quality of the sunlight? That there is, no one has yet even attempted to show, and were such the case it would doubtless be traceable in a variety of phenomena not limited to the organic world.

Another important point has been raised by Mr. Bates. He shows that while in many tropical butterflies the males are most splendidly colored, the females—in numbers of cases at least—are sombre and insignificant in appearance, so much so that in former times they were often regarded as specifically distinct from their mates. If excess of light, therefore, be the producing cause of the splendor of the tropical Lepidoptera, why should not the effect appear alike in both sexes? To this argument, however, the reply has been made that in these very species the females are exceedingly sedentary in their habits, remaining generally concealed in shady thickets, while the males flutter about in the sunshine, and, being thus more exposed to light, experience modifications which—transmitted with constant accumulation from one generation to another—have produced the splendor now characteristic of their sex. To this question of the relative amount of exposure to light in different stages of existence we shall have to return.

But the amount—or at least the intensity and clearness—of the sun does not necessarily vary with latitude alone. The air of some countries is more transparent, less obscured by fogs and clouds than that of others. More light evidently reaches the earth's surface on open plains or on table-lands and in deserts than in dense forests and in narrow valleys. Do we find any corre-

sponding variation in the prevalent hues of the animal population of these respective localities? Mr. Wallace points out that the most brilliantly-clad birds and insects are dwellers in the forests where the amount of light received is comparatively scanty. On the other hand, in the deserts, where—as we have already mentioned—light must attain its terrestrial maximum, the prevalent coloration, if not dark, is certainly neither light nor brilliant. As the Rev. H. Tristram remarks, in such regions the smaller mammalia, the birds, the snakes, and lizards, are alike sand-colored, their hues having evidently more reference to concealment than to the influence of an intense illumination. There is indeed, if we wish to come to details, a curious want of harmony in the effects which light is expected to produce. We know that it bleaches in certain cases and darkens in others; but it is no easy task for us to predict when either of these opposite effects will be manifested. Still it is perfectly possible that light might have a bleaching power upon some living organisms, and a darkening effect upon others, according to their different molecular structure. There is, for instance, little doubt but that the air of Persia is, as a rule, exceedingly transparent; the climate is dry, mists and clouds comparatively rare, woodlands scanty, and the country generally open. We have even heard it stated that there the satellites of Jupiter are occasionally visible with the naked eye. Here, therefore, we have doubtless a case of light in its greatest intensity; but, according to Mr. Blanford, Persian specimens are generally paler than their nearest European representatives. Here, if light be directly concerned, its action must be of a bleaching character; yet we generally find in mammals, in birds and reptiles, as well as in insects, the upper surface, or portion most exposed to the sun, is darker than the under side, or than parts generally kept in the shade. An animal in whom the contrary arrangement prevails—such as the common badger—has much of the appearance of a caricature. This darkening of the superior surface of animals is again adduced as an instance of the chromogenic power of light, a view to which we shall afterward take occasion to revert.

As regards the comparison between the tropical and the extra-tropical faunæ the case may, perhaps, be fairly summed up thus: There are certain cosmopolitan groups whose members, wherever found, are alike devoid of rich or brilliant coloration; there are other groups—such as the Ornithoptera, the Papiliones, the Buprestidæ, the Cetoniadæ, the trogons, humming-birds, birds-

of-paradise, etc.—which have a remarkable and hitherto-unexplained tendency to the development of splendid hues, and which, if not exclusively tropical, have their headquarters and produce their largest representatives within the torrid zone. Other groups, again, attain their greatest splendor beyond the tropics, e. g., the ducks, the pheasants, and, among insects, the ground-beetles, or Carabidæ. It has, indeed, been suggested that if the colder regions of the earth are now inferior to the tropical districts in the beauty of their fauna, the cause may be sought in the ravages of the Glacial epoch. If the most magnificent species were forest-dwellers, as we now find it to be the case in warm climates, their destruction would be almost inevitably involved in the desolation of their haunts, and the annihilation of their food. Perhaps, too, the very splendor of such supposed forms would render them more conspicuous to their enemies, and thus accelerate their extirpation. All such speculations, however, are little more than conjectural. We conclude, indeed, judging from the fossil remains of insects discovered at Eningen and elsewhere (see *Quarterly Journal of Science*, vii., 255), that certain groups, now mainly tropical or sub-tropical, were very extensively developed in Central Europe; but at the same time we find indications that the climate, at least as far as warmth is concerned, was almost tropical in its character.

We may next inquire whether the relative brilliance of color in various animal groups is at all connected with their diurnal or nocturnal habits, or with their greater or less exposure to light at different stages of their development. It is a truism that the diurnal Lepidoptera are upon the average much more highly colored than the nocturnal species, the moths. Some weight has been laid on the circumstance that in butterflies both sides of the wings are freely exposed to light, and that both are also adorned with a variety of hues, while in moths, where the under surface of the wings is not turned to the light, it generally exhibits a dull and uniform coloration; but these facts admit of much qualification. Even among the small number of beetles indigenous in Britain there are some—such as *Erebina Cassiope*, *Cænonympha Davus*, and *Thanaos Tages*—certainly less brightly colored than many moths. Many species of butterflies, also, if richly colored on the upper surface of the wings, can boast no gay or varied tints beneath. We need only mention the common peacock (*Vanessa Io*). Again, in certain genera of moths we find colors as vivid as can be met with in butterflies—e. g.,

Callimorpha, *Euchelia*, *Chelonia*, and *Catocala*. The most remarkable feature in these genera is that the chief display of color appears on the upper surface of the hind-wings—a part as little exposed to light as the lower surface, since when the insect is at rest, in the daytime, it is completely screened by the anterior pair of wings.

In the larva state it cannot be said that Lepidopterous insects are much exposed to light. As a rule the caterpillars of the diurnal as well as of the nocturnal species prefer shade to sunshine. It is perhaps somewhat curious that the habits of the larva stand in no regular connection with the diurnal or nocturnal character of the mature insect.

Turning to the Coleoptera, we find further facts unfavorable to the supposed predominant influence of light upon the development of color. Such Coleopterous larvæ—and they are the majority—as live in total darkness are, indeed, generally of a dull, dirty gray, contrasting strongly with caterpillars which are more or less exposed to light, and many of which exhibit a bright and pleasing coloration. This circumstance, like the etiolation of plants reared up in darkness, is certainly in favor of the view that light is not without influence upon organic coloration; but, on the other hand, let us consider the after-life of some of these dull-looking beetle-grubs. The most gorgeous, perhaps, of all Coleoptera are the Buprestidæ. These creatures spend the whole of their larval and pupal life within the trunks of trees, and consequently in total darkness. When mature, indeed, they sport for a time in the checkered sunlight of the woodlands. But why, if light be the main cause of animal coloration, should they be so far superior in brilliance to the Longicornes, or wood-beetles, which from birth to death are exposed to precisely the same circumstances? Taking the opposite extreme, the Staphylinidæ—of which the common “devil’s coach-horse” is a familiar example—rank in appearance among the dulllest and least decorated of all the insect tribes, whether they inhabit cold or warm climates; yet these creatures, instead of leading the earlier part of their life in complete and constant darkness, are active when larvæ, and may be seen running about in the daylight, seeking for prey. Surely, therefore, being so much more exposed to light than the Buprestidæ or the Cetoniadæ, they ought, on the theory we are examining, to be at least correspondingly beautiful. Let us turn to the Melolonthidæ, of which the

common and destructive insect known as the cockchafer may serve as the type. Their early life is spent in darkness, since when larvæ they live underground, devouring the roots of plants. When mature their colors must be pronounced far less brilliant than those of their near allies, the rose-beetles (*Cetoniadæ*), which are equally nursed in darkness. It will be, of course, objected that the adult cockchafer is a nocturnal—or, at least, a twilight-loving—insect, while the rose-beetle feeds and flies by day. We will, therefore, take another instance—that of the *Elatridæ*, or click-beetles. As larvæ they, like the immature cockchafer, live underground, but when mature they are diurnal in their habits; yet the general coloration of the family is what some people call “sober,” scarcely more gay than that of the *Melolonthidæ*, and forming a most striking contrast to that of the *Buprestidæ*, whom they so closely approach at once in their structure and in the degree of light which they encounter, both in their earlier stages and in mature life. Again, we may consider the weevils (*Cureulionidæ*), all of them when larvæ burrowing from daylight in the interior of fruits and in the buds and stems of plants; yet, when mature, some of them—e. g., the diamond-beetle—are as remarkably brilliant as others are conspicuously sombre.

On the other hand, attention is drawn to the *Chrysomelidæ*, to which the redoubtable Colorado beetle—vilely called the potato-bug—belongs, a family very richly and brightly colored. Their larvæ are active, and they are thus throughout their lives exposed to the sunshine.

Among the animal population of the seas and rivers, also, we meet with facts, not a few, difficult to reconcile with the hypothesis under examination. It must be admitted that in all waters, save the very shallowest, the amount of light enjoyed must be very decidedly less than that which falls upon the surface of the land in similar climates; yet we do not find that the denizens of the waters are, as a general rule, less vividly colored than those of the dry land. On the contrary, fishes, crustaceans, mollusks, besides aquatic forms lower in the scale of existence, such as the sea-anemones, display all the colors of the rainbow in a purity and in a profusion rivaling what we observe in the most gorgeous birds and insects. We admit that splendid oceanic forms are more abundant in tropical waters than in higher latitudes, and also that in a majority of cases the inmates of shallow waters are more vividly colored than the dwellers in

deeper and consequently darker seas. But what must be inferred from the following observations, extracted from a paper by H. N. Mosely, late naturalist to the Challenger Expedition, read before the Linnean Society on February 15, 1877? “A species of *Edwardsia*, from 600 fathoms, has undergone but little modification from the littoral form. The *Cerianthus*, from 2,750 fathoms, is like its shore-brethren. Thus one species is found in shallow water at the Philippines, under the full glare of the tropical sun, while another species exists at three miles’ depth, where solar rays never penetrate, and where the water is at freezing-point. The deep sea-anemones retain vivid colors in the dark.”

This fact is very suggestive. It agrees ill with the often-expressed view of teleologically-disposed naturalists, that all the brilliant hues of animal and vegetable life have been called into existence for man’s delectation; but no less does it clash with the conclusions drawn from the paleness and obscurity of certain nocturnal, subterranean, or cave-haunting animals, such as the Coleopterous larvæ to which we have referred, wood-lice, crickets, etc. Light, it would seem, is not the sole condition for the production of positive color; nor are the dwellers in darkness necessarily restricted to a garb of whites, blacks, and grays. It can, further, scarcely be contended that the land-shells of any country are more vividly and intensely colored than the marine shells of its coasts, many of which are as highly decorated within as without; yet a land-shell will doubtless receive a larger share of the solar radiations than a sea-shell.

Again, while there is thus abundant proof that an aquatic or even a deep-sea existence is not necessarily incompatible with a rich coloration, we find certain groups—the aquatic insects—ordinarily plain in their hues. The water-beetles, chiefly frequenting shallow pools and rivers, present ordinarily a dark-olive, black, or brown coloration, relieved at most with rusty yellow, and those of tropical climates show little, if any, preëminence in this respect over their allies from colder regions. But these beetles, be it noted, if devoid of splendor, are not etiolated. The water-scorpion, water-boatman, and other aquatic Hemiptera, though living rather on than in the water, and fully exposed to light, are also remarkably plain in their coloration.

We have repeatedly referred to nocturnal animals; but it will be observed that in the higher forms of life the common views concerning their dominant colors scarcely hold good. Thus the

owls, though not decked out with any metallic hues, differ little in the general character of their coloration from their diurnal kindred, the hawks, presenting bold, well-defined patterns, and a variety of black, fawn, brown, buff, and white shades. Few mammals display more vivid hues than the Felidæ, most of which are unquestionably nocturnal. Many nightly or subterranean insects also, such as *Sphodrus leucophthalmus* and *Pristonychus terricola*, show no signs of etiolation. Even the common cockroach makes no approach to that pallid, ghastly hue which is commonly supposed characteristic of animals inhabiting sunless localities. Among nocturnal species we believe few, if any, instances can be found where the male surpasses the female in brightness or depth of coloring.

Mr. Wallace, however, while going perhaps even further than we should be prepared to accompany him in the rejection of the theory which regards animal coloration as directly proportionate to the intensity of solar radiation, gives some curious instances of phenomena proving that in certain cases light has a direct action upon the colors of organic beings. Thus Mr. T. W. Wood, some time ago, pointed out that the chrysalids of the small "cabbage white" (*Pontia rapæ*) varied in color when the larvæ had been fed up in boxes lined with different colored materials. Those which were kept in black boxes were nearly black, while such as had lived in white boxes were almost white. He observed corresponding changes in the same species in a state of Nature: chrysalids fixed against a whitewashed wall being whitish; those secured to a red-brick wall being reddish; while those fixed against a pitched pal- ing were nearly black. The cocoon of the emperor moth is also observed to be either white or brown, in accordance with the colors of surrounding objects. A still more decisive instance of such changes has been observed in the chrysalis of *Papilio Nireus*, a South-African butterfly which has been studied by Mrs. Barber. It acquires, more or less exactly, the color of any contiguous object. "A number of the caterpillars were placed in a case with a glass cover, one side of the case being formed by a red-brick wall, the other sides being of yellowish wood. They were fed on orange-leaves, and a branch of the bottle-brush tree (*Banksia*) was also placed in the case. When fully fed, some attached themselves to the orange-twigs, others to the bottle-brush branch—and these all changed to green pupæ; but each corresponded exactly in tint to the leaves around it, the one being a dark and the other a pale,

faded green. Another attached itself to the wood, and the pupa became of the same yellowish color; while one fixed itself just where the wood and brick joined, and became one side red, the other side yellow."

This Mr. Wallace pronounces "a kind of natural photography, the particular colored rays to which the fresh pupa is exposed in its soft, semi-transparent condition effecting such a chemical change in the organic juices as to produce the same tint in the hardened skin." This power of the pupa to assume the color of closely-adjacent objects, however, is limited, since when Mrs. Barber surrounded one of her caterpillars with a piece of scarlet cloth the pupa displayed its ordinary green tint, though the small red spots with which it is marked were rendered abnormally bright. It must be recorded, however, that these very interesting changes are confined to the chrysalis, and do not appear to have extended in any way to the mature butterfly. We have never been able to trace any modification in the colors of butterflies reared, for one generation, in abnormally colored light, nor, as far as we are aware, has any other observer been more successful.

A correspondence has also been in some instances traced between the colors of animals and those of the localities which they inhabit and the food which they eat. Spiders have been found of exactly the same tint as the flowers in which they lurk. Mr. Wallace, on the authority of Sir Charles Dilke, mentions a pink-colored *Mantis* which, when at rest, closely resembles the pink flower of an orchis, and is thus enabled to seize unsuspecting butterflies. But we should be wrong in ascribing such similarity of coloration to the effects of reflected light, or, indeed, of any merely physical influence. They are almost certainly due to physiological causes, and are instances of what is called "protective coloration."

There is another class of phenomena which at first sight seems due to the action of light. Many insects when they first emerge from the pupa are abnormally pale, and do not take their full mature coloration until after a longer or shorter interval of time. It was in virtue of this property that an entomologist, commissioned by the German Government to inspect a field where the dreaded Colorado beetle had made its appearance, was enabled to decide that these insect enemies had only just appeared in the mature form, and that on turning up the ground a further stock would be found in a rudimentary state, as on actual trial was found to be the case. But this

gradual development of color has not been proved to be the result of light. We have reared up caterpillars in perfect darkness, and have found their colors on reaching maturity no less brilliant than those of their fellows which had been exposed to light in the ordinary course of Nature. In the case of interference-colors a change in the physical condition of the integuments, consequent of their drying and hardening on exposure to the air, is doubtless necessary for their development. The evolution of the pigment-colors we are at present investigating, and believe that it is simply due to a process of oxidation.

Some other of the phenomena advanced in support of the "light-theory" of organic coloration may also be, with great probability, referred to other causes. Thus some ascribe to light the fact that the upper surface of most animals is more intensely colored than their under side. Many fishes have a dark back, and a pale grayish blue or greenish belly; but, as Mr. Wallace points out, this arrangement seems more protective than due to the action of light. An enemy—say a sea-bird—looking down from above will have difficulty in distinguishing the dark back of the fish amid the water. On the other hand, an enemy looking from below will see the pale belly of the fish against the dull bluish color of the sky as seen on looking up through the water, and will scarcely detect its presence. Now, were this arrangement of colors reversed, the fish would be much more readily seen, either from above or from below, and the chances of its escaping from its enemies would be much reduced. At the same time it must be confessed that this explanation is not admissible in all cases of a similar arrangement of color. Thus in many crustaceans unable to swim, and therefore not liable to be seen by any enemy from below, the under surface is much paler than the back. Similarly slugs—whether creeping upon the ground, upon the stems or leaves of vegetables—are liable to be espied from the back or the sides, but never from beneath; yet in most cases their under surface is decidedly paler than their back. These instances, and others which might be adduced, certainly seem to agree better with the supposition of a darkening influence due to the freer action of light upon the upper side than with that of a protective distribution of color.

But from the whole of the evidence before us, especial attention being paid to the case of the deep-sea anemones, we are forced to conclude that the coloration of an animal species is not, in the mathematical use of the word, a function of the

amount of solar radiations to which it is exposed. That this conclusion does not compel us to deny the influence of sunlight upon the hues of all animals, under all conceivable circumstances, scarcely needs to be stated.

The fact that Lepidopterous larvæ are in a majority of cases, partially at least, of a green color, is not inexplicable. They retain in their bodies, in an undecomposed state, the chlorophyll of the leaves upon which they have fed. Larvæ, on the other hand, whether Lepidopterous or Coleopterous, which feed not upon leaves, but upon wood, roots, seeds, etc., not containing chlorophyll, may naturally be found deficient in this green color, without our taking the presence or absence of light into account. Hence we need not wonder that the caterpillars of the goat-moth and the wood-leopard, the larvæ of the Longicornes, Buprestidæ, Dynastidæ, etc., are not green: they have not been consuming a green pigment. But why have we comparatively so few green butterflies and moths, and so many green birds and green beetles? The green colors found in birds and in beetles—with the exception of such forms as *Cassida*, a *leaf-feeder*—are due not to a pigment, but to the interference of light, so that their formation must be explained on different principles. The paucity of green butterflies may, perhaps, be traced to the fact that chlorophyll is a mixture of two coloring principles¹—cyanophyll, which is blue, and xanthophyll, which is yellow—the latter of these colors being much more permanent than the other. Hence if, as appears exceedingly probable, chlorophyll is assimilated by leaf-eating insects, a number of phenomena connected with their coloration become at once intelligible. We have mentioned in an earlier part of this paper that among animal tints pigment-greens are generally the first to fade, and that they become a dull yellow or a yellowish drab, as may be observed in a specimen, say, of *Cassida equestris*, which, however carefully preserved, soon loses its pale-green hue, and turns yellowish. The reason of this change, we contend, is that the cyanophyll or blue coloring-matter first undergoes decomposition, while the yellow xanthophyll alone remains. A similar change, taking place in the living animal in its pupa condition, is the cause why pigment-greens are so rare alike among Lep-

¹ Some authorities consider that chlorophyll is a mixture not of two, but of three coloring principles (Fremy and Cloëz), or of four (Stokes). As these, however, are in all cases found to be respectively blue and yellow, the view we have taken will not be affected by these discordant results..

diptera and Coleoptera, while yellows and browns of different shades are so exceedingly common, and relatively so permanent. We find also that certain caterpillars, green in the earlier part of their life generally, though not invariably, take a brown color as they approach the time of their assuming the pupa state.

But even supposing that chlorophyll is demonstrably assimilated or deposited in the tissues of certain insects, the hypothesis we have been suggesting takes us but a very little way. We have still to ask why the green color in certain species remains undecomposed to the mature condition, while in others it disappears in the pupal or even in the larval state, and how, after disappearance or absence in the larva, as in *Chærocampa Elpenor*, it appears in the perfect insect? We have to inquire why certain diurnal caterpillars, consuming as much chlorophyll as do any others—e. g., *Vanessa Io*, *V. xanthomelas*, *V. urticae*, etc.—are free from a green coloration? At the same time we must admit that in caterpillars of this class a yellow pattern is very rarely absent, as if the xanthophyll had already been separated from the cyanophyll. We have to explain the pigment-blues, of which there seem to be two, if not three, the identity of which with cyanophyll must not be too rashly assumed, though in many cases we see both blue and yellow spots appearing in a butterfly, as if the two colors, which in its earlier state had been blended together, were now separated, as in *Papilio Machaon*. We have, further, to throw a light upon the origin of the pigment-reds, to two of which Mr. Wallace refers as being different in their chemical constitution and behavior.

But chlorophyll is not the only substance which has been called into requisition in order to explain the mysteries of animal coloration. It has not escaped the attention of biologists that all those creatures which develop, more or less frequently, beautiful hues, are precisely the same in which uric acid is abundantly secreted—i. e., birds, reptiles, insects—while in the mammalia, in which the secretion of uric acid is trifling, the prevailing colors are dull. It was asserted that while uric acid is abundantly found in the excretions of parrots, humming-birds, etc., at other times of the year, during and immediately before the moulting season it was absent. Hence the inference that this compound might play a part in the elaboration of the new plumage was not unwarrantable. In addition came the fact that a beautiful violet color, known as murexide, and capable of producing a variety of shades, was ar-

tificially obtained from uric acid.¹ Unfortunately, when these investigations were carried on, the distinction between interference-colors and absorption-colors had not been fully apprehended, and the iridescent hues of humming-birds, trogons, *Belionotæ*, were supposed to be due to some peculiar pigments of unknown composition. Nor has it, as far as we are aware, ever been shown that the excreta of splendidly-colored birds are richer in uric acid than those of sea-fowl. For the present, therefore, the uric-acid theory must be considered as useless.

A consideration of the food of different species might at first sight appear likely to throw some light upon the nature of their coloration. But we find intense splendor and varied tints alike among carnivorous species (Cicindelidæ and certain Carabidæ), wood-eaters (Buprestidæ), and leaf-eaters (Chrysomelidæ). We find dull and sordid colors among many carrion and dung-feeders (Silphidæ, Aphodiidæ, Staphylinidæ), while others addicted to a similar diet—such as most species of the genus *Phæneus*—display the most splendid hues. Nor is an examination of the diet of birds more satisfactory.²

It may perhaps be thought that in an inquiry into the influence of light upon the coloration of animals a consideration of their diet, or of their peculiar secretions and excretions, is out of place. But whether solar radiations, or local atmospheric influences, or the need of protection take a greater or smaller share in the development of color, there must be essential differences in the material upon which these causes act. Mammals are exposed to the same climatic influences as birds and insects, and are likewise exposed to dangers which they might escape by a coloration favorable to concealment. Their hair is, chemically considered, a material no less suitable for the display of gay and brilliant colors than are the feathers of birds, the scales of serpents, or the chitinous coating of insects; yet neither in lustre, in varying play of color, nor in delicacy and

¹ Murexide, known in the commercial world as "Roman purple" and "Tyrian purple," was some time ago prepared from guano—i. e., the excreta of sea-fowl—and was in considerable demand among dyers and calico-printers. Being costlier than the coal-tar colors, it is now superseded.

² In addition to the case of chlorophyll above mentioned there seem to be individual instances where the coloring-matter of a plant, if eaten by insects, may be traced in their secretions. We do not know whether the deep reddish violet liquid which exudes from *Timarcha lœvigata*, an insect feeding upon bed-straw, a plant of the madder tribe, has ever been examined for alizarin or purpurin.

elaborateness of design, do they make even the faintest approach to a rivalry with these groups of animals. There must therefore be an internal source of coloration, not everywhere present, upon which external influences may react.

Mr. Wallace, while rejecting the light-theory, brings forward certain principles which he considers throw a light upon the phenomena of color in organic Nature. While demurring to the common conclusion that tropical light and heat are the cause of color, he fully recognizes the general fact that "all the more intense and gorgeous tints are manifested by the animal life of the tropics, while in some groups, such as butterflies and birds, there is a marked preponderance of highly-colored species." This phenomenon he ascribes to a variety of causes, some of which yet remain to be discovered. The foremost place is given to the following consideration: "The luxuriant vegetation of the tropics throughout the entire year affords so much concealment that color may there be safely developed to a much greater extent than in climates where the trees are bare in winter, during which season the struggle for existence is most severe, and even the slightest disadvantage may prove fatal." Fully admitting the force of this consideration in the case of birds, we must yet, with all the deference due to so eminent an authority as Mr. Wallace, point out that it can have very little moment as regards insects which during the winter are in a dormant condition, as larvæ or pupæ, either in the earth, in the trunks of trees, or other localities where neither beauty can betray them nor its lack screen them from the pursuit of any enemy.

As the first among the causes of coloration he places the need of protection. He points out that browns and other tertiary colors, being most readily produced by "an irregular mixture of many kinds of solar rays, are most likely to occur when the need of protection is slight, or even when it does not exist at all, always supposing that bright colors are not in any way useful to the species." Hence browns, olives, and other dirty colors, may naturally be expected to predominate.

Brilliant colors, again, often serve as a sign that their wearer possesses some unpleasant or dangerous property, and hence warn possible enemies to pass on and seek some less nauseous prey. The number of apparently feeble and defenseless species which are clad in the most conspicuous colors, and which are avoided and refused by birds, monkeys, spiders, etc., is aston-

ishing. The present writer, in a paper read before the Entomological Society ("Transactions of the Entomological Society," 1877, Part III., page 205), has shown that, in a great number of cases at least, the most showy and conspicuous caterpillars feed upon plants either absolutely poisonous or possessing offensive flavors and odors, whence the rejection of such larvæ by insectivorous animals. Their brilliant coloration is therefore simply a danger-signal.

The theory of "Sexual Selection," upon which Mr. Darwin lays great weight, Mr. Wallace finds himself unable to accept as in any way an explanation of the distribution of color in animals. He remarks that "while male butterflies rival, or even excel, the most gorgeous male birds in bright colors and elegant patterns, there is literally not one particle of evidence that the female is influenced by color, or even that she has any power of choice, while there is much direct evidence to the contrary." In the case of the silkworm Mr. Darwin admits that "the females appear not to evince the least choice in regard to their partners." On the principle of natural selection among a number of rival male butterflies, "the most vigorous and energetic" will probably be successful, and, as these properties are very generally correlated with intensity of color, natural selection "becomes a preserver and intensifier of color." Very similar is the case among birds. We know that in many species the male displays his colors and ornaments, but, as Mr. Wallace contends, there is a total absence of any evidence that the females admire, or even notice, this display. "The hen, the turkey, and the peafowl, go on feeding, while the male is displaying his finery, and there is reason to believe that it is his persistency and energy, rather than his beauty, which wins the day." Here, again, vigor and intense vitality seem to be the chief recommendations of the male in the eyes of the female, and these—as is very strikingly manifest in the game-cock—appear correlated with intense coloration. Mr. Wallace resumes: "Evidence collected by Mr. Darwin himself proves that each bird finds a mate under any circumstances. He gives a number of cases of one of a pair of birds being shot, and of the survivor being always found paired again almost immediately. This is sufficiently explained on the assumption that the destruction of birds by various causes is continually leaving widows and widowers in nearly equal proportions, and thus each one finds a fresh mate; and it leads to the conclusion that permanently unpaired birds are

very scarce, so that, speaking broadly, every bird finds a mate and breeds. But this would almost or quite neutralize any effect of sexual selection, of color, or ornament, since the less highly-colored birds would be at no disadvantage as regards leaving healthy offspring." While accepting this conclusion, we may ask whether the same argument is not capable of further application? It is generally stated that the "fittest" male—i. e., the one most in harmony with the circumstances in which he is placed—will have the best chance of securing a mate and of leaving offspring, while the feebler, the slower, the less energetic, and those least in harmony with the situation, will be left in a state of single blessedness, and will not transmit their attributes to posterity. But, on the principles laid down in the passage we have just quoted, the effects of natural selection will be greatly neutralized. It must, however, be remembered that the destruction of birds, especially in a state of Nature, will not fall exclusively or mainly upon those which have secured mates, but will likewise extend to the unwedded.

While combating Mr. Darwin's view, that the brilliant colors of butterflies have been acquired for the sake of protection, Mr. Wallace remarks: "It is, in fact, somewhat remarkable how very generally the black spots, ocelli, or bright patches of color, are on the tips, margins, or disks of the wings; and, as the insects are necessarily visible while flying, and this is the time when they are most subject to attacks of

insectivorous birds, the position of the more conspicuous parts at some distance from the body may be a real protection to them." This rule, however, is by no means universal. The fire-wasp (*Chryseis*), and not a few other Hymenoptera, have brilliantly-colored bodies, but colorless and transparent wings, which, when expanded and in action, are scarcely visible. In numbers of Lepidoptera the more intense colors, especially reds, are found entirely or mainly on the posterior wings, which extend to a less distance from the body than do the anterior pair. In many cases, again, Lepidoptera, Coleoptera, and Hymenoptera, display conspicuous colors at the extremity of the abdomen, where a blow from the beak of a bird would doubtless permanently disable.

A question may here arise concerning the use of the coloration of the posterior or true wings in certain beetles, a circumstance not sufficiently examined. While these wings in the vast majority of Coleopterous species are colorless, or, at most, of a very faint yellowish hue, in the Colorado beetle they are pink, and purple in several *Chrysocroas*, *Pachnodas*, and *Lomapteras*. Why should these species thus differ from other closely-allied forms, with whom they appear to agree most closely in their habits?

We have no doubt that Mr. Wallace's formal declaration against the doctrine of sexual selection will attract the attention of disbelievers in evolution, and we venture to hope that all the comments which will be elicited may not be beside the question.—*Quarterly Journal of Science*.

THE ANCIENT SILK-TRADERS' ROUTE ACROSS CENTRAL ASIA.

THE paper on the above subject read by Baron Richthofen before the Berlin Geographical Society, on the 5th of May last, was based, in a great measure, on the general views enumerated in the author's recently-published work on China, the more detailed information being derived from Ptolemy and Chinese sources. It opened with a general sketch of Central Asian geography, in which the parts played by the Himalayan, Kuen-Lun, Tien-shan, and Altai systems were clearly expounded. The Tarim Basin the author likened to a gigantic horseshoe-shaped plain, the sides of which are formed by the Tien-

shan and the Kuen-Lun. This horseshoe was the western part of a former extensive sea, which was bounded on the north by the Altai Range. Its eastern limit cannot at present be defined with accuracy, but it nowhere trenched on the confines of modern China. One noteworthy feature of this great inland sea, which is even now testified to by the name *Han-koi*, or "dried-up sea," applied by the Chinese to its former site, was the depression or arm between the Tien-shan or Altai Ranges, by which it communicated with another extensive sea, beginning about Lake Balkash. In the recesses formed by the spurs of the Tien-

shan and of the North Persian Ranges, civilized nations formerly existed, and extended to the banks of the Jaxartes and Oxus, and their tributaries. With the exception of the less important oases in the Tarim Basin, they were the first civilized countries to be found west of China, from which they were separated by thirty degrees of longitude, the only practicable line of communication lying across steppes and deserts.

The migrations of nations and the movements of traders are very unlike, though both follow distinct laws. The former have always chosen localities which have afforded them broad, easy, and natural routes into warm and fertile plains. Mountains were only crossed where a low pass gave easy access to the wished-for goal. These successive waves of migration came from the northeast; but when they ventured into the basin of the Tarim, they were caught in a *cul-de-sac*, whence they could only escape by the way they came. In prehistoric times migrations toward China may have found their way into the region referred to. But as soon as its people were capable of looking after their own interests, the only available exit lay through the Dzungarian trough between the Tien-shan and Altai Ranges, mentioned above. Thence they invaded Europe, Persia, and India. Mountain-passes naturally did not present such insuperable difficulties to passing armies, and on several occasions large hosts have made their way from China to Turan over passes near the sources of the Oxus and Jaxartes, and from Turan to the western oases in the Tarim Basin.

The movements of traders follow entirely different laws. They invariably sought the shortest routes between the two countries whose goods they wished to exchange one for the other. Among these goods, silk has played an important part since the earliest ages. The duration of this silk-trade is most conveniently divided into two periods: the first from remote and uncertain ages to about 114 B. C., being the period of indirect traffic; and the second from 114 B. C. to 120 A. D., being the period of direct commerce between China and the Turanian plains. In the book "Yue-kung," which treats of the history of China during the last 4,000 years, silk is mentioned as an article of tribute in some of the provinces, and we learn therefrom that the great Yue aimed at introducing the growth of the mulberry and silk culture in the lands about the mouth of the Yellow River. A thousand years later the "Chuli Book," which contains the official precepts of the Chu dynasty, makes frequent

mention of silk, and it is probable that the precious jade of Khotan was largely exchanged for it, though, probably, not by a direct traffic between the two countries.

It is uncertain how far back silk-stuffs were first exported to India and Western Asia. The Chinese name for silk was *Sz'*, and it is curious to observe that both this name and the product itself made their way into Corea, Japan, Mongolia, and (especially) Central Asia, and in later times into Greece and the other European countries. After a time the letter *r* got affixed, and the root-word was thus changed into *ssir* or *sser*. The word *Sherikoth* in Isaiah probably refers to the same, and the Arabs to this day call a piece of silk goods *saraqat*. It is probable that Herodotus, in speaking of the fineness of the Median dresses, alludes to silken stuffs. The first undoubted mention of the manufacture is to be found in Nearchus (320 B. C.), who speaks of the Seric stuffs of India, of the people called Seres, and of their country Sera. There is no evidence to show by what route these silks reached India, Persia, and Media. It is supposed that the princes of the house of Tsin, who since the eighth century before Christ occupied a small principality in the western part of Shensi, extended their dominion into Central Asia, and that by this means the Chinese carried on direct trade with the lands about the Oxus. This supposition rests on three points: the mention of a country called *Sinim* by Isaiah, the frequent mention of the name *Matchin* (which was supposed to refer to China) by Firdusi in speaking of early Persian history, and the frequent allusion in the Mahabharata to the *Tchina* people in the northwest of India. Against this, however, must be remarked that the Tsin princes certainly never penetrated into Central Asia, nor, as far as can be shown, beyond the Yellow River; that the name *Matchin* was used to designate any powerful princes of Turan, with whom the Persian kings had intercourse; while the researches of recent travelers have disclosed the existence of a people called *Tchina* in the Northwestern Himalayas. There is no proof that the Chinese ever journeyed beyond their western borders before the second century of our era, or even that they knew of the existence of other nations beyond their immediate neighbors in Central Asia. The producers and consumers of the silk were thus equally ignorant of its destination and origin. There is good reason for supposing that the inhabitants of Khotan, who were known to the Greeks under the name of Issedoncs, were the chief medium of

transmission of the silk-trade across the passes into India and over the Pamir.

The second period of the silk-trade, embracing the period of direct traffic between China and Turan, began with the year 114 B. C., in which the first caravan set out westward, and ended about 120 A. D., when the power of the Han dynasty was on the wane. The direct traffic only flourished when all Central Asia was subject to one sovereign will. It was never more prosperous than when the Mongols exercised supremacy over the lands between China and Europe, but before that time it had revived in the seventh and eighth centuries, when the Tang dynasty extended their rule to the Caspian Sea. One of the chief circumstances which helped to develop it was the building of the Great Wall, which the great Tsin-shi-wang-ti erected to protect his kingdom from the attacks of the Hiungnu, who had for centuries molested the vassal princes and chiefs on the northern borders of the empire. During the Han dynasty (205 B. C.) the successive waves of invading hordes from the steppes broke themselves against the wall, and gradually falling out among themselves, dispersed and retired through the Dzungarian Valley or depression into the Aralo-Caspian Basin. At the beginning of the second century, the Usun people, who lived in the Alashan Mountains and near the Etsina River, engaged in conflict with the Yuëtschi people, who lived about Kan-chow-fu, and were vanquished by the latter, who migrated through Dzungaria to Ili, where they came upon the Sz' people. Twenty-two years later, the Usun revenged themselves by driving the Yuëtschi out and settling themselves in Ili and the Tien-shan, while the Yuëtschi and the Sz' migrated toward the Jaxartes.

These wanderings now began to have their effect on the silk-trade. In 140 B. C. Hsia-wu-ti, the greatest king of the Han dynasty, wishing to break the power of the Hiungnu, sent his general, Tchang-kien, into Central Asia to conclude a treaty of alliance with the Yuëtschi. This is the first Chinese expedition to the west of which we hear, and the report which, after thirteen years' adventurous wanderings, the general furnished, on his return home, has the appearance of a description of previously-unknown wonders. Although the expedition failed in its immediate object, it returned with the novel intelligence that in the far west of Turan there dwelt great and civilized nations, who owned grand cities and engaged in commerce, who esteemed very highly the Chinese silk, and wished further to do direct trade with China, of whose greatness they had often

heard. The emperor recognized the importance of acting on this wish, and endeavored by every means in his power to further its fulfillment. The ways by which this was attempted to be carried out are interesting. Tchang-kien reported that westward the Hiungnu formed an insuperable bar to commerce, as they commanded the entrance to the Tarim Basin. But he suggested an alternative. Among the Tahia, a people dwelling in towns south of the Upper Oxus, he was surprised to see a certain sort of reed or grass, and a stuff which in his opinion must have come from his native home, Shu (the plain of modern Ching-tu-fu). He was informed that they came from a land called Yin-tu, which lay some thousand *li* southeast of Tahia, and where the people lived in hot plains and rode on elephants. Through this land of Yin-tu (i. e., India) Tchang-kien thought it would be easy for people from Shu to reach Tahia. This suggestion was followed up with energy, and a number of expeditions were sent, but unfortunately failed through the hostility of the mountain tribes, and led to no other result than the discovery by some merchants of Burmah and of the great rivers of Southeastern Asia.

In the mean time, affairs in the north took a more favorable turn. A young leader, called Ho-kiu-ping, placed himself at the head of a Chinese army, and for the first time in Chinese history advanced into the Steppe, and easily vanquished the Hiungnu, opening the road into the Tarim Basin.

This was an event of great importance for the future history of China. The road referred to was called the Yue-monn passage, or the way of the Yue gate: *yue* being the name applied to the jade of Khotan, and the Yue-gate being a rocky defile through which the precious mineral was conveyed along the only natural way between the Tarim and China—a sort of depressed road between high mountains on the one side and a steppe plateau on the other. This approach proved to be the key of Central Asia and of great future moment, both in political and commercial exigencies.

The inhabitants of the oases on the south of the Tarim, freed from the presence of the Hiungnu, received the Chinese with open arms, and in the year 114 B. C. the first caravan started for the West. Judging from the fact that it reached the land of Tahia and Ansi, it must have crossed the Pamir. But the city of Tawan formed the chief mart; it lay on the Jaxartes and the way to it was over the Terek Pass. From five to ten large

caravans visited the town yearly, and the first sudden effect of this was to depreciate the value of the silk. On the approach, however, of a Chinese army in 104 B. C., matters improved, and the market for the silk extended farther and farther westward, until the Roman Empire was reached.

For 120 years the way remained open, but at the expiration of that time the Hiungnu again gained possession of the trade-route, and the Tarim Basin was lost to the Chinese for fifty-six years. General Pan-chow then not only regained the whole of the lost country, but also (95 A. D.) led a victorious Chinese army across the Pamir Steppe to the Caspian Sea, where, for a brief time, the Chinese and Roman Empires were brought into close proximity, without, however, any permanent result. In 120 A. D. the Chinese again lost their control of Turanian lands, and in 150 A. D. all direct communication with the west of the Tarim Basin ceased.

As regards the geography of this subject, one of the most important points is to fix the site of Tawan. Baron Richthofen considers that Rémusat's opinion that Tawan was the capital of the modern Khokan or Ferghana is erroneous. Tawan, he points out, was not the first kingdom reached after crossing the Tsung-ling Pass (Terek-dawan), but Hsiusiu, whose king lived in Usi (Osh?), 500 *li* from the mountain-pass. It was 920 *li* from Usi to Tawan, which would bring us to the great bend of the Jaxartes, near Oratepe, which was called Sutrusna by the Arabs, a name which we easily recognize in Su-tui-sha-na, which it appears from Chinese sources was the subsequent name of Tawan. The people of Tawan were a commerce-loving people, but brought the silk only to the nearest markets, while the Ansi, who possessed many towns, vessels, and wagons, who were addicted to agriculture, and had stored up riches, conveyed it to the northern slope of the Iranian Plateau and the shores of the Caspian. As regards the nationality of these traders, it would appear from Tchang-kien's description that they were Tajiks. They spoke different tongues, but also had one common *lingua franca* for trading purposes, and there is ground for concluding that the trading inhabitants of the Tawan, Tahlia, and Ansi kingdoms, were the Persian-speaking predecessors of the Tajiks.

In the Han annals, the Chinese complain that they were prevented by the Ansi from entering into direct commercial relation with the *Ta-tsin*, or Romans. The silk reached India through the medium of the Tahlia, who inhabited the oases of Balkh and Kunduz, and other districts south of

the Oxus. In the last century before Christ the Roman authors begin to speak of *Serie* stuffs, of the land *Serica*, and its people, of which they heard only indirectly and from vague report. There is no proof that the Romans ever held direct intercourse with the Chinese.

With regard to the routes of the silk-traders, we gather most information from Chinese sources, and first among these we must place the annals of the Han dynasty. At present we know of one route in the valley of the Tarim which follows the western and northern edge of the horseshoe above referred to. Mediæval travelers, Buddhist pilgrims from China, Marco Polo, and Shah Rukh's ambassadors, testify to the existence in their time of kingdoms and towns along the southern edge of the basin between Khotan and Lob-Nor, and these were united by diverse routes; but in the middle ages these latter were fast disappearing, and there were traditions of buried treasures, sand-covered towns, and even kingdoms which had disappeared beneath the encroaching sand-desert. In the time of the Han dynasty things had not got so far, and these districts were in a better condition. There were then two kingdoms, called Liulan and Kuchi, on Lake Lob, and Yutien (Khotan), which are generally mentioned. There were roads between Lob-Nor and Khotan, called the "southern roads," one along the Tarim, and one along the southern foot of the Tien-shan (the northern one). But the latter, west of Kucha, was occupied in ancient times by hostile tribes, and the southern road was more frequently used. The official road extended from Liulan, on Lake Lob, for 720 *li* to Tsie-mo, where roads to the north and south diverged. Hsiao-wan and Yung-lin appear to have been situated on southern tributaries of the Tarim which are now filled up with sand. The road then led to Yutien (Khotan), Sokiu (Yarkand), and Suléi (Kashgar). The roads over the Pamir and Terek Passes were certainly much used; but, unfortunately, a detailed description of them is wanting.

Turning to Western writers, we come first upon Ptolemy, who wrote about 150 A. D., and who derived much of his information from Marinus (contemporaneous with Pan-chow, who conquered the Tarim Basin, and led his army as far as the Caspian). The weight of evidence goes to prove that Ptolemy's *Serica* denoted not merely China, but also the basin of the Tarim, or the greater portion of it, and the old silk-traders' route lay at the southern foot of the Tien-shan. The difficulty of identifying the places mentioned

by him arises partly from the erroneous idea that the present route was the only one then in use, partly from the omission to consult the Chinese authorities, and partly from a failure to take ancient names in preference to modern ones for purposes of comparison.

In expounding the geography of Serica, Ptolemy found himself in the position in which many geographers stood at the beginning of this century as regards their knowledge of diverse continents; i. e., they possessed a knowledge of the countries which in some particulars was precise, but had to lay down the courses of rivers and the direction of mountain-ranges, the positions of cities and districts, out of itineraries and vague information. By this means rivers, which later information showed to be separate, got thrown into one, mountains were incorrectly laid down, and maps were generally erroneously constructed. Ptolemy's knowledge was of an analogous character. On the Indian side the districts at the foot of the Himalayas were known among the Greeks by the name of Emodus. Of the mountainous land between the Indus and Oxus little was known beyond the road between Balkh and Peshawur. The region of the Upper Oxus and Jaxartes was somewhat better known, and its supposed meridional range and water-parting was called Imaus, and supposed to be a spur of the Emodus. Silk was brought across both the Imaus and the Emodus: across the former to Sogdiana and Bactriana, and across the latter to India. Beyond was Serica; but as this was partly identified with the political limits of China, which was known not to reach as far as the Imaus, the region immediately beyond was called *Scythia extra Imaum*. Ptolemy acquired his information respecting Serica both from India, in regard to the regions across the Emodus, and from Sogdiana and Bactriana, with reference to the regions east of the Imaus; but, as Colonel Yule has remarked, he was unable to focus the two stereoscopic pictures into one. Marinus, on whom Ptolemy mainly relied, was exposed to the danger of misspelling names, as he acquired his information second-hand; and of the agents of Maës Titianus, the Macedonian merchant, who went to China for silk, we do not know of what nationality they were, but it is probable that they were Persians, or Persian-speaking Tajiks. Bearing this in mind, as well as the fact that in Marinus's time Western travelers entered on Chinese ground not far distant from Kashgar or Yarkand, and that the names of places must be identified with names of

some antiquity, and not with modern ones, we shall be in a position to form a tolerably correct notion of the silk-route of Marinus and Ptolemy. Its point of departure was Baktra (Balkh), and its terminus Tshang-ngan (Hsi-ngan-fu), whether the traders managed to reach this latter place or not. It is probable that the embassies sent by the princes between Persia and the Altai to the court of China during the two preceding centuries did not go beyond it, and that it was not even visited by the foreign merchants. The latter appear to have converged from different directions on Sha-chow, and the stations Yang-kwan and Yu-moun-kwan were points of departure for the same.

The position of the kingdom of the Issedonese is of importance in determining the route of the silk-traders. Greek writers had spoken of this people as a great nation. And in the whole basin of the Tarim there was only one kingdom corresponding entirely to the description given by them, and that was the Yue-tien of the Chinese, the capital of which was Khotan. Ptolemy represents the country of the Issedones as lying north of a mountain-range which he calls the Kasian Mountains. The similarity of the name has led Deguignes, D'Anville, Lassen, Ritter, Humboldt, and other commentators on Ptolemy, to identify the same with the modern Kashgar. But the name of Kashgar was not then in existence, the town being called Suléi for several centuries after. A glance at the map, however, will show a striking analogy between the Kasian Range and the western Kuen-Lun, and a further link is found in the name of the chief product of the country, i. e., jade, which among the Chinese was called *yue*, but among the Persian and Turkish nations appears to have been generally called *kash*. The range seems thus, by a practice common elsewhere, to have been named after its most important mineral product. The identification is clinched by the fact that Issedon Serica is described by Ptolemy as the most important place along the trade-route, and the Chinese accounts give Yue-tien as the chief place.

A second phase of importance on the line of route was Daxata, which Hager has shown to be a Grecized form of the Persian *Desht*—sand—a term which is to be found in the name of the town, Sha-chow, referred to above, which really means "Sand-town." Turning to that portion of the route between Issedon Serica (Khotan) and Daxata (Sha-chow) we come upon two localities, *Thogara* and *Drosache*. The latter Baron Richt-

hofen has been unable to identify, but the former name has, he points out, similarity to the Tukhâra of the Indians, or Tu-hô-lo of the Chinese, a people who during the seventh century of the Christian era were found by Hwen-Tsang to have once dwelt a few days' journey east of Khotan, and whose name still prevailed there at his time, although the people themselves (who are probably identical with the Yuëtschi above mentioned, or, at all events, the greater part of them) had, in the second century A. D., lived in the vicinity of Kan-chow-fu, and at the time of the Buddhist pilgrim's journey settled partly on the Upper Oxus and partly on the Upper Indus. It is not unlikely that the encroachment of the sandy desert had caused a portion of the people to migrate from their ancient oasis in the valley of the Tarim, but that enough of them remained to give their name to the old site. The identity of the site with Ptolemy's Thogaroï is confirmed by the name Aspacaes, which is very like the Persian name for nation of riders, and which referred to the great Thibetan nomad race called No-kiang, which, we learn from Chinese sources, dwelt south of the oasis. Asmiræa, too, is described by Ptolemy as lying south of the river Oikhardes, which must be the Tarim. The important town of Tsiüno, where the northern and southern roads diverged, is the only name which has any similarity to Asmiræa.

Eastward of Daxata, or Sha-chow, the old silk-route rested only on vague hearsay evidence. The traders reported that a river and a mountain had to be crossed before reaching the Sera metropolis. The river is given as a branch of the *Bautisos*, which must be the Hwang-ho. But *Bautisos* is the name of the stream flowing north of the Emodus through the land of the *Bautæ* (i. e., Bhot, or Thibet in its restricted sense), or, in other words, the Yarudzangbo, or Upper Brahmapootra. It is evident that Ptolemy's information derived from India here occasioned him some confusion, and that he has assumed that the Hwang-ho, which flowed out of a little-known mountainous country, and the Brahmapootra, which, according to the Thibetans, flowed eastward into an unknown region, were one and the same. Similar instances of erroneous geographical conclusions may be found in Livingstone's supposition that the Lualaba and Nile formed one river, and the theory, not long since held, that the Sanpu and the Irrawaddy were one and the same.

The western limit of Serica would appear to have been near Kashgar and Yarkand, where Marinus's information leads him to place them.

Kashgar (Sulêi) was a small kingdom, while Yarkand (Sokiu) was more important, and was often united with Yue-tien, or the Issedon kingdom. In 87 A. D. the Chinese and Yue-tien made common cause against Sokiu and overthrew it, and from that time the western limit of Serica appears to have been where the agents of Maës Titianus placed it. Before 87 a portion of the Issedon kingdom belonged to Scythia, i. e., to the non-Serie country, and Issedon Scythica was, therefore, a natural form of expression. The western boundary then lay between Yarkand and Khotan, and this corresponds with Ptolemy's map. Another possible explanation is, that as the Greeks designated all nomads by the name of Scythians, and as they heard of the existence of many of these nomad tribes eastward of the Imaus, Ptolemy was induced to lay down a sharp eastern boundary to *Scythia extra Imaum*, and that the same boundary formed the western boundary of Serica, which was thus shifted too far eastward.

In endeavoring to fix the direction of the route of the agents of Maës Titianus between Baktra and the Tarim Basin, we meet with many difficulties. In settling this question the position of Issedon Scythica becomes of great importance. On Ptolemy's map it lies east of Imaus, west of the sources of the *Œchardus*, south of the Auxacian Mountains, which were probably the mountains on the west of the Tarim depression, where they approach Aksu, and northwest of Issedon Serica. This description would correspond to Kashgar and Yarkand, and the pass leading to it would be either the southernmost Pamir Pass from Badakshan or the Terek Pass to the north. The latter answers best to the description. From Baktra there ran an important route, i. e., that past Samarcand throughout the length of Ferghana, and it appears, from Chinese authorities, that this was once a great commercial line of route. In the Takht-i-Suleiman, near Osh, some professed to recognize Ptolemy's "stone fort," which was west of the Imaus; but inasmuch as important places such as Samarcand are not mentioned, Colonel Yule suggested, in 1866, that some intermediate line was the one sought for. Later research has proved that there are various routes through Karateghin, and the Alai country, which might have been utilized for trade purposes. It is possible, therefore, that at the time when Baktra was the centre of a flourishing commerce, a direct way to the Tarim Basin was preferred to the circuitous route by Samarcand, along which also heavy dues were exacted. The land

of the Comedæ is probably the Kiumito of Hwen-tsang, and the land of Komèdh in Ibn Dasta, which probably lay northeast of the great bend of the Oxus. The stone tower would thus have been situated at the upper end of Karateghin, where the valley rises up to the steppe country of the Alai. This, however, does not coincide with the theory that Osh was the site of the stone fort.

There is much room for conjecture in the question as to the route from the Stone Fort to Issedon Scythica. Ptolemy gives a caravansary on the line of the Imaus, i. e., near the water-parting. This would naturally be situated at the point of junction of two important trade-routes, and was very probably at the point where the way from Karateghin joined that from Ferghana and the Terek Pass. At the present time Balkh has lost its importance, so that the Karateghin route has fallen into disuse; but, in the fifteenth century, Shah Rukh's embassy, on its return, separated into two parties in the "defile of Andijan," one going toward Balkh, and the other toward Andijan and Samarcand.

The summary of his researches is thus given by Baron Richthofen: From 114 B. C. to 120 A. D. (with a break of fifty-six years between), the silk was brought along routes from Sha-chow

and Lob-Nor which traversed the southern part of the Tarim Basin, and preferably used the Terek Pass for those caravans resorting to the great mart of Tawan, or Ora-tepe. Thence the silk went to Samarcand, and thence partly through the lands of the Upper Oxus to India, and partly through the lands of the Parthians to Farther Asia and the Roman market. The only journey of Western traders of which we possess detailed information did not, however, follow the Samarcand route, but diverged probably, at Merv, and passed through Balkh, probably through Karateghin and the Alai, entered the Tarim Basin at Kashgar, proceeded to Khotan, and followed the southern border of the basin of the Tarim, till they reached Sha-chow. Thence to the chief mart of China the account is too vague to follow. When the Chinese lost their hold on the Tarim Basin in 150 A. D., they could no longer protect their caravans, and the trade fell into the hands of the Persians, and Kan-chow-fu became the frontier mart of China. The introduction of the silk into Europe dates from the sixth century, when Dizabul, the prince of the Tukin, sent an embassy to Constantinople to secure a market for the silk. From the following century the overland route of the silk-traders lost all its former importance.—*Geographical Magazine*.

BRIEF NOTES.

Dr. Paul Broca on the Antiquity of Man.—M. Paul Broca, in his opening address at the meeting of the French Association for the Advancement of Science, sketched the history of scientific opinion concerning the antiquity of man. M. Broca frankly admitted that the evidence for the existence of man in Tertiary times is not yet conclusive. He classified into three races the prehistoric men whose bones have been found in Europe. The oldest of these three types of man is the *Canstadt* race. To this we must refer the Neanderthal skull. The *Canstadt* people were of short stature, with very long heads, much flattened at the top, the flattening being mainly due to the retreating forehead: they were *dolichoplatycephalic*, or with long and flattened heads. These people were, according to M. Broca, more savage than any in existence now. They date back to the Quaternary period, and appear to have had a very wide geographical distribution.

Next comes the *Cromagnon* race, a *dolichocephalic*, or long-headed, people, like those of *Canstadt*, but of vastly superior organization; they flourished as far back as the second half of the Quaternary period, and were at their zenith during the reindeer age. Finally, there is the *Furfooz* type, so called from *Furfooz*, in Belgium, where some remains were found a few years ago. The men of this race were extremely short, with a type of cranium decidedly lower than that of the *Cromagnon* people. The head is rounded, but not decidedly brachycephalic. This race arrived in Belgium at the close of the reindeer age. They were acquainted with the art of making pottery.

Impervious Coatings on the Skin.—Dr. Senator, of Berlin, cites experiments made by himself to prove that the covering of the skin of human beings with an impermeable coating (varnish, for

instance) is, contrary to the received opinion, a harmless operation. Dr. Senator subjected a patient suffering from subacute rheumatism to a gradual envelopment, until both legs, from the tips of the toes to the hips, both arms, from the tips of the fingers to the shoulders, were incased in sticking-plaster, and his back, abdomen, and breast, painted with collodion, which was daily repeated. The patient remained a week in this condition without reduction of temperature or albuminuria. Another case is cited, where a patient remained for three days under similar conditions. A third patient had a coating of tar all over the body for a week, but presented no abnormality, except blackening of the urine, which was shown to be due to the presence of carboic acid. In considering the grounds of the prevailing opinion as to the necessarily fatal effect of an impermeable coating on the skin, Dr. Senator refers to the case of the gilded boy—a child who was covered with gold-leaf in order to act the character of an “angel” in a miracle-play. This child, he says, died so soon that it is probable that there was something poisonous in the gold leaf. He also quotes current American history, to show that a coat of “tar and feathers” of itself produces no ill effects.

Utilizing the Flood-Water of the Nile.—Another gigantic engineering project has been suggested, namely, diverting a portion of the flood-water of the Nile into the deserts of Nubia, Libya, and Soodan. As is well known, the main stream of the Nile is fed by the great equatorial lakes of Africa, and its annual inundations are caused by the in-rush of torrent-water, laden with soil from the fertile slopes of the Abyssinian plateau. This silt is now for the most part deposited in the bed of the Mediterranean, where it is gradually forming a new delta. Sir Samuel Baker, in a letter to the *London Times*, after rehearsing these facts, proposes a plan by which not only the water of the Nile, but the mud which it now deposits wastefully, may be utilized as a means of fertilizing the deserts south of Egypt. He proposes, by suitable engineering works, to divert

a portion of the Nile flood-water into these deserts, where it can deposit its rich sediment in the sands, and also irrigate them so as to transform them into “cotton-fields that would render England independent of America.” He would construct sluices and dams at different points of the Nile; at the cataracts, for instance. These dams and sluices, by enabling craft to pass the cataracts, would also render the Nile navigable from the Mediterranean to Gondokoro.

When and how much to eat.—The following remarks on “Regularity of Meals” occur in a paper by Dr. Wilson, read at the recent Domestic Economy Congress at Birmingham: For the active out-door laborer and artisan, an early breakfast before work, a mid-day dinner, with an interval of rest, and supper after the day’s work is over, have long been proved by experience to be the most conducive to health. For the business-man, a later breakfast, a mid-day luncheon, and a late dinner after the day’s work is over, is the best arrangement. For literary men, who write more in the evening than during the day, an early dinner and a light supper will be found to be the most advantageous for steady work. Idlers, to enjoy life, if they possibly can, should dine early if they intend to spend the evening at theatres and the like; but if they accept dinner-invitations freely, they should be very careful not to eat too much at the mid-day meal. The breakfast-hour should be determined, in great measure, by the hour of rising, but in any case food should be partaken of before the material business of the day is commenced. Those who like to take a “constitutional” before breakfast would find their appetite whetted, and their walk made all the more enjoyable, if they took a little milk, or *café-au-lait*, with bread or biscuit, before starting. Work done before breakfast is always irksome and fatiguing, and on that account is very likely to be badly done. The last meal should be sufficiently late for the whole not to be absorbed before retiring to rest. To a person in health, three meals a day ought to be quite sufficient; and the practice of continually “taking something” is sure to bring on indigestion.

WILLIAM HARVEY.

By T. H. HUXLEY.

ON the coming 1st of April, three hundred years will have elapsed since the birth of WILLIAM HARVEY, who is popularly known as the discoverer of the circulation of the blood.

Many opinions have been held respecting the exact nature and value of Harvey's contributions to the elucidation of the fundamental problem of the physiology of the higher animals; from those which deny him any merit at all—indeed, roundly charge him with the demerit of plagiarism—to those which enthrone him in a position of supreme honor among great discoverers in science. Nor has there been less controversy as to the method by which Harvey obtained the results which have made his name famous. I think it is desirable that no obscurity should hang around these questions; and I add my mite to the store of disquisitions on Harvey which this year is likely to bring forth, in the hope that it may help to throw light upon several points about which darkness has accumulated, partly by accident and partly by design.

Every one knows that the pulsation which can be felt or seen between the fifth and sixth ribs, on the left side of a living man, is caused by the beating of the heart; and that, in some way or other, the ceaseless activity of this organ is essential to life. Let it be arrested, and, instantaneously, intellect, volition, even sensation, are abolished, and the most vigorous frame collapses, a pallid image of death.

Every one, again, is familiar with those other pulsations which may be felt or seen, at the wrist, behind the inner ankle, or on the temples; and which coincide in number and are nearly simultaneous with those of the heart. In the region of the temples, it is easy, especially in old people, to observe that the pulsation depends on the change of form of a kind of compressible branched structure which lies beneath the skin, and is termed an artery. Moreover, the least observant person must have noticed, running beneath the skin of various parts of the body, notably the hands and arms, certain other bluish-looking bands which do not pulsate, and which mark the position of structures somewhat like the arteries, which are called veins.

Finally, accidental wounds have demonstrated to all of us that the body contains an abundance

of a warm red fluid—the blood. If the wound has traversed a vein, the blood flows in torrents from its interior, in an even stream; if it has involved an artery, the flow takes place by jerks, which correspond in interval with the pulsations of the artery itself, and with those of the heart.

These are facts which must have been known ever since the time when men first began to attend to and reflect upon the every-day course of Nature, of which we form a part. I doubt not, also, that butchers, and those who studied the entrails of animals for purposes of divination, must very early have noticed that both the arteries and the veins are disposed in the fashion of a tree, the trunk of which is close to the heart, and connected with it, while the branches ramify all over the body. Moreover, they could not fail to observe that the heart contains cavities, and that some of these communicate with the stem of the arteries, and some with the stem of the veins. Again, the regular rhythmical changes of form, which constitute the beating of the heart, are so striking in recently-killed animals, and in criminals subjected to modes of punishment which once were common, that the demonstration that the heart is a contractile organ must have been very early obtained, and have thus afforded an unintentional experimental explanation of the cause of the pulsation felt between the ribs.

These facts constitute the foundation of our knowledge of the structure and functions of the heart and blood-vessels of the human and other higher animal bodies. They are to be regarded as parts of common knowledge, of that information which is forced upon us whether we desire to possess it or not; they have not been won by that process of seeking out the exact nature and the causal connection of phenomena, to the results of which the term science may properly be restricted.

Scientific investigation began when men went further, and, impelled by the thirst for knowledge, sought to make out the exact structure of all these parts, and to comprehend the mechanical effects of their arrangement and of their activity.

The Greek mind had long entered upon this scientific stage, so far back as the fourth century before the commencement of our era. For, in

the works attributed to Aristotle, which constitute a sort of encyclopædia of the knowledge of that time, there is evidence that the writer knows as much as has been mentioned, and he refers to the views of his predecessors. Twenty-two hundred years ago the sciences of anatomy and physiology existed, though they were as yet young, and their steps tottered.

Aristotle's description of the heart is often cited as an example of his ignorance, but I think unjustly. However this may be, it is certain that, not long after his time, great additions were made to anatomical and physiological science. The Greek anatomists, exploring the structure of the heart, found that it contained two principal cavities, which we now call the ventricles, separated by a longitudinal partition, or septum; the one ventricle is on its left, the other on its right side. It was to the fleshy body which contains the ventricles that the ancients restricted the title of "heart." Moreover, there is another respect in which their terminology was so different from that of the moderns that, unless we recollect that the facts may be just as accurately stated in their fashion as in ours, we are liable to fall into the mistake of supposing that they are blundering.¹ What they speak of as the auricles of the heart, we term the appendices of the auricles; and what we call the auricles are, for the ancients, on the right side, a part of the great vein or vena cava, and, on the left side, a part of the arterial system—the root, in fact, of what they termed the *arteria venosa*. Thus they speak of the auricles as mere appendages, or dilatations, situated upon the arterial and venous trunks respectively, close to the heart; and they always say that the vena cava and the *arteria venosa* open into the right and left ventricles respectively. And this was the basis of their classification of the vessels, for they held all those vessels which, in this sense, open into the right ventricle to be veins, and all those which open into the left ventricle to be arteries. But here a difficulty arose. They observed that the aorta, or stem of the arteries, and all the conspicuous branches which proceed from it to the body in general, are very different from the veins; that they have much thicker walls, and stand open when they are cut, while

the thin-walled veins collapse. But the "vein" which connected the right ventricle and the lungs had the thick coat of an artery, while the "artery" which connected the left ventricle and the lungs had the thin coat of a vein. Hence they called the former the *vena arteriosa*, or artery-like vein, and the latter the *arteria venosa*, or vein-like artery.

The *vena arteriosa* is what we call the pulmonary artery, the *arteria venosa* is our pulmonary vein; but in trying to understand the old anatomists it is essential to forget our nomenclature and to adopt theirs. With this precaution, and with the facts before our mind's eye, their statements will be found to be, in the main, exceedingly accurate.

About the year 300 B. C. a great discovery, that of the valves of the heart, was made by Erasistratus. This anatomist found, around the opening by which the vena cava communicates with the right ventricle, three triangular membranous folds, disposed in such a manner as to allow any fluid contained in the vein to pass into the ventricle, but not back again. The opening of the *vena arteriosa* into the right ventricle is quite distinct from that of the vena cava; and Erasistratus observed that it is provided with three pouch-like, half-moon-shaped valves; the arrangement of which is such that a fluid can pass out of the ventricle into the *vena arteriosa*, but not back again. Three similar valves were found at the opening of the aorta into the left ventricle. The *arteria venosa* had a distinct opening into the same ventricle, and this was provided with triangular membranous valves, like those on the right side, but only two in number. Thus the ventricles had four openings, two for each; and there were altogether eleven valves, disposed in such a manner as to permit fluids to enter the ventricles from the vena cava and the *arteria venosa* respectively, and to pass out of the ventricles by the *vena arteriosa* and the aorta respectively, but not to go the other way.

It followed from this capital discovery that, if the contents of the heart are fluid, and if they move at all, they can only move in one way; namely, from the vena cava, through the ventricle and toward the lungs, by the *vena arteriosa*, on the right side; and, from the lungs, by way of the *arteria venosa*, through the ventricle, and out by the aorta for distribution in the body, on the left side.

Erasistratus thus, in a manner, laid the foundations of the theory of the motion of the blood. But it was not given to him to get any further. What the contents of the heart were, and whether

¹ We say that the heart, in man and the higher animals, consists of two auricles and two ventricles; and that each auricle has an appendix in the form of a pouch. We term the vessel which arises from the right ventricle the pulmonary artery, because it supplies the lungs with blood. Those vessels which bring away the blood from the lungs to the left auricle we call the pulmonary veins.

they moved or not, was a point which could be determined only by experiment. And, for want of sufficiently careful experimentation, Erasistratus strayed into a hopelessly misleading path. Observing that the arteries are usually empty of blood after death, he adopted the unlucky hypothesis that this is their normal condition, and that during life, ~~also~~, they are filled with air. And it will be observed that it is not improbable that Erasistratus's discovery of the valves of the heart and of their mechanical action strengthened him in this view. For, as the arteria venosa branches out in the lungs, what more likely than that its ultimate ramifications absorb the air which is inspired; and that this air, passing into the left ventricle, is then pumped all over the body through the aorta, in order to supply the vivifying principle which evidently resides in the air; or, it may be, of cooling the too great heat of the blood? How easy to explain the elastic bounding feel of a pulsating artery by the hypothesis that it is full of air. Had Erasistratus only been acquainted with the structure of insects, the analogy of their tracheal system would have been a tower of strength to him. There was no *prima-facie* absurdity in his hypothesis—and experiment was the sole means of demonstrating its truth or falsity.

More than four hundred years elapsed before the theory of the motion of the blood returned once more to the strait road which leads truthward; and it was brought back by the only possible method, that of experiment. A man of extraordinary genius, Claudius Galenus, of Pergamos, was trained to anatomical and physiological investigation in the great schools of Alexandria, and spent a long life in incessant research, teaching, and medical practice.¹ More than one hundred and fifty treatises from his pen, on philosophical, literary, scientific, and practical topics, are extant; and there is reason to believe that they constitute not more than a third of his works. No former anatomist had reached his excellence, while he may be regarded as the founder of experimental physiology. And, it is precisely because he was a master of the experimental method, that he was able to learn more about the motions of the heart and of the blood than any of his predecessors; and to leave to posterity a legacy of knowledge, which was not substantially increased for more than thirteen hundred years.

The conceptions of the structure of the heart

and vessels, of their actions, and of the motion of the blood in them, which Galen entertained, are not stated in a complete shape in any one of his numerous works. But a careful collation of the various passages in which these conceptions are expressed, leaves no doubt upon my mind that Galen's views respecting the structure of the organs concerned were, for the most part, as accurate as the means of anatomical analysis at his command permitted; and that he had exact and consistent, though by no means equally just, notions of the actions of these organs, and of the movements of the blood.

Starting from the fundamental facts established by Erasistratus respecting the structure of the heart and the working of its valves, Galen's great service was the proof, by the only evidence which could possess demonstrative value, namely, by that derived from experiments upon living animals, that the arteries are as much full of blood during life as the veins are, and that the left cavity of the heart, like the right, is also filled with blood.

Galen, moreover, correctly asserted, though the means of investigation at his disposition did not allow him to prove the fact, that the ramifications of the vena arteriosa in the substance of the lungs communicate with those of the arteria venosa, by direct, though invisible, passages, which he terms anastomoses; and that, by means of these communications, a certain portion of the blood of the right ventricle of the heart passes through the lungs into the left ventricle. In fact, Galen is quite clear as to the existence of a current of blood through the lungs, though not of such a current as we now know traverses them. For, while he believed that a part of the blood of the right ventricle passes through the lungs, and even, as I shall show, described at length the mechanical arrangements by which he supposes this passage to be effected, he considered that the greater part of the blood in the right ventricle passes directly, through certain pores in the septum, into the left ventricle. And this was where Galen got upon his wrong track, without which divergence a man of his scientific insight must infallibly have discovered the true character of the pulmonary current, and not improbably have been led to anticipate Harvey.

But, even in propounding this erroneous hypothesis of the porosity of the septum, it is interesting to observe with what care Galen distinguishes between observation and speculation. He expressly says that he has never seen the openings which he supposes to exist, and that he

¹ Galen was born in the year 131 A. D., and died in or about the year 201.

imagines them to be invisible, by reason of their small size and their closure by the refrigeration of the heart, after death. Nevertheless, he cannot doubt their existence, partly because the septum presents a great number of pits which obviously lead into its substance as they narrow, and, as he is so fond of saying, "Nature makes nothing in vain;" and, partly, because the vena cava is so large, in comparison with the vena arteriosa, that he does not see how all the blood poured into the ventricle could be got rid of, if the latter were its only channel.

Thus, for Galen, the course of the blood through the heart was—on the right side, *in* by the vena cava, *out* by the vena arteriosa and the pores of the septum; on the left side, *in* by the pores of the septum and by the arteria venosa, *out* by the aorta. What, now, becomes of the blood which, filling the vena arteriosa, reaches the lungs? Galen's views are perfectly definite about this point. The vena arteriosa communicates with the arteria venosa in the lungs by numerous connecting channels. During expiration, the blood which is in the lungs, being compressed, tends to flow back into the heart by way of the vena arteriosa; but it is prevented from doing so, in consequence of the closure of the semilunar valves. Hence, a portion of it is forced the other way, through the anastomoses into the arteria venosa; and then, mixed with "pneuma," it is carried to the left ventricle, whence it is propelled, through the aorta and its branches, all over the body.

Galen not only took great pains to obtain experimental proof that, during life, all the arteries contain blood and not air, as Erasistratus supposed; but he distinctly affirms that the blood in the left ventricle and in the arteria venosa is different from that in the right ventricle and in the veins, including the vena arteriosa; and that the difference between the two lies in color, heat, and the greater quantity of "pneuma" contained in arterial blood. Now, this "pneuma" is something acquired by the blood in the lungs. The air which is inspired into these organs is a kind of aliment. It is not taken bodily into the vena arteria and thence carried to the left ventricle to fill the arterial system, as Erasistratus thought. On the contrary, Galen repeatedly argues that this cannot be the case, and often refers to his experimental proofs that the whole arterial system is full of blood during life. But the air supplies a material kindred to the "pneuma," out of which and the blood the "pneuma" is concocted. Hence, the contents of the arteria venosa are large-

ly composed of "pneuma," and it is out of the mixture of this with the blood which filters through the septum that the bright "pneumatic" blood found in the arteries, and by them distributed over the body, is formed. The arteria venosa is a channel by which "pneuma" reaches the heart, but this is not its exclusive function; for it has, at the same time, to allow of the passage of certain fuliginous and impure matters which the blood contains, in the opposite direction; and it is for this reason that there are only two valves where the arteria venosa enters the ventricle. These, not fitting quite tightly, allow of the exit of the fuliginous matters in question.

Modern commentators are fond of pouring scorn upon Galen, because he holds that the heart is not a muscle. But, if what he says on this subject is studied with care and impartiality, and with due recollection of the fact that Galen was not obliged to use the terminology of the nineteenth century, it will be seen that he by no means deserves blame, but rather praise, for his critical discrimination of things which are really unlike.

All that Galen affirms is, that the heart is totally unlike one of the ordinary muscles of the body, not only in structure, but in being independent of the control of the will; and, so far from doubting that the walls of the heart are made up of active fibres, he expressly describes these fibres and what he supposes to be their arrangement and their mode of action. The fibres are of three kinds, longitudinal, transverse, and oblique. The action of the longitudinal fibres is to draw in, that of the circular fibres to expel, and that of the oblique fibres to retain, the contents of the heart. How Galen supposed the oblique fibres could execute the function ascribed to them, I do not know; but it is clear that he thought that the activity of the circular fibres increased, and that of the longitudinal fibres diminished, the size of the cavities which they surrounded. Nowadays we term an active fibre muscular; Galen did not, unless, in addition, it possessed the characters of voluntary muscle.

According to Galen, the arteries have a systole and diastole (that is, a state of contraction and a state of dilatation), which alternate with those of the ventricles, and depend upon active contractions and dilatations of their walls. This active faculty of the arteries is inherent in them, because they are, as it were, productions of the substance of the ventricles which possess these faculties; and it is destroyed when the vital con-

tinuity of the arteries with the heart is destroyed by section or ligature. The arteries fill, therefore, as bellows fill, not as bags are blown full.

The ultimate ramifications of the arteries open by anastomoses into those of the veins, all over the body; and the vivifying arterial blood thus communicates its properties to the great mass of blood in the veins. Under certain conditions, however, the blood may flow from the veins to the arteries, in proof of which Galen adduces the fact that the whole vascular system may be emptied by opening an artery.

The two ventricles, the auricles, the pulmonary vessels, and the aorta with its branches, are conceived by the Greek anatomist to be an apparatus superadded to the veins, which he regards as the essential foundation and the most important part of the whole vascular system. No portion of Galen's doctrines has been more sharply criticised than his persistent refusal to admit that the veins, like the arteries, take their origin in the heart, and his advocacy of the view that the *fons et origo* of the whole venous system is to be sought in the liver. Here, however, I must remark that it is only those who are practically ignorant of the facts who can fail to see that Galen's way of stating the matter is not only anatomically justifiable, but that, until the true nature of the circulation was understood, and physiological considerations overrode those based upon mere structure, there was much more to be said for it than for the opposite fashion.

Remembering that what we call the right auricle was, for Galen, a mere part of the vena cava, it is impossible not to be struck by the justice of his striking comparison of the vena cava to the trunk of a tree, the roots of which enter the liver as their soil, while the branches spread all over the body. Galen remarks that the existence of the vena portæ, which gathers blood from the alimentary canal, and then distributes it to the liver, without coming near the heart, is a fatal objection to the view of his opponents, that all the veins take their rise in the heart; and the argument is unanswerable, so far as the mere anatomical facts are concerned.

Nothing could have appeared more obvious to the early anatomists than that the store of nutriment carried by the vena portæ to the liver was there elaborated into blood, and then, being absorbed by the roots of the venous system, was conveyed by its branches all over the body. The veins were thus the great distributors of the blood; the heart and arteries were a superadded apparatus for the dispersion of a "pneumatized"

or vivified portion of the blood through the arteries; and this addition of "pneuma," or vivification, took place in the gills of water-breathing animals and in the lungs of air-breathers. But, in the latter case, the mechanism of respiration involved the addition of a new apparatus, the right ventricle, to insure the constant flow of blood through these organs of "pneumatization."

Every statement in the preceding paragraphs can be justified by citations from Galen's works; and, therefore, it must be admitted that he had a wonderfully correct conception of the structure and disposition of the heart and vessels, and of the mode in which the ultimate ramifications of the latter communicate, both in the body generally and in the lungs; that his general view of the functions of the heart was just; and that he knew that blood passes from the right side of the heart, through the lungs, to the left side, and undergoes a great change in quality, brought about by its relation with the air in the lungs, in its course. It is unquestionable, therefore, that Galen, so far, divined the existence of a "pulmonary circulation," and that he came near to a just conception of the process of respiration; but he had no inkling even of the systemic circulation; he was quite wrong about the perforation of the septum; and his theory of the mechanical causes of the systole and diastole of the heart and arteries was erroneous. Nevertheless, for more than thirteen centuries, Galen was immeasurably in advance of all other anatomists; and some of his notions, such as that about the active dilatation of the walls of the vessels, have been debated by physiologists of the present generation.

No one can read Galen's works without being impressed by the marvelous extent and diversity of his knowledge, and by his clear grasp of those experimental methods by which, alone, physiology can be advanced. It is pathetic to watch the gropings of a great mind like his around some cardinal truth, which he failed to apprehend simply because he had not in his possession the means of investigation which, at this time, are in the hands of every student. I have seen learned disquisitions on the theme, Why did the ancients fail in their scientific inquiries? I know not what may be the opinion of those who are competent to judge of the labors of Euclid, or of Hipparchus, or of Archimedes; but I think that the question which will rise to the lips of the biological student, fresh from the study of the works of Galen, is rather, How did these men, with their imperfect appliances, attain so vast a measure of success? In truth, it is in the Greek world that

we must seek, not only the predecessors, but the spiritual progenitors, of modern men of science. The slumbering aptitude of Western Europe for physical investigation was awakened by the importation of Greek knowledge and of Greek method; and modern anatomists and physiologists are but the heirs of Galen, who have turned to good account the patrimony bequeathed by him to the civilized world.

The student of the works of the anatomists and physiologists of modern Europe in the fifteenth and the beginning of the sixteenth century, will find that they were chiefly occupied in learning of their own knowledge what Galen knew. It is not strange, therefore, that they were overpowered by so vast a genius, and that they allowed themselves to be enslaved by his authority, in a manner which he would have been the first to reprove. Vesalius, the great reformer of anatomy, had a bitter struggle to carry on Galen's work, by showing where he had erred in expounding the structure of the human body, on the faith of observations made on the lower animals; but it was not till the middle of the sixteenth century that anything was done to improve on Galen's physiology, and especially to amend his doctrines concerning the movements of the heart and of the blood.

The first step in this direction is very generally ascribed to Michael Servetus, the unhappy man whose judicial murder by slow fire was compassed by John Calvin; he being instigated thereto by theological antagonism, intensified by personal hatred; and aided and abetted in his iniquity by the Protestant Churches of Switzerland. The whole story has recently been clearly and fully told by Dr. Willis,¹ and I refer to it only for the purpose of remarking that the name and fame of Calvin's victim would probably have been as completely obliterated as his persecutor intended they should be, had it not happened that one or two copies of the "*Christianismi Restitutio*," the attempted publication of which was the immediate cause of Servetus's death, were saved from destruction.

Servetus was undoubtedly well acquainted with anatomy, inasmuch as he was demonstrator to Joannes Guinterus in the School of Paris, where he had Vesalius for his colleague; and, in his later years, he practised as a physician. Hence it is not wonderful to find that the "*Christianismi Restitutio*," although essentially a farrago of scatterbrained theological speculations, contains much

physiological matter. And it is in developing his conception of the relations between God and man that Servetus wrote the well-known passages on which many have asserted his claim to the discovery of the course of the blood from the heart, through the lungs, and back to the heart, or what is now termed the pulmonary circulation.

I have studied the passages in question with great care, and with every desire to give Servetus his due, but I confess I cannot see that he made much advance upon Galen.¹ As we have seen, Galen said that some blood goes to the left side of the heart from the right side through the lungs, but that the greater part traverses the septum. Servetus appears, at first, to declare that all the blood of the right side goes through the lungs to the left side, and that the septum is imperforate. But he qualifies his assertion by admitting that some of the blood of the right ventricle may transude through the septum, and thus the question between him and Galen becomes merely one of degree. Servetus cites neither observation nor experiment in favor of the imperviousness of the septum; and the impression upon my mind is that he really knew no more than Vesalius had already published, but that the tendency to headlong speculation, which is so characteristic of the man, led him to rush in where his more thoughtful colleague held back.

Whatever may be thought of the moral claim of Servetus to be regarded as the discoverer of the pulmonary circulation, there is no reason to believe that he had any influence on the actual progress of science.² For Calvin dealt with all the packages of the edition of the "*Christianismi Restitutio*" he could lay hands on as he had served their author, and it is believed that only a few copies escaped the flames. One of these, in the National Library of France, is the very book used by the counsel for the prosecution, whom Calvin prompted, at Geneva; another is in Vienna. The public had no access to the work until it was reprinted, more than two centuries afterward.

¹ I cannot but think that Dr. Willis's natural affection for his hero has carried him too far when he says, "Had his '*Restoration of Christianity*' been suffered to get abroad and into the hands of anatomists, we can hardly imagine that the immortality which now attaches so truly and deservedly to the great name of Harvey would have been reserved for him." But within six years of Servetus's death the doctrine of the pulmonary circulation did get abroad through Realdo Columbus, without the effect supposed.

² The arguments adduced by the learned and ingenious Tollin ("*Die entdeckung der kreislaufs durch Michel Servet*," 1876), on the other side, will hardly bear close scrutiny.

¹ "*Servetus and Calvin*," by R. Willis, M. D., 1877.

The first author who declared, without any qualification, that the septum of the ventricles is imperforate, and that all the blood of the right ventricle traverses the lungs and (except so much as may be retained for the nutrition of these organs) passes to the left ventricle, was Realdus Columbus, Professor of Anatomy in the famous School of Padua. The remarkable treatise, "*De Re Anatomica*," of this able anatomist, was published in 1559, or only six years after the death of Servetus, of whose notions there is no evidence that Columbus had any cognizance. Moreover, Columbus, as able an experimenter as he was a skillful dissector, deals with the question in a very different way from Servetus; so that, from his time, the existence of the pulmonary circulation, in the modern sense, may be said to have become established. Ambroise Paré, the great surgeon, writing in 1579,¹ refers to the course of the blood through the lungs as notoriously the discovery of Columbus. And I think not only that Realdus Columbus is entitled to the whole credit of this very considerable advance upon Galen's views, but that he is the only physiologist, between the time of Galen and that of Harvey, who made any important addition to the theory of the circulation.

The claim which is put forward on behalf of the celebrated botanist Cæsalpinus appears to me to be devoid of any foundation.² Many years after the publication of the work of Realdus Columbus, who was professor at the most famous and most frequented anatomical school of the time, and who assuredly was the last man to hide his light under a bushel, Cæsalpinus incidentally describes the pulmonary circulation in terms which simply embody a statement of Columbus's doctrine, adding nothing, and, to his credit be it said, claiming nothing. Like all the rest of the

world since venesection was invented, Cæsalpinus noticed that the vein swells on the side of the ligature away from the heart; and he observes that this is inconsistent with the received views of the motion of the blood in the veins. If he had followed up the suggestion thus made to him by the needful experimental investigation, he might have anticipated Harvey; but he did not.

Again, Cannani discovered the existence of valves in some of the veins in 1547; and Fabricius rediscovered them, and prominently drew attention to their mechanism, in 1574. Nevertheless, this discovery, important as it was, and widely as it became known, had absolutely no effect in leading either the discoverers or their contemporaries to a correct view of the general circulation. In common with all the anatomists of the sixteenth century, Fabricius believed that the blood proceeded from the main trunk, or vena cava, outward to the smallest ramifications of the veins, in order to subserve the nutrition of the parts in which they are distributed; and, instead of being led by the mechanical action of the valves to reverse his theory of the course of the venous blood, he was led by the dominant theory of the course of the blood to interpret the meaning of the valvular mechanism. Fabricius, in fact, considered that the office of the valves was to break the impetus of the venous blood, and to prevent its congestion in the organs to which it was sent; and, until the true course of the blood was demonstrated, this was as likely an hypothesis as any other.

The best evidence of the state of knowledge respecting the motions of the heart and blood in Harvey's time is afforded by those works of his contemporaries which immediately preceded the publication of the "*Exercitatio Anatomica*," in 1628.¹ And none can be more fitly cited for this purpose than the "*De Humani Corporis Fabrica, Libri decem*," of Adrian van den Spiegel, who, like Harvey, was a pupil of Fabricius of Aquapendente, and was of such distinguished ability and learning that he succeeded his master in the chair of anatomy of Padua.

¹ "The Works of Ambrose Paré," translated by Thomas Johnson, 1691, p. 97.

² "Videmus Cæsalpinum eadem de sanguinis itinere per pulmonem, atque de valvularum usu quæ Columbus ante docuisset proponere; causas vero sanguinis movendi juxta eum ignarissimis nescivisse; motus cordis atque arteriarum perturbasse; sanguinem e dextro cordis ventriculo per pulmonem in sinistram ventriculum deferri, nullo experimento sed ingenii commento probabili persuasum credidisse. De venis ab injecto vino intumescensibus aliena omnino dixisse; alimentum auctivum e venis in arterias, per oscula mutua vasorum sibi invicem commissorum, elicium invita experientia docuisse."

Not one of the ingenious pleaders for Cæsalpinus has yet, in my judgment, shown cause for the reversal of the verdict thus delivered by the learned biographer of Harvey in the edition of his "*Opera Omnia*," which was published by the College of Physicians in 1766.

¹ The whole title of the copy of the rare first edition in the library of the College of Physicians runs: "*Exercitatio Anatomica de motu cordis et sanguinis in animalibus. Gulielmi Harvæi. Angli Medici Regii et Professoris Anatomie in Collegio Medicorum Londinensi. Francofurti, sumptibus Gulielmi Fitzeri. Anno MDCXXVIII.*" The dedications, of which that to Charles I. is pasted in, as if it had been an afterthought, extend to p. 9; the Proæmium to p. 19; while the *Exercitatio* itself occupies pp. 20 to 72 inclusively. There are two plates illustrative of experiments on the veins of the arm.

Van den Spieghel, or Spigelius, as he called himself, in accordance with the fashion of those days, died comparatively young in 1625, and his work was edited by his friend Daniel Bueretius, whose preface is dated 1627. The accounts of the heart and vessels, and of the motion of the blood, which it contains, are full and clear; but, beyond matters of detail, they go beyond Galen in only two points, and, with respect to one of these, Spigelius was in error.

The first point is the "pulmonary circulation," which is taught as Columbus taught it nearly eighty years before. The second point is, so far as I know, peculiar to Spigelius himself. He thinks that the pulsation of the arteries has an effect in promoting the motion of the blood contained in the veins which accompany them. Of the true course of the blood as a whole, Spigelius has no more suspicion than had any other physiologist of that age, except William Harvey; no rumor of whose lectures at the College of Physicians, commenced six years before Spieghel's death, was likely in those days of slow communication, and in the absence of periodical publications, to have reached Italy.

Now, let any one familiar with the pages of Spigelius take up Harvey's treatise and mark the contrast.

The main object of the "Exercitatio" is to put forth and demonstrate, by direct experimental and other accessory evidence, a proposition which is far from being even hinted at, either by Spigelius, or by any of his contemporaries or predecessors; and which is in diametrical contradiction to the views, respecting the course of the blood in the veins, which are expounded in their works.

From Galen to Spigelius, they one and all believed that the blood in the vena cava and its branches flows from the main trunk toward the smallest ramifications. There is a similar consensus in the doctrine, that the greater part, if not the whole, of the blood thus distributed by the veins is derived from the liver; in which organ it is generated out of the materials brought from the alimentary canal by means of the vena portæ. And all Harvey's predecessors further agree in the belief that only a small fraction of the total mass of the venous blood is conveyed by the vena arteriosa to the lungs and passes by the arteria venosa to the left ventricle, thence to be distributed over the body by the arteries. Whether some portion of the refined and "pneumatic" arterial blood traversed the anastomotic channels, the existence of which was assumed, and so reached the systemic veins, or whether, on the

contrary, some portion of the venous blood made its entrance by the same passage into the arteries, depended upon circumstances. Sometimes the current might set one way, sometimes the other.

In direct opposition to these universally received views, Harvey asserts that the natural course of the blood in the veins is from the peripheral ramifications toward the main trunk; that the mass of the blood to be found in the veins at any moment was, a short time before, contained in the arteries, and has simply flowed out of the latter into the veins; and, finally, that the stream of blood which runs from the arteries into the veins is constant, continuous, and rapid.

According to the view of Harvey's predecessors,¹ the veins may be compared to larger and smaller canals, fed by a spring which trickles into the chief canals, whence the water flows to the rest. The heart and lungs represent an engine set up in the principal canal to aerate some of the water and scatter it all over the garden. Whether any of this identical water came back to the engine or not would be a matter of chance, and it would certainly have no sensible effect on the motion of the water in the canals. In Harvey's conception of the matter, on the other hand, the garden is watered by channels so arranged as to form a circle, two points of which are occupied by propulsive engines. The water is kept moving in a continual round within its channels, as much entering the engines on one side as leaves them on the other; and the motion of the water is entirely due to the engines.

It is in conceiving the motion of the blood, as a whole, to be circular, and in ascribing that circular motion simply and solely to the contractions of the walls of the heart, that Harvey is so completely original. Before him, no one, that I can discover, had ever so much as dreamed that a given portion of blood contained, for example, in the right ventricle of the heart may, by the mere mechanical operation of the working of that organ, be made to return to the very place from which it started, after a long journey through the lungs, and through the body generally. And it should be remembered that it is to this complete circuit of the blood, alone, that the term "circulation" can, in strictness, be applied. It is of the essence of a circular motion that that which moves returns to the place whence it started. Hence, the discovery of the course of the blood from the right ventricle, through the

¹ See the comparison of the veins to the canals for irrigating a garden, in Galen, "*De Naturalibus Facultatibus*," vol. iii., cap. xv.

lungs, to the left ventricle, was in no wise an anticipation of the discovery of the circulation of the blood. For the blood which traverses this part of its course no more describes a circle than the dweller in a street who goes out of his own house and enters his next-door neighbor's does so. Although there may be nothing but a party-wall between him and the room he has just left, it constitutes an efficient *défense de circuler*. Thus, whatever they may have known of the so-called pulmonary circulation, to say that Servetus, or Columbus, or Cæsalpinus, deserves any share of the credit which attaches to Harvey, appears to me to be to mistake the question at issue.

It must further be borne in mind, that the determination of the true course taken by the whole mass of the blood is only the most conspicuous of the discoveries of Harvey; and that his analysis of the mechanism by which the circulation is brought about is far in advance of anything which had previously been published. For the first time, it is shown that the walls of the heart are active only during its systole or contraction, and that the dilatation of the heart, in the diastole, is purely passive. Whence it follows, that the impulse by which the blood is propelled is a *vis a tergo*, and that the blood is not drawn into the heart by any such inhalent or suctional action as not only the predecessors but many of the successors of Harvey imagined it to possess.

Harvey is no less original in his view of the cause of the arterial pulse. In contravention of Galen and of all other anatomists up to his own time, he affirms that the stretching of the arteries which gives rise to the pulse is not due to the active dilatation of their walls, but to their passive distention by the blood which is forced into them at each beat of the heart; reversing Galen's dictum, he says that they dilate as bags and not as bellows. This point of fundamental, practical as well as theoretical, importance is most admirably demonstrated, not only by experiment, but by pathological illustrations.

One of the weightiest arguments in Harvey's demonstration of the circulation is based upon the comparison of the quantity of blood driven out of the heart, at each beat, with the total quantity of blood in the body. This, so far as I know, is the first time that quantitative considerations are taken into account in the discussion of a physiological problem. But one of the most striking differences between ancient and modern physiological science, and one of the chief reasons of the rapid progress of physiology in the last half-century, lies in the introduction of exact

quantitative determinations into physiological experimentation and observation. The moderns use means of accurate measurement, which their forefathers neither possessed nor could conceive, inasmuch as they are products of mechanical skill of the last hundred years, and of the advance of branches of science which hardly existed, even in germ, in the seventeenth century.

Having attained to a knowledge of the circulation of the blood, and of the conditions on which its motion depends, Harvey had a ready deductive solution for problems which had puzzled the older physiologists. Thus the true significance of the valves in the veins became at once apparent. Of no importance while the blood is flowing in its normal course toward the heart, they at once oppose any accidental reversal of its current, which may arise from the pressure of adjacent muscles, or the like. And, in like manner, the swelling of the veins on the farther side of the ligature, which so much troubled Cæsalpinus, became at once intelligible, as the natural result of the damming up of the returning current.

In addition to the great positive results which are contained in the treatise which Harvey modestly calls an "Exercise"—and which is, in truth, not so long as many a pamphlet about some wholly insignificant affair—its pages are characterized by such precision and simplicity of statement, such force of reasoning, and such a clear comprehension of the methods of inquiry and of the logic of physical science, that it holds a unique rank among physiological monographs. Under this aspect, I think I may fairly say that it has rarely been equaled and never surpassed.

Such being the state of knowledge among his contemporaries, and such the immense progress effected by Harvey, it is not wonderful that the publication of the "Exercitatio" produced a profound sensation. And the best indirect evidence of the originality of its author, and of the revolutionary character of his views, is to be found in the multiplicity and the virulence of the attacks to which they were at once subjected.

Riolan, of Paris, had the greatest reputation of any anatomist of those days, and he followed the course which is usually adopted by the men of temporary notoriety toward those of enduring fame. According to Riolan, Harvey's theory of the circulation was not true; and, besides that, it was not new; and, furthermore, he invented a mongrel doctrine of his own, composed of the old views with as much of Harvey's as it was safe to borrow, and tried therewith to fish credit for

himself out of the business. In fact, in wading through these forgotten controversies, I felt myself quite at home. Substitute the name of Darwin for that of Harvey, and the truth that history repeats itself will come home to the dullest apprehension. It was said of the doctrine of the circulation of the blood that nobody over forty could be got to adopt it; and I think I remember a passage in the "Origin of Species," to the effect that its author expects to convert only young and flexible minds.

There is another curious point of resemblance in the fact that even those who gave Harvey their general approbation and support sometimes failed to apprehend the value of some of those parts of his doctrine which are, indeed, merely auxiliary to the theory of the circulation, but are only a little less important than it. Harvey's great friend and champion, Sir George Ent, is in this case; and I am sorry to be obliged to admit that Descartes falls under the same reprehension.

This great philosopher, mathematician, and physiologist, whose conception of the phenomena of life as the results of mechanism is now playing as great a part in physiological science as Harvey's own discovery, never fails to speak with admiration, as Harvey gratefully acknowledges, of the new theory of the circulation. And it is astonishing, I had almost said humiliating, to find that even he is unable to grasp Harvey's profoundly true view of the nature of the systole and the diastole, or to see the force of the quantitative argument. He adduces experimental evidence against the former position, and is even further from the truth than Galen was, in his ideas of the physical cause of the circulation.

Yet one more and a last parallel. In spite of all opposition, the doctrine of the circulation propounded by Harvey was, in its essential features, universally adopted within thirty years of the time of its publication. Harvey's friend, Thomas Hobbes, remarked that he was the only man, in his experience, who had the good fortune to live long enough to see a new doctrine accepted by the world at large. Mr. Darwin has been even more fortunate, for not twenty years have yet elapsed since the publication of the "Origin of Species;" and yet there is no denying the fact that the doctrine of evolution, ignored, or derided, and vilified, in 1859, is now accepted, in one shape or other, by the leaders of scientific thought in every region of the civilized world.

I proposed at the outset of this essay to say something about the method of inquiry which

Harvey pursued, and which guided him through-out his successful career of discovery.

It is, I believe, a cherished belief of Englishmen, that Francis Bacon, Viscount St. Albans, and sometime Lord Chancellor of England, invented that "Inductive Philosophy" of which they speak with almost as much respect as they do of church and state; and that, if it had not been for this "Baconian Induction," science would never have extricated itself from the miserable condition in which it was left by a set of hair-splitting folk, known as the ancient Greek philosophers. To be accused of departing from the canons of the Baconian philosophy is almost as bad as to be charged with forgetting your aspirates; it is understood as a polite way of saying that you are an entirely absurd speculator.

Now the "Novum Organon" was published in 1620, while Harvey began to teach the doctrine of the circulation in his public lectures in 1619. Acquaintance with the "Baconian Induction," therefore, could not have had much to do with Harvey's investigations. The "Exercitatio," however, was not published till 1628. Do we find in it any trace of the influence of the "Novum Organon?" Absolutely none. So far from indulging in the short-sighted and profoundly unscientific depreciation of the ancients in which Bacon indulges, Harvey invariably speaks of them with that respect which the faithful and intelligent study of the fragments of their labors that remain to us must inspire in every one who is practically acquainted with the difficulties with which they had to contend, and which they so often mastered. And, as to method, Harvey's method is the method of Galen, the method of Realdus Columbus, the method of Galileo, the method of every genuine worker in science either in the past or the present. On the other hand, judged strictly by the standard of his own time, Bacon's ignorance of the progress which science had up to that time made, is only to be equaled by his insolence toward men in comparison with whom he was the merest sciolist. Even when he has some hearsay knowledge of what has been done, his want of acquaintance with the facts and his abnormal deficiency in what I may call the scientific sense prevent him from divining its importance. Bacon could see nothing remarkable in the chief contributions to science of Copernicus, or of Kepler, or of Galileo; Gilbert, his fellow-countryman, is the subject of a sneer; while Galen is bespattered with a shower of imputations, which reach their climax in the epithets "puppy" and "plague."¹

¹ "Video Galenum, virum angustissimi animi, de-

I venture to think that if Francis Bacon, instead of spending his time in fabricating fine phrases about the advancement of learning, in order to play, with due pomp, the part which he assigned to himself of "trumpeter" of science, had put himself under Harvey's instruction, and had applied his quick wit to discover and methodize the logical process which underlaid the work of that consummate investigator, he would have employed his time to better purpose; and, at any rate, would not have deserved the just but sharp judgment which follows: "that his (Bacon's) method is impracticable, cannot, I think, be denied, if we reflect, not only that it never has produced any result, but also that the process by which scientific truths have been established cannot be so presented as even to appear to be in accordance with it." I quote from one of Mr. Ellis's contributions to the great work of Bacon's most learned, competent, and impartial biographer, Mr. Spedding.¹

Few of Harvey's sayings are recorded, but Aubrey² tells us that some one having enlarged upon the merits of the Baconian philosophy in his presence, "Yes," said Harvey, "he writes philosophy like a chancellor." On which pithy reply diverse persons will put diverse interpretations. The illumination of experience may possibly tempt a modern follower of Harvey to expound the dark saying thus: "So this servile courtier, this intriguing politician, this unscrupulous lawyer, this witty master of phrases, proposes to teach me my business in the intervals of his. I have borne with Rician, let me also be patient with him;" at any rate, I have no better reading to offer.

In the latter half of the sixteenth and the beginning of the seventeenth centuries, the future of physical science was safe enough in the hands

sertorem experientie et vanissimum causatorem. . . . O canicula! O pestis!—Temporis Partus Masculus!"

"Canicula" has even a coarser meaning than "puppy."

¹ General Preface to the Philosophical Works, vol. i., p. 38.

² Aubrey says: "He had been physician to the Lord Ch. Bacon, whom he esteemed much for his witt and style, but would not allow to be a great philosopher. Said he to me, 'He writes philosophy like a L^d. Chancellor,' speaking in derision. . . . He was very communicative, and willing to instruct any that were modest and respectful to him. And in order to my journey dictated to me what to see, what company to keep, what books to read, how to manage my studies; in short, he bid me go to the fountaine head, and read Aristotle, Cicero, Avicenna, and did call the Neoteriques—" something almost as bad as "canicula:" the little swarthy, black-eyed, choleric man.

of Gilbert, Galileo, Harvey, Descartes, and the noble army of investigators who flocked to their standard, and followed up the advance of their leaders. I do not believe that their wonderfully rapid progress would have been one whit retarded if the "*Novum Organon*" had never seen the light; while if Harvey's little "*Exercise*" had been lost, physiology would have stood still until another Harvey was born into the world.

There is another point in reference to method on which I desire to contribute my mite toward the dissipation of a wide-spread popular delusion. On the faith of a conversation reported by Robert Boyle, Harvey is said to have declared that he discovered the circulation of the blood by reasoning deductively from the disposition of the valves of the veins. On this I may remark, firstly, that the words imputed to Harvey by no means warrant this conclusion; secondly, that if they did, the statement could not be true, because we have Harvey's own evidence to the contrary; and, thirdly, that if the conclusion were warranted by the words reported, and were not contradicted by Harvey himself, it would still be worthless, because it is impossible to prove the circulation of the blood from any such data. What Robert Boyle says is this: "And I remember, that when I asked our famous Harvey, in the only discourse I had with him (which was but a while before he died), what were the things that induced him to think of a circulation of the blood? he answered me that when he took notice that the valves in the veins of so many parts of the body were so placed that they gave free passage to the blood toward the heart, but opposed the passage of the venal blood the contrary way: he was invited to imagine that so provident a cause as Nature had not so placed so many valves without design; and no design seemed more probable, than that since the blood could not well, because of the interposing valves, be sent by the veins to the limbs, it should be sent through the arteries and return through the veins, whose valves did not oppose its course that way."¹

I have no doubt that it may be quite true that Harvey was "induced" to "think of a circulation of the blood" by considering the disposition of the valves of the veins; just as Ctesalpinus might have been led to the same thought; and then might have found out the true state of the case if he had taken the hints which Nature gave him and had used the proper means of investigation

¹ "A Disquisition about the Final Causes of Natural Things."—Boyle's Works, vol. v., p. 427.

in order to discover whether those hints were valuable or worthless. Harvey must have learned the views of his master Fabricius; and it is likely enough that to his acute mind Fabricius's explanation of the functions of the valves seemed rather lame. But, as a matter of fact, Harvey did not reason out the circulation from the datum of the valves. On this point his own words, in the passage which contains the fullest account of the considerations which led him to the doctrine of the circulation, leave no doubt whatever:

"Thus far I have spoken of the passage of the blood from the veins into the arteries,¹ and of the manner in which it is transmitted and distributed by the action of the heart; and thus far some, perhaps, moved by the authority of Galen or of Columbus, or by the reasonings of other authors, will agree with me. But when I proceed to what remains to be said concerning the quantity and the origin of the blood thus transmitted (though it is highly worthy of consideration) it will seem so new and unheard of, that I not only fear injury to myself from the envy of a few, but I dread lest I make all mankind my enemies. So much does custom, or teaching once accepted and fixed by deep roots, weigh with all; and such is the influence of the venerable opinion of antiquity. However this may be, now that the die is cast, my hope lies in the candor of lovers of truth and of learned minds. Indeed, when I thought often and seriously upon how large the quantity [of transmitted blood] is; upon my dissections of living animals (for the purposes of experiment) and the opening of arteries and the many considerations arising therefrom; as well as upon the magnitude and the symmetry of the ventricles of the heart and of the vessels which enter and leave them (since Nature makes nothing in vain, so great a size proportionally would not be given to these vessels without an object); and upon the elaborate mechanism of the valves and fibres, and of the rest of the structure of the heart: as well as of many other things; and when I long turned over in my mind, what might be the quantity of the transmitted blood, in how short a time its transmission might be effected; whether that quantity could be supplied by the juices of the food ingested: I came at length to the conclusion that the veins would become collapsed and empty, while the arteries, on the other hand, would be ruptured by the excess of blood poured into them;

¹ In the preceding chapter (vii.) Harvey has been discussing the passage of the blood through the lungs, supporting his views, among other arguments, by the authority of Galen and of Columbus; and it must be remembered that he termed the pulmonary artery *vena arteriosa* and the pulmonary vein *arteria venosa*. Wherefore he properly speaks of the passage of the blood "from the veins into the arteries."

unless there were some road by which the blood could at length run back from the arteries into the veins, and return to the right ventricle of the heart. So I began to think whether there was a kind of motion as it were in a circle; this I afterward found to be true."²

In all this very full and interesting account of the course of Harvey's inquiry, it will be observed that not one word is said about the valves of the veins. The valves of which he speaks are those of the heart, which had been known, as I have pointed out, ever since the days of Erasistratus.

Finally, I venture to affirm that Harvey did not deduce the circulation from the disposition of the valves of the veins, because it is logically impossible that any such conclusion should be deduced from such premises. The only conclusion which is warranted by the presence of valves in the veins is, that such valves will tend to place a certain amount of obstacle in the way of a liquid flowing in a direction opposite to that in which the valves are inclined. The amount of obstacle, from mere impediment to absolute barring of the way, will depend upon the form and disposition of the valves; upon their inertia, or stiffness of motion, in relation to the force of the current of liquid; and, above all, upon the firmness or yieldingness of the walls of the tube to which they are attached. The valve which hermetically closes the passage through an iron pipe may be of no use in an India-rubber tube. Therefore, unless the action of such valves as exist in the veins were carefully tested by experiment on the living animal, any conclusions that might be based upon their presence would be of doubtful value, and might be interpreted either in the sense of Fabricius, or in that of Harvey.

Moreover, supposing that it could be proved that in those veins in which valves exist the blood can move only in one way, what is to be said about the numerous veins which have no valves? And, unless we already know upon experimental grounds that the walls of the cavities of the heart contract in a certain definite order; that the arteries are full of blood and not of air; and a number of other important facts which can only be experimentally determined—what good is it to know that there are valves in the veins? There are valves in the lymphatics as well as in the veins, and yet any one who concluded therefrom that the lymph circulates after the manner of the blood would make a woful mistake.

² "Gulielmi Harveji Exercitationes Anatomicae." Exercitatio I., cap. viii., edition 1660.

The fact is, that neither in this nor in any physiological problem can mere deductive reasoning from dead structure tell us what part that structure plays, when it is a living component of a living body. Physiology attempts to discover the laws of vital activity, and these laws are obviously ascertainable only by observation and experiment upon living things.

In the case of the circulation of the blood, as in that of all other great physiological doctrines, take away the truths which have been learned by observation and experiment on living structures, and the whole fabric crumbles away. Galen, Columbus, Harvey, were all great vivisectioners. And the final ocular demonstration of the circulation of the blood by Malpighi, seven years after Harvey's death—the keystone of the fabric he raised—involved an experiment on a living frog.

This experiment can be performed on a demonstrably insensible animal. Nevertheless, any English subject who repeats it, in these days, may be subjected to fine or imprisonment, as a common malefactor, whenever the chances of political strife give the home office to some minister of less knowledge, less justice, and, above all, less firmness in resisting open and underhand pressure, than the present Secretary of State for the Home Department.

I do not think the present is a fitting occasion for the discussion of the burning question of vivisection. My opinions on the subject have been formed and expressed under a due sense of responsibility, and they have not been, and are not likely to be, affected by the preposterous misrepresentations and unseemly abuse which they have evoked. The good Harvey, in one of his fits of choler, I suppose, said that "man was but a great mischievous baboon,"¹ and yet for twenty years he kept silence, and at the end answered Riolan with quite angelic mildness. I can imitate his silence, if not his mildness; and therefore I have nothing further to offer on this subject. It may be that those are right who say, "Perish the human race, rather than let a dog suffer." It may be that those are right who think that a man is worth a wilderness of apes, and that he who will not save human life when he could do so, by sacrificing a hecatomb of animals, is an accomplice in murder.

But, without touching upon this debatable ground, I may be of some use in cleansing the ground of mere rubbish. I submit two points for your consideration. The one of these is the

unquestionable fact that physiology is based upon experiment, and can only grow by experiment; and that the discovery of the true motion of the blood, which is one of the cardinal doctrines of that science, and a doctrine the truth of which is implied in the diagnosis and the treatment of nine diseases out of ten, has been made in no other way than by reasoning on the data supplied by repeated and multiplied vivisections.

The other is a mere suggestion, which, perhaps, may be dictated by a want of power on the part of a man who is growing old, to adjust himself to a changing world. The great mark of senility, I believe, is to be a "laudator temporis acti." But, as Harvey says, "the die is cast, and I put my faith in the candor of the lovers of truth and of learned minds."

I have had occasion to remark that the science of former days was not so despicable as some think; and that, however foolish undue respect for the wisdom of the ancients may be, undue disrespect for it may be still more reprehensible. Now I fancy that a candid mind will admit it to be within the limits of possibility, that the like may apply to the public opinion and the moral sense of former ages.

Harvey was the favored friend of his sovereign, the honored Nestor of his profession, the pride of his countrymen. If he lived now, and were guilty of serving mankind to the same extent and in the same way, so far from any such marks of favor reaching him, he would find himself to be a mark of a different kind—a mark, I mean, for immeasurable calumny and scandalous vituperation; and, though his professional brethren would surely pay him all honor, so far from being the pride of his countrymen, a goodly number of them, of all grades in the social scale, would be spending a world of energy in the endeavor to give him the legal status of a burglar.

I venture to ask you to consider seriously whether, under these circumstances, it is quite so certain, as some seem to believe, that the public opinion of the England of Harvey's day—that time when Englishmen could hurl back a world arrayed in arms against them, because they feared neither to suffer, nor to inflict, pain and death in a good cause; that age within which Shakespeare and Milton, Hobbes and Locke, Harvey and Newton, Drake and Raleigh, Cromwell and Strafford, embodied the powers of our race for good and evil in a fashion which has had no parallel before or since—was absolutely contemptible when set

¹ Aubrey.

against that of this present enlightened and softly-nurtured, not to say sentimental, age.

Maybe it is; possibly the world is entering upon a phase in which the recognized whole duty of man will be to avoid the endurance, or the infliction, of physical pain, whatever future alleviation of misery may be its consequence, however great the positive benefit to mankind which may flow thereupon. If so, "*Finis Physiologiæ*." When that time arrives, there will be an end to all progress in our knowledge of the laws of life, to all advance toward rational medicine. And, if I do not greatly err, these are not the only things which the logical outcome of such premises will have abolished. Crime must go unpunished—for what justification is there for "torturing" a poor thief or murderer except the general good of society? The "voice of the sluggard" will not "be heard to complain," for no one will dare to "torture" him by disturbing his slumbers. There will be no means of transport, and nothing to ride, except steam-engines and bicycles, for the "torture" involved in the training and in the labor of beasts of draught and burden will be insufferable. No man will think of eating meat, though it may be proper for him to serve

as meat to other creatures; for what right can men have to "torture" fleas by the administration of insecticide powder, merely for the benefit of mankind? Sport, I need not say, will have been abolished, and war will have followed it; not so much because war is fraught with evil for men, but because of the awful "torture" which it inflicts directly upon horses and mules, to say nothing of the indirect dyspeptic sufferings of the vultures and wolves, which are tempted by our wickedness to overeat themselves.

As I have confessed, I find myself to be regrettably out of harmony with many worthy and enthusiastic people among my contemporaries; and perhaps the prospect of the coming of the new era, in which these things shall be, does not affect others as it does me. To say truth, I am rather glad to think that the species can hardly be perfected thus far, in my time. I must distinctly admit that I should be loath to be obliged to exist in a world in which my notions of what men should be and do will have no application. As the old Norseman said, when the choice between heaven with the new generation, and hell with the old, was offered him, "I prefer to be with my ancestors."—*Fortnightly Review*.

LEARNING AND HEALTH.¹

By BENJAMIN W. RICHARDSON.

IN this day the cultivation of the mental faculties is made to hold the first place in education. There be some who still maintain the superiority of physical over mental culture, and there be many who insist on the necessity of a high degree of physical culture of a certain extreme and artificial kind. But, as a rule, the favor once too exclusively tendered to a purely physical training is on the decline. The admiration which once was bestowed on men of great strength has almost ceased in civilized circles. Physical strength may, if it show itself in some singular and abnormal manner, create for a time an excitement and noise, but the excitement ends in the silence that follows clamor. Men who perform great feats of strength are no longer heroes to be courted and immortalized. Hercules himself would be a nine days' wonder in these days.

The evidence now is fairly clear, moreover, that men who even combine heroism with physical power are not the demi-gods they were. In war, the man, in these days, who displays the deepest skill and cunning in the management of troops is the great general. It is not necessary that he should lead a column or expose himself to danger for a moment. His power lies in his knowledge, and his knowledge in his power.

To attain knowledge is one of the most desired objects, and so much of admiration of man for man as yet remains (it is not really very much) is expended on those who show the greatest mental gifts or possessions. The admiration, estimated at its true value, feeds vanity rather than veneration. Men who wish to be honestly admired see no mode of having what they long for except by the acquisition of knowledge and the toilsome display of it. They are frequently disappointed; more frequently, I fancy, disappointed than satis-

¹ Lecture delivered at the London Institution, on Monday, January 14, 1878.

fied, when they even attain to all they aspire to as scholars. They feel themselves, perhaps justly know themselves, to be great scholars; and yet, how little are they recognized above the common people who are well-to-do and are no scholars at all! But what other course is open to laudable ambition?

There is in this way induced, therefore, a strain after knowledge as a means of getting that remaining part, that skeleton of distinction, which so soon will be put up as a curiosity of the past.

The acquisition of much knowledge has, however, another meaning and object beyond mere ambition. In this so-called practical day it is imagined that knowledge must be extended without limitation among the young, in order that it may be limited without extension among those who have passed their youth and have become engaged in the practical affairs of life. School-days and student-days must be given up to the attainment of mastery over subjects included in the whole domain of the human understanding. The days of active life, in which men are made or marred, must be devoted to the perfect mastery, or supposed perfect mastery, of one particular subject. Branches of great divisions, and in time branches of divisions of great divisions, and in time again branches of little divisions derived from the secondary divisions, must be made the subjects of special study by special men.

It is very singular to observe in common conversation the expression of these two lines of mental activity. A fond parent, speaking in terms of admiration of his son at school, unfolds with pride the school report. His boy has been working with a zeal that cannot be too much applauded. In that monthly report-sheet the lad has the highest number of marks in Greek, and the same in Latin. He fails only one mark from the highest in Latin exercise, he is equally near to the top in French, and in German he is but one lower down. In what is called English he is third, in Grecian history second, in Roman history first, in English fourth. In geography he is first, in chemistry fifth, in natural philosophy second, in mathematics third, in algebra third, in arithmetic first, in mental arithmetic second, and in writing fifth. Poor boy! what a month of close work has been spent on that long list! Four hours of school in the morning, three in the afternoon. Lessons after school, assisted by an intelligent and active tutor devoted to the progress of his pupil, and very determined, though so exceedingly kind, for three hours and sometimes four hours more.

The father is delighted with the progress of the son. Suppose, however, you take the father on these very subjects, and see his position in respect to them. In nine cases out of ten you find that for him such learnings are vanities. He tells you he has no time for the gaining of any information on other subjects save the one which is the matter of his life. You may hear him say of men placed as he is, that they must keep to the single calling. Division of labor is the soul of success. In these times, to master one subject is to do all that is required. An accomplished man! Where is there such a man, and of what use is he if he do exist, which is improbable? An accomplished woman! Yes, an accomplished woman is now and then met with, but she, too, is rare, and not of much use either; but women have more time, and may be excused if they let their minds run after many things in learning.

This picture may perhaps be thought to have a mercantile or business character of too exclusive a kind. I do not think so. In science, the same kind of argument is not wanting in respect to the young and to middle-aged men. The student of science must, in the period of his studentship, go through the whole range of scientific learning. He must struggle for his degrees and get them. Once through the ordeal necessary for so much successful winning, he must settle down into minuteness; he must find some little point in the great world he has tried to traverse, fix on that, and seek to live on it in competency and reputation. He must touch no one else in his course, and let no one touch him. His magic circle, his ground of specialistic thought, is to be considered sacred. The same fashion, for I cannot call it a principle—nay, I cannot, without abusing the word, call it a method—is maintained in the professions; in two of them, the medical and the legal, in the most marked degree. A modern medical student, through the ordinary term of his studies, from the day he enters school until the day he gets his diploma, may work like a galley-slave at the whole world of natural science, and then, having seized his envied prize, may settle in life to the exclusive study and practice of disease of some section of the animal body. To be successful, he cannot draw the line too sharply round his particular pasture. Into that no man must enter unless he have a pasture somewhat similar, and such a one is not over-welcome. In deference to other men of other pastures, our man of men must not go out of his own. If he knows another department ever so well, he must not profess to know it—it is out of his line.

In legal pursuits the same kind of exclusiveness obtains, and I think in some instances in a more marked degree than in medicine.

It is fortunate for the Church that, with all her backslidings and troubles, she has not yet tumbled down to so low a position as her sisters have. It is of happy omen for the clergy that they must keep up their learning as general scholars. It is more than happy that in their case division of labor is not recognized as profitable; for if they were to begin to specialize, if one clergyman were to take one sin for special study, and keep to it all his life, and another a different sin; if one took up the cure of swearing, for instance, and another of theft, and another of lying, the confusion of the modern learned world would be complete indeed.

This introduction to present modes of learning and application of learning would well befit an essay on the subject of learning, as a practical development of civilization not altogether in accord, as it is now carried on, with the welfare of our race. I trust soon some scholar, whose heart is on education as mine is on health, will be bold enough to declare the unity of knowledge, the connection of it with wisdom, and the utter vanity that must soon be witnessed if the current fashion be allowed to follow its fragmentary, self-repulsive, and self-destructive course.

To me it falls to oppose the system of modern education as destructive of vital activity, and thereby of strength of mental growth. It is my business to declare that at this time health and education are not going hand-in-hand; that the whole head is sick, and the whole heart is faint.

I cannot sit day by day to see failure of young brain, and of brain approaching its maturity, and of brain that is matured, and tamely accept the phenomenon as necessary and therefore to be endured. To see the errors that prevail and not to speak of them were to be silent on errors which would lead a nation into trained feebleness, which shall lead to new generations springing out of that feebleness, and to the propagation of a community that should no more be illuminated by those greatnesses of the past who, in less learned but freer times, gave forth the noblest of noble poetry, the most wonderful of wonderful art, and a science, philosophy, and literature, that have been hardly mortal. Such a poetry as Shakespeare has poured forth; such an art as Gainsborough, and Reynolds, and Turner, and Herschel, and Siddons, and Kemble, and Kean, have presented; such a science as Newton, and Priestley, and Davy, and Young, and Faraday,

have immortalized; such a philosophy as Bacon and Locke have contributed; and such a literature as Johnson, and Scott, and Dickens have, in the freedom of their intellectual growths, bequeathed forever. To me, observing as a physician, the appearance and development of these men, under the circumstances in which they appeared, is natural, the more course of nature untrammelled, regular, and divinely permitted; not forced but permitted, Nature being left to herself. To me, observing as a physician, the appearance of such men in similar greatness of form is at this time an all but impossible phenomenon. The men truly may appear, for Nature is always reproducing them, and the divine permission for their development is equally good now as of yore; but the development is checked by human interference, and thereby hangs the reason of the impossible. Nature produces acorns for future oaks, and is as free as of yore that oaks should make forests; but if the young oaks be forced in their growth, and when they are approaching to maturity be barbarously compressed, head and trunk, into narrow, unyielding tubes, there will be no forests, nor so much as spare representatives of the forest, amid the brushwood of commonplace meadow or bare ploughed field of mental life.

If it be true that education does not go hand-in-hand with health, it is vain to expect that education shall bring forth the first fruits of knowledge, and, what is more important, of wisdom. My argument is, that the present modes of education for the younger population, and for the older, are not compatible with healthy life; and that education, therefore, is not producing the mental product that is required for the steady and powerful progress of the nation.

There are many faults in the processes of education of the young which tell upon health in a direct mode. There are faults in the construction of school-rooms still: there are faults in respect to discipline in schools: there are faults in respect to punishments in school-life. I do not at this moment dwell on these, and for the simple reason that they are departing errors. No one who has watched the improvements which have been made in schools during the past twenty years can fail to see how markedly they have advanced; what care is taken to secure good ventilation; how clean and warm the modern school-room has become, compared with the school-room of the past day.

No one, again, can doubt that the discipline of the modern school is much more correct than

it used to be, and that the manners and customs of scholars in school, and out of school, are superior in every particular. Scholars are cleaner than they were, less brutal than they were, and less subjected to those painful school accidents which, in our forefathers' time, were wont to leave their marks for life.

Lastly, it must be obvious to all that the law of kindness in schools is fast replacing the modes of ruling by the rod, and other forms of punishment, which once stood out as solemn and legalized barbarities—modes which hardened many hearts in their first days, and broke more than they hardened; modes which have left their impress even yet in the men and women whom they trained into transmissible forms of character and mind.

I may, then, leave these departing shadows on the school-day health, that I may touch more definitely on the shadows that are now deepening and daily falling.

EDUCATION IN CHILDHOOD.

The first serious and increasing evil bearing on education, and its relation to health, lies in too early subjection of pupils to study. Children are often taught lessons from books before they are properly taught to walk, and long before they are taught properly to play. Play is held out to them, not as a natural thing, as something which the parent should feel it a duty to encourage, but as a reward for so much work done, and as a rest from work done; as though, forsooth, play were not itself a form of work, and often work of a most fatiguing nature. Play, therefore, is not used as it ought to be used—as a mode of work which the child likes, but rather as a set-off against a mode of work which the child does not like, and which, in nine cases out of ten, he does not like because it is altogether unfitted for his powers; because Nature is protesting, as loudly as she can and as plainly as she can, that the child has not arrived at a period of growth when the kind of mental food that is forced on it is fitted for its organization.

For children under seven years of age the whole of the teaching that should be naturally conveyed should be through play, if the body is to be trained up healthily as the bearer of the mind. And it is wonderful what an amount of learning can by this method be attained. Letters of languages can be taught; conversation in different languages can be carried on; animal life can be classified; the surface of the earth can be made clear; history can be told as story;

and a number of other and most useful truths can be instilled without ever forcing the child to touch a book or read a formal lesson.

Under such a system the child grows into knowledge, makes his own inventory of the world that surrounds him and the things that are upon it, and, growing up free to learn, learns well, and eats, and sleeps, and plays well.

In a child trained after this method, not only is health set forth, but happiness likewise—a most important item in this period of life. Priestley, who was as good an observer of men as he was of inanimate Nature, was accustomed to say of himself, with much gratitude, that he was born of a happy disposition; that he was happy by heredity. So, in all his great trials—in his failures as a speaker because of his defective stammering habit; in his difficulties as a theologian; in his persecution as a presumed politician, flying for his life, having his house burned to the ground, and all the treasures he valued most flung out of window to a senseless, drunken, groaning mob; in all these trials, and others to come—the cruel cutting of his colleagues of the Royal Society, and the final parting forever, in his old age, from his beloved England that he had served so well; in all these trials, I say, which so few could have borne, he sustained the full share of his hereditary gifts, his mental happiness and health—or, I should rather say, his health, and therefore his happiness.

But this blessed health, which so distinctly propagates itself, is never at any period of life so tried as in the first years. Then it is confirmed or destroyed, made or unmade.

In this period, in which so many die from various causes, Nature herself, at first sight, seems to set up continued irritations. It is only that she seems, for if she were allowed she would do all her spiriting gently, even to the cutting of teeth, and the modification of digestion to modification of food.

It is in this period that education is too often made for the first time to stand at variance with health. It is in this period that the enforced lesson too often harasses, wearies, and at last darkens the mind. It is in this period that the primary fault is committed of making play a set-off against work, and a promise of a good game an inducement for the persistence in hard labor.

What is constantly attempted to be taught in this period of life is the saddest detail. I have known a regular imposition of work per day equal to the full complement of natural work for many a man or woman. There are schools in which

children of eight, nine, and ten years of age, and, it may be, younger children still, are made to study from nine o'clock until noon, and again, after a hasty meal and an hour for play, from two to five in the afternoon, and later on are obliged to go to lessons once more preparatory for the following day.

The bad fact is, that the work is actually done, and as the brain is very active because it is diverted from its natural course, the child it belongs to is rendered so unusually precocious that it may become a veritable wonder. Worse than all, this precocity and wonderful cleverness too often encourage both parents and teachers to press the little ability to some further stretch of ability, so that the small wonder becomes an actual exhibition, a receptacle of knowledge that can turn up a date like the chronological table of the "Encyclopædia Britannica," give the whole history of Cleopatra, to say nothing of the Needle, carry you through a Greek verb without a stop, and probably recite a dozen selections from the best poets.

This is the outside of the marvelous picture. Let us look at the inside of it, as a skilled eye can easily look and read too. These precocious coached-up children are never well. Their mental excitement keeps up a flush, which, like the excitement caused by strong drink in older children, looks like health, but has no relation to it. If you look at the tongues of these children, you see them to be furred or covered with many red points like a strawberry, or to be too red and very dry. If you inquire into the state of the appetite, you find that the appetite is capricious; that all kinds of strange foods are asked for, and that the stomach never seems to be in order. If you watch the face for long, you note that the frequent flush gives way to an unearthly paleness. If you watch the eyes, you observe that they gleam with light at one time and are dull, depressed, and sad at another, while they never are laughing eyes. Their brightness is the brightness of thought on the strain, an evanescent and dangerous phenomenon. If you feel the muscles, they are thin and flabby, though in some instances they may be fairly covered with fat. If you inquire as to the sleep these children get, you hear that it is disturbed, restless, and sometimes broken. In a healthy child the sleep comes on irresistibly at an early hour, and, when the eyes are shut and the body composed, the sleep is carried out till waking-time without a movement of position of the body. You ask the healthy child about his sleep, and he says that he is simply conscious of having closed his eyes and opened them again.

But these unhealthy, over-taught children have no such elysium. They sleep, perchance to dream; to dream during half the night, and to be assailed with all the pressures and labors of dreams; passing through strange abodes and narrow crevices which it seems impossible to squeeze into; and waking in a start, with the body cold, in what is commonly called a nightmare, and sometimes in somnambulism, or sleep-walking. The bad sleep naturally leads to a certain over-wakeful languor the next day; but, strangely enough, it interferes with the natural advent of sleep the next night, so that sleeplessness at night becomes a habit. The child must be read to sleep, or told stories until it is off, and thus it falls into slumber fed with the food of dreams, worries, cares, and wonders.

In this period of early education, first state of what may be fairly called the intemperance of education, the recreations that are adopted for the little scholar are often as pernicious as any other part of the system in which he or she is trained. During the day-pastimes, a want of freshness and freedom prevails, almost of necessity, in large towns; and this want is often made worse than it need to be by inattention or deficiency of knowledge.

In a town like London there are three classes of children, all of whom present different aspects of health.

The children of the poorer people, the children that play in the open streets and round the squares, are constantly found to present the best specimens of health in the whole child community. If these children are well fed at home, and have moderately comfortable beds, and are not put to work for hours too long, they are singularly healthy in many instances, even though they be the denizens of courts, mews, and alleys. It is true that numbers of them inherit sad constitutional diseases; it is true that numbers of them exhibit deformities of the skeleton, owing to the circumstance that during their infancy they were not properly fed with food that will yield bone-forming structure; still, among them are the roughest and healthiest of the town communities. They owe their health to the free and out-door life.

There is next a class of children belonging to the well-to-do. These are taken out for walks in the public parks and gardens, or are driven out, and if they be permitted really to enjoy the outing, and are not harassed with long lessons at home or at school, they are bright and healthy, though it is rare for them to present all the natu-

ral ruddiness and strength of the spring-time of life.

There is a third class of children who, least fortunate, lie between the rich and the poor, and who belong to the middle trading-classes. The parents of these children are anxious, for the most correct of motives, that their young people shall not run wild in the streets to mix with children who are of a different class and under different influences. At the same time, they are unable to send their children out to the parks or suburbs, as their wealthier neighbors are. The consequence is, that these children are kept close at home or at school. They have to live in small rooms badly ventilated or irregularly ventilated, and, albeit they are well clothed and well fed and comfortably bedded, they grow up all but universally unhealthy.

These children are they who specially suffer from too close work at books and educational labor generally. They are usually very pale, muscularly feeble, and depressed in mind. They grow up irrelative, and yield a large—by far the largest—number of those who fill up the death-roll of that disease of fatal diseases, pulmonary consumption.

For fourteen years of my life I was physician to one of the hospitals in this metropolis, to which so many of those who are afflicted with consumption find their way. Twice, and occasionally three times a week, the duty of inquiry into the origin of this disease came to my share of professional work. The field of observation was extensive, and no fact was yielded in it so definitely as this fact, that the larger proportion of the consumptive population have been brought up under the conditions I have named above: in close school-rooms, during school-hours far too prolonged, and then in close rooms at home, where other work, in confined space, filled the remaining lifetime.

It is to be confessed that many practical difficulties lie in the way of parents of children of the classes I have just named. But there are no insurmountable difficulties to improvement. An intelligent public demand for an improvement would very soon lead to an extension of what are called garden-schools for the young, in which teaching by amusing lessons, or games of learning, in a pure air and in ample space, would secure all the advantages which are now so much desired. In our large and splendid board-schools, which are becoming distinct and beautiful social features of the age, something toward this system is approached, if not attained.

EDUCATION IN BOYHOOD.

In the education which is bestowed on the young in the next stage of life—I mean on those who are passing from the eleventh to the sixteenth or seventeenth year of life—the errors committed in respect to health are often as pronounced as in the earlier stage.

This period of life is in many respects extremely critical. The rapid growth of the organs of the body, the still imperfect and imperfect condition of the most vital organs: the quick changing, and yet steadily developing, form of mind, which, like the handwriting, is now being constructed: the imitative tendency of the mind: and, not to name other peculiarities, the intensity of feelings in the way of likes and hates—all these conditions, physical and mental, make this stage of a human career singularly liable to disorders of a functional or even of an organic kind. For one organ of the body, or for one propensity of the mind, to outgrow or out-develop another or others, is the easiest of all proceedings in this stage of life, unless care be taken to preserve a correct balance.

The lines of error carried out in this period run in three directions at least, all tending to impair the healthy and natural growth. The first of these errors is *overwork*, which often is useless overwork. The second is deficient skill or care in detecting the natural character of ability; in other words, the *turn of mind*, and it may be said *capability*, of the learner. The third is the system of forcing the mind into needless *competitions*, by which passions which are not intellectual but animal feed the intellectual soul with desire, and, by creating an over-development of the nervous-physical seats of passion, make or breed a soul of passions which may never be put out in after-life, until itself puts out the life abruptly by the weariness it inflicts.

I have sketched from a trustworthy record the work of learning imposed on a pale and nervous boy at a school the discipline of which is by some felt to be rather light than heavy. Any four of the subjects therein named were really sufficient to occupy all the natural powers for work of that young mind. Five of the subjects, Latin or Greek, English, arithmetic, history, and French or German language, with writing superadded as an exercise, would be the extreme of lesson-work a prudent care would suggest. For these exercises of the mind eight hours of work would be necessary, and if this period of labor were enforced, with two hours for meals and ablutions, and four

hours for play, it would require all the remaining ten hours, out of the twenty-four, for sleep, in order to supply that perfect renovation of body, that extra nutrition which growth of the developing organs of the body so rigorously demands. But it seems never to be conceived, in respect to the human animal, that growth is labor. To put a horse into harness at too early a time of its life, and to make it work hard as it is growing, is considered the most ignorant of processes; while to work a growing child harder probably now than at advanced periods of life is often considered the most correct and vigilant of processes.

This educational training has, according to my experience, only one result—a reduced standard of health and life. Boys and girls subjected to it are rendered pale, thin, irritable, feverish, restless at night, and feeble. A thoroughly good diet, and brisk play, and kind and sympathetic encouragement, may diminish the evil, and I am bound to say often do diminish it; but these aids, at their best, do no more than diminish. The root of the danger remains, and for delicate children the aids are a poor shield against the diseases of lungs, of heart, of nervous system, that are ever threatening and giving cause for alarm. How easily such overworked children take cold during vicissitudes of season, how severely they suffer when they are attacked with the epidemic diseases—the common experience of every practising physician proves. For these diseases are themselves of nervous origin, and find the readiest place in exhausted nervous natures.

So the brilliant boy or girl of the school, whose intelligence has preilluminated the world, too frequently dies, and the dull boy or girl, the hulk of the school, escapes back to health from variations of it. And alas! say the admiring mourners of the dead, alas! it is true, "whom the gods love die young." Alas! it is false, I say. Whom the gods love die old; go through their appointed course, fulfill their appointed duties, and sink into their rest, knowing no more of death than of birth, and leaving no death-stricken mourners at their tombs.

The breach between health and education in the period of studentship now under consideration is further evidenced by the method that exists—and as a necessity exists in a bad system—of making no practical distinction between one learner and another in relation to physical capacity and power. It is one of the faults in the system of punishments for those unfortunates who have broken the laws of the land, that the same labor is inflicted constantly on persons of entirely

different physical power, so that either half a punishment, or a double punishment, may be imposed for the same offense. This is most unfair even to criminals. It is not a bit more unfair than the system in school-classes of teaching every one the same. To take the boy who has an inherited tendency to consumption, or to heart-disease, or to insanity, and to place him under the same mental *régime* as another boy who has none of these proclivities, but is of healthiest parentage, is almost a crime in ignorance. And when it is the fact that the healthiest boy in a school is, in all probability, himself overworked, it is not difficult to detect that, in respect to work imposed on pupils passing from the eleventh to the seventeenth or eighteenth year, it is impossible for health and education to progress side by side and develop lustily together.

I said there was a second course of error in education at the period of life now under consideration. That consists in failing to allow for difference of mental capacity and turn of mind in different learners. There are many minds of neutral tendency; minds that can take in a certain limited amount of knowledge on almost any and every subject, but which can never master much in anything. These minds, if they be not unduly pressed and rubbed out, or flattened down, become in time respectable in learning, and sometimes imbued with the plainest common-sense. These minds bear at school much work with comparatively small injury, for they are admittedly dull, and great things are not expected of them, and great things are not attempted by them. These minds do the necessary work of mediocrity, in this world, an important work enough—the work of the crust of the intellectual sphere.

There are two other very different orders of minds. There is the mind analytical, that looks into details in business, into elements in science, into figures and facts in civil and natural history. In the school such a mind is good at arithmetic; good at mathematics; good at facts and dates; good at niceties of language. In these directions its lessons are pleasures, or, at the worst, are scarcely labors. There is, again, the mind constructive or synthetic; the mind that builds; that uses facts and figures, only, in the end, for its own purposes of work; which easily learns principles of construction; which grasps poetry and the hidden meaning of the poet; which is wonderful often for memory, but remembers the whole, rarely the parts of a theme; and which cannot by any pressure inflicted on it, or self-inflicted, take fast hold of minute distinctions.

The true intellect of the world, from the first dawn of it until now, has been made up of these two distinct forms. They seem antagonistic; they are so; but out of their antagonism has come the light of knowledge and wisdom. They are the representative poles of knowledge and of wisdom. The first is knowing, the second wise—two distinct qualities, though commonly confounded as one.

In the small school of the youth, as in the great school of the world, these representative orders of mind are ever present. The mistake is, that they are so commonly confounded, and that no change is made in the mode of study to fit the taste of the one or the other.

The consequence is, that lessons are given to the analytical student which he cannot possibly grasp, and to the synthetical student which he cannot possibly master. Under these conditions both chafe, and worry, and weary, and still do not get on. Then they fall into bad health, grow fretful and feverish, are punished or slighted, and otherwise made sad, and, it may be, revengeful. And so, if they be unduly forced, they grow up unhealthy in body and in mind. They grow up feeling as beings who have in some manner missed their way in life. The occupation into which they have drifted, and in which they have become fixed, is not congenial to them; at last they fall into listlessness, and, seeking in amusements and pleasures for the treasure they have lost, are trodden into the crust of the intellectual sphere—the great mediocrity.

I said there was a third course of error in educational training in this period of life, and I noted that as the prize system, the forcing of young minds to extremes of competition in learning. This system is bad fundamentally. I have been assured by excellent teachers that it is bad as a system of teaching, and that nothing but the demand for it on the part of ambitious parents and friends could make them permit it as a part of their work. They say it obliges them, as prize-days draw near, to devote excessive time to the most earnest of the competitors. They say that the attention of the whole school is directed toward the competitors, who have their special admirers, and so the masses, who, from fear or from want of ability, do not compete, are doubly neglected, are neglected by their teachers to some extent, and are forgetful of their own prospects in the interest they take as to the success of their idols. In this way, those that are weakest are least, and those that are strongest are most, assisted—another illustration of the proverb, "To him that

hath shall be given; but from him that hath not shall be taken away even that which he hath."

I cannot undertake to confirm this judgment myself, though it sounds like common-sense, but I can affirm that in matter of health, in interference with that blessing, the prize system stands at the bar guilty of the guilty. You have but to go to a prize distribution to see, in the worn, and pale, and languid faces of the successful, the effects of this system. And, when you have seen them, you have not seen a tithe of the evil. You have not seen the anxious young-old boys or girls at the time of the competition; you have not seen them immediately after it; you have not seen them between the period of competition and the announcement of the awards. You have not seen the injury inflicted by the news of success to some, and of failure to others who have contested and lost. If you could, as through a transparent body, have seen all the changes incident to these events; if you could only have seen one set of phenomena alone, the violent over-action and the succeeding depressed action of the beating heart, you would have seen enough to tell you how mad a system you have been following to its results, and how much the dull and neglected scholars are to be envied by the side of the bright and, for the moment, the applauded, and flattered, and triumphant.

These bad physical results the physician alone sees as a rule, and he not readily, since the evil does not of necessity appear at the moment, nor does he, nor do others, see the remaining evils from the physical side. It requires a look into the mental condition produced by the competition, to the effect of that condition on the passions, and to the influence of the passions on the nutrition and maintenance of the body, to know or surmise the secondary mischiefs to health which these fierce mental struggles in girlhood and boyhood inflict on the woman and the man.

While this lecture has been in preparation, I have received from Dr. Holbrook, the editor of the *Herald of Health* of New York, one of his miniature tracts on health, in which he records the experiences of men who have lived long, laborious, and successful lives, and the reasons they assign for having enjoyed such prolonged health and mental activity. The tract before me contains letters from two men of great eminence, namely, William Cullen Bryant and William Howitt. A part of William Howitt's letter so admirably expresses the lesson I am now endeavoring to teach, that I quote it in full. It refers to his early life, and its perfect freedom of learning:

"My boyhood and youth were, for the most part, spent in the country; and all country objects, sports, and labors, horse-racing and hunting excepted, have had a never-failing charm for me. As a boy, I ranged the country far and wide in curious quest and study of all the wild creatures of the woods and fields, in great delight in birds and their nests, climbing the loftiest trees, rocks, and buildings, in pursuit of them. In fact, the life described in the 'Boys' Country Book' was my own life. No hours were too early for me, and in the bright sunny fields in the early mornings, amid dews and odors of flowers, I breathed that pure air which gave a life-long tone to my lungs that I still reap the benefit of. All these daily habits of climbing, running, and working, developed my frame to perfection, and gave a vigor to nerve and muscle that have stood well the wear and tear of existence. My brain was not dwarfed by excessive study in early boyhood, as is too much the case with children of to-day. Nature says, as plainly as she can speak, that the infancy of all creatures is sacred to play, to physical action, and the joyousness of mind that give life to every organ of the system. Lambs, kittens, kids, foals, even young pigs and donkeys, all teach the great lesson of Nature, that to have a body healthy and strong, the prompt and efficient vehicle of the mind, we must not infringe on her ordinations by our study and cramping sedentariness in life's tender years. We must not throw away or misappropriate her forces destined to the corporeal architecture of man, by tasks that belong properly to an after-time. There is no mistake so fatal to the proper development of man and woman as to pile on the immature brain, and on the yet unfinished fabric of the human body, a weight of premature, and therefore unnatural, study. In most of those cases where Nature has intended to produce a first-class intellect, she has guarded her embryo genius by a stubborn slowness of development. Moderate study and plenty of play and exercise in early youth are the true requisites for a noble growth of intellectual powers in man, and for its continuance to old age."

EDUCATION IN ADOLESCENCE.

In the education that is bestowed on the young in the period of their adolescence, namely, from the seventeenth or eighteenth to the twenty-second or twenty-third year, there is, I regret to say, no redeeming quality in regard to health as an attendant consideration.

Young men and young women, who are now presenting themselves for the higher-class examinations at our universities and public boards, are literally crushed by the insanity of the effort. It has happened to me within the past year to have

under observation four of these victims to the inquisition of learning.

In one of these examples, where success, so called, crowned the effort, in addition to many minor injuries inflicted on the body, an absence of memory has succeeded the cram, so that names of common places are for the time quite forgotten; while the subjects that were got up so accurately have become a mere confused dream, in which all that relates to useful learning is inextricably buried.

In another of these competitors, the period of competition was attended with an entire absence of sleep, and thereby with that exhaustion which leads almost to delirious wandering of mind. Here failure led to an extreme depression, to a forgetfulness of the reason of failure, and to a listlessness on all subjects it will take months to cure.

In the third example to which I refer, sleeplessness, labor, and excitement, brought on an hereditary tendency to intermitting action of the heart, to unsteadiness of power, and thereby to uncertainty of effort, which almost of necessity led to failure of attempt. Even cram in an instance of this nature, backed by all the assiduity that will, and patience, and industry, could support, was obliged to fail, because the physical force was not at hand to keep the working body in accord with the mental power. Ignorant of what they were after, the examiners who were putting on the screw were not examining the mental qualities of this youth at all, but were really trying how long his heart would hold out under their manipulation.

In the fourth instance, it was my duty to decide whether a youth, brought up just to the condition for going into the inquisition, should, worn and wearied with the labor, bloodless and sleepless, run the risk—being quite ready for it—or should, at the last moment, take six months' entire rest, and then be got up to the same pitch of lifelessness and misery again.

Is there any occasion to wonder at these phenomena? One of the members of my profession has a son who originally was a lad of good parts, and who, after undergoing the inquisition, had to wander about for months in travel, helpless in mental and physical state—"more like an idiot," said his father to me, than anything else. Is there any occasion to wonder at these phenomena, I repeat? None. In some of these inquisitions each examiner can pluck from his own paper, and there are several examiners. Ask one of those examiners to answer

the paper of another examiner, and see what he would do. The unhappy student has to answer them all.

The system is doing sufficient evil to men; but what is to happen to the world if women, anxious to emulate, are to have their way, and, like moths, follow their sterner mates into the midnight candle of learning? Up to this time the stability of the race in physical and mental qualities has greatly rested on the women. Let the fathers do what they might—in this age dissipate and duel and fight; in that age smoke, drink, and luxuriate; in another age run after the vain shadows of competitive exercises, mental or physical; still the women remained unvitiated, so that one-half the authorship of the race was kept intact as reasonable and responsible beings. In other words, there were mothers as well as fathers. But if in these days women, catching the infection of the present system, succeed in their clamor for admission into the inquisition, and mothers thereupon go out, as they certainly will, just in proportion as they go in, the case will be bad indeed for the succeeding generations.

Some wise man has given us, if we would read his lesson correctly, the moral of this kind of effort in the wonderful story of Babel.

It is quite true. You cannot build a temple that reaches to heaven, though all the world try. It is not, that is to say, by forcing the minds of men to learn, that man can penetrate the secrets of Nature and know them. If one learned man could seize and hold and apply the knowledge of two learned men, there might be a progression of knowledge in geometrical ratio, and soon, in truth—

"Men would be angels, angels would be gods."

To this Nature says *No*; and, when the attempt is made, she corrects it by the interruption she sets up, through the corporeal mechanism, to the mental strife and contagion.

To let this struggle against Nature progress up to confusion of tongues, in which one learned man shall not understand another, is a far easier thing than many suppose: for Nature is unswerving in her course, and the struggle now is far advanced toward its natural consummation.

For a time yet it may be necessary to subject men who are to take part in responsible professional labors, in the practice of which life or property is concerned, to certain efficient tests as proofs of knowledge and skill. Such examination tests may easily be conducted without be-

ing made in any sense competitive, and without in any sense doing an injury to health and life.

At best, such tests are arbitrary, and define no more than the capacity of a man at the period of his entry into manhood. At that period there is presented but one phase of mental life among many varying phases; and to let the brand of superiority stamped at that age, however distinguished the superiority then may be, stand forth as the all-sufficient distinguishing mark for a lifetime, would indeed be, and indeed is, unjust foolishness.

It is a very bad system that suggests such a mode of obtaining a claim to permanent superiority, and the effects of the present system are shown as most mischievous in this very particular.

The man who succeeds in gaining these great competitive honors is usually content to rest on them, and rarely wins other distinctions in after-life. It is doubtful whether the training is not fatal to the after-distinction, and whether the great geniuses of the world would ever have appeared at all, if, in their early days, they had been oppressed by the labor, strain, and anxiety, of the competition on the one hand, or had been bound by the hard-and-fast lines of dogmatic learning on the other. I believe myself that great after-distinction is impossible with early competitive superiority gained by the struggles I have indicated, and that the evils now so widespread among our better-class communities will find their full correction in the circumstance that the geniuses of the nation and the leaders of the nation will henceforth be derived, unless there be a reformation of system, from those simple pupils of the board-schools who, entering into the conflicts of life able to read, write, and calculate, are left free of brain for the acquirement of learning of any and every kind in the full powers of developed manhood.

Be this as it may, I am sure that the present plan, which strands men and women on the world of active life, old in knowledge before their time, and ready to rest from acquirement on mere devotion of an automatic kind to some one particular pursuit, is directly injurious to health both of body and mind.

Continued action of the mind and varied action of the mind are essentials to length of life and health of life, and those brain-workers who have shown the greatest skill in varied pursuits, even when their works have been laborious, have lived longest and happiest and best.

The truth is that, when men do not die of

some direct accident of disease, they die, in nine cases out of ten, from nervous failure. And this is the peculiarity of nervous failure—that it may be fatal from one point of the nervous organism, the rest being sound. A man may therefore wear himself out by one mental exercise too exclusively followed, while he may live through many exercises extended over far greater intervals of time and involving more real labor if they be distributed over many seats of mental faculty.

Just as a sheet of ice will bear many weights if they be equally distributed upon it, but will give way and break up at one point from a lesser weight, so the brain will bear an equally distributed strain of work for many years, while pressure not more severe on one point will destroy it in a limited period, and with it the body it animates.

CONCLUSION.

Let health and education go hand-in-hand, and the progress of the world, physically and mentally, is sound and sure.

Let the brain, in the first stage of life, make its own inventory: distress it not with learning, or sadness, or romance of passion. Let it take Nature as a second mother for its teacher.

In the second age, instill gently and learn the order of mind that is being rendered a receiving agency: allay rather than encourage ambition: do not push on the strong, but help the feeble.

In adolescence, let the studies, taking their natural bent, be more decisive and defined as toward some particular end or object, but never distressing, anxious, or distractingly ambitious. Let this be an age for probation into the garden of knowledge, and of modest claim to admission there; not for a charge by assault and for an entry with clarion and standard and claim of so much conquered possession.

And for the rest, let the course be a continued learning, so that with the one and chief pursuit of life other pursuits may mingle happily, and life be not—

“ . . . a dissonant thing
Amid the universal harmony.”

My task is done. I find no fault with any particular class, neither of teachers nor pastors nor masters. I speak only against a prevailing error, for which no one is specially at fault, but for which all are somewhat at fault, however good the object had in view may be.

What we now witness in the way of mental competition is but the old system of physical competitive prowess in a new form; and when the evils of it are seen, and when the worse than uselessness of it is detected, it will pass away as all such errors do when the universal mind which sustains them sees and appreciates the wrong that is being done. I believe sincerely that the errors I have ventured to describe, and which at this present separate health from education, will in due time be recognized and removed.

In a leading article last year in one of our powerful and widely-read newspapers on a lecture of mine delivered in this place, there was an expression of regret that I, as a man of science, should deal so earnestly with subjects so trivial as these. Suppose the subjects to be trivial, and then in answer I might fairly say there are mites in science as well as in charity, and the ultimate results of each are often alike important and beneficial. But I deny the triviality. I ask, if these subjects, which refer to the very life-blood of the nation, be trivial, what are the solemn subjects, and who are dealing with them?

I read in another and scientific paper, that to state facts of a similar order to those I have now related, to a public as distinct from a strictly professional audience, is a sure means by which to hurt tender susceptibilities, and of a certainty to give to some a cause of offense. To that criticism I reply, as I conclude, in the words of the good St. Jerome: “If an offense come out of truth, better is it the offense come than the truth be concealed.”—*Gentleman's Magazine*.

STANLEY'S DISCOVERIES AND THE FUTURE OF AFRICA.

THE exploration of Africa has been conducted of late on a new system. The routes of the earlier travelers passed either through parts of the continent where the population is sparse, as in Caffre land or in the Sahara, or in those

where it is organized into large kingdoms, such as lie between Ashanti and Wadai, and which are much too powerful to admit of any traveler forcing his way against the will of their rulers. The older explorers were therefore content to travel

with small retinues, conciliating the natives of the larger kingdoms by patient persistence and feeling their way. But of recent years all this has been changed. The progress of discovery has transferred the outposts of knowledge and the starting-points of exploration to places where the population is far more abundant than that which is met with in either the northern or the southern portions of Africa, yet where it is, for the most part, divided into tribes. Hence modern explorers have found the necessity of traveling with large and strongly-armed retinues. This new method has been frequently adopted in the upper basin of the White Nile, which has also been the scene of many military expeditions sent by the Egyptian Government to force a way into the Soudan, including that commanded by Sir Samuel Baker. So, in the south, Livingstone's comparatively small band of determined Caffres, placed at his disposal by a chief whose confidence he had gained, enabled him to cross the continent in the latitude of the Zambesi. Subsequently other travelers, like Burton, Speke, Grant, and Cameron, starting from Zanzibar, have adopted a similar plan. Their forces were large enough to enable them to pass as they pleased through regions where the tribes were small, they were sufficiently powerful to make larger tribes fear to attack them, and, as they invariably adopted a conciliatory policy with the latter, they never came into serious collision with the natives. Mr. Stanley has adopted the plan of traveling with an armed retinue on a much larger scale than any of those whom we have named, and he has certainly carried, by these means, a great expedition successfully through Africa. Thus he states, "I led 2,280 men across hostile Unyoro," on an expedition intended to cross the Albert Nyanza. Again, when he leaves Nyangwe on his final expedition down the Lualaba, he starts with a body of 500 fighting-men. Thus, with a larger military force than hitherto employed, and making a determined use of it, Mr. Stanley has conducted a geographical raid across the middle of Africa, which has led him into scenes of bloodshed and slaughter, beginning at the Victoria Nyanza, and not ending until he arrived in the neighborhood of the western coast. This achievement undoubtedly places Mr. Stanley in the foremost rank of African discoverers, and insures to him a hard-earned and lasting fame.

The question will no doubt be hotly discussed how far a private individual, traveling as a newspaper correspondent, has a right to assume such a warlike attitude, and to force his way through

native tribes regardless of their rights, whatever those may be. A man who does so acts in defiance of the laws that are supposed to bind private individuals. He assumes sovereign privileges, and punishes with death the natives who oppose his way. He voluntarily puts himself into a position from which there is no escape, except by battle and bloodshed; and it is a question which we shall not argue here, whether such conduct does not come under the head of filibustering. Nations are above laws, and may do and decide what expeditions they may care to launch, but the assumption of such a right by private individuals is certainly open to abuse, and seems hard to defend. It is impossible to speak of Mr. Stanley's journey without noticing this exceptional characteristic of it. At the same time it is not our present object to discuss the morality of his proceedings, but to occupy ourselves with his discoveries, which are unquestionably of the highest geographical importance, and may lead to consequences in comparison with which the death of a few hundred barbarians, ever ready to fight and kill, and many of whom are professed cannibals, will perhaps be regarded as a small matter.

The results of Mr. Stanley's journey at the moment of writing these remarks are very imperfectly before us; but we already know enough to see that he finds the course of the Congo to form a great arc, as was rudely laid down in the well-known map of Duarte Lopez, published by Pigafetta at Rome in 1591, and that his route brings him into *quasi* connection with the two farthest points reached in that part of the continent by explorers from the north, namely, that reached by Schweinfurth, who received the gold medal of the Royal Geographical Society in 1874 "for his discovery of the Uelle River, beyond the southwestern limits of the Nile Basin," and that other point reached by the literary informant of Dr. Barth, who, traveling southward from Darfur, came to the great river of Kubanda, flowing to the west.

The Uelle was reached by Schweinfurth¹ in April, the time when its waters were at their lowest level, yet it was then 800 feet across, with a depth of from 12 to 15 feet; its volume of outflow was estimated by him at 10,000 cubic feet per second. All the Monbuttoo and the Niam-niam people agreed in telling him that the Uelle held on its course, as far as they could follow it, for days and days together, till it widened so vastly that the trees on its banks ceased to be

¹ Schweinfurth, "The West of Africa," vol. i., p. 553, English translation.

visible. Schweinfurth speaks with admiration of the peculiar shape and size of the canoes that he saw on the Uelle, which curiously correspond with those seen by Stanley on the Aruwimi. Schweinfurth says:

"They were hewed out of a single trunk of a tree, and, alike in shape and solidity, were superior to what we had hitherto seen. Some of them were not less than thirty feet long and four feet broad, and sufficiently spacious to convey both horses and bullocks. So ample are their dimensions that there is no risk of their being upset, nor did they lurch in the least degree as we got into them. They were made with both ends running horizontally out into a beak, and the border-lines were ornamented with carved figures.

"I had seen the teak canoes of the Red Sea, which are called 'hoory' in Arabic, and are of a build imported from India, and many of the canoes which are in use at Saakim and Djidda; but none of these were comparable, either with respect to size or elegance, with the canoes of the Monbuttoo."

Mr. Stanley speaks of similar canoes at the mouth of the Aruwimi, which he places some 250 miles to the southwest of Schweinfurth's position, the river itself being obviously either the Uelle or a larger stream to which the latter is an affluent, or at least a river draining the same country and having similar characteristics to those which Schweinfurth has so ably described. Mr. Stanley's words are as follows:

"Down the natives came, fast and furious, but in magnificent style. Everything about them was superb. Their canoes were enormous things, one especially, a monster of eighty paddlers, forty on a side, with paddles eight feet long, spear-headed, and really pointed with iron blades—for close quarters, I presume. The top of each paddle-shaft was adorned with an ivory ball. The chiefs pranced up and down a planking that ran from stem to stern. On a platform near the bow were ten choice young fellows, swaying their long spears at the ready. In the stern of this great war-canoe stood eight steersmen, guiding her toward us. There were about twenty—three-fourths of her size—also fine-looking; but none made quite such an imposing show. At a rough guess there must have been from 1,500 to 2,000 savages within these fifty-four canoes."

Another point of resemblance between the characteristics of Schweinfurth's country and those at the mouth of the Aruwimi are the dwarf inhabitants. We find the words "Region of dwarfs" near that place in Mr. Stanley's map that is published by the *Daily Telegraph*, and we are all familiar with Schweinfurth's description of the

diminutive race that fell under his own notice. When fuller reports reach us, we shall no doubt hear much of extreme interest on this subject, which throws important light on the nature of the aboriginal inhabitants of Africa, or at least of those who preceded the negro.

The point of contact between Stanley and Barth's informant is at the northernmost part of the great arc of the Congo, where muskets were seen and robes were worn by the chiefs of crimson blanket-cloth, bearing witness to the existence of a native trade with the north. Barth himself was never within 600 miles of this spot, but he was a great collector of itineraries, and there was one in particular upon which he laid the greatest stress. He did so with such good reason, that the river of Kubanda, of which we are about to speak, has ever since been regarded by geographers as a fact to be accounted for in whatever theory might on other grounds be advanced as to the hydrography of Central Africa. This river, as laid down by Barth in his map, coincides very fairly with the part of the Congo above mentioned. Such distrust attaches itself to all native information, that it is well to explain at some length the qualifications of Barth's informant; and in doing so a double purpose will be served, for we shall have further on to lay much stress on the merits of the Arab civilization in Africa, of which the man in question is an exceptionally high example. He was¹ the Fâki Sâmbo, a person of the Fellatah race, and of wide-spread reputation, with whom Barth spent many hours of conversation at Mâsseña, about 100 miles to the southeast of Lake Tchad. He says:

"I could hardly have expected to find in this out-of-the-way place a man not only versed in all the branches of Arabic literature, but who had even read (nay, possessed a manuscript of) those portions of Aristotle and Plato which had been translated into, or rather Mohammedanized in, Arabic, and who possessed the most intimate knowledge of the countries he had visited. . . . When he was a young man, his father, who himself possessed a good deal of learning, and who had written a work on *Ilâusa*, sent him to Egypt, where he had studied many years in the mosque of El Azhar. It had been his intention to go to the town of Zebid in Yemen, which is famous among the Arabs on account of the science of logarithms, or *el hésab*; but, when he had reached Gunfûda, the war which was raging between the Turks and the Wahabiye had thwarted his projects, and he had returned to Darfur, where he had settled down some time, and

¹ Barth's "Travels in Central Africa," vol. iii., p. 373.

had accompanied a memorable expedition to the southwest, as far as the borders of a large river, of which I shall have another occasion to speak."

A short account of the expedition that he accompanied is given in the "Journal of the Royal Geographical Society."¹ They passed through Bimberri, a pagan country, to Kubanda, a large place extending ten or twelve miles along the banks of a river, so large that they could with difficulty make out people standing on the southern bank, and which was not fordable. This river ran straight from east to west. In a second expedition a little to the west of this, they reached a pagan country, Andoma, inhabited by a very warlike race, who had oxen and sheep. Their country was covered with a great profusion of trees, of which the native names are given. The king sat on a throne constructed of elephants' tusks laid one above the other. This latter statement corresponds with Stanley's account of the ivory structure of solid tusks surrounding an idol; and as to the former Schweinfurth remarks that among the trees mentioned by the Fákí Sámbo is the "Kumba"—the Kumba being the name in the Niam-niam language for the abundant Malaghetto pepper (*Xylopia Æthiopica*), which has communicated its name to the "Pepper Coast" of Western Africa. This gives some ground for supposing that the river of Kubanda debouches on the coast of Western Africa.

Mr. Stanley's discoveries come, therefore, most opportunely in the present state of geographical science. They supply central threads in the network of routes by which, through his efforts, Africa is now finally covered. As it is, perhaps, the greatest of the first-class exploratory achievements in Africa, so it is the last of those which the world now admits other than in the barren regions of either pole. It has dissected and laid bare the very heart of the great continent of Africa.

It is not proposed in the following remarks to trace the steps or to epitomize the discoveries of Mr. Stanley. The materials are not before us, as we pen these lines, for doing so with any approach to completeness or justice. But the occasion is a good one to make some general remarks on the proximate future of Africa, based on the experiences of many previous travelers, and confirmed by the geographical facts in their broad outlines as now made known to us.

What is the extent and value of the territory that has been discovered in Equatorial Africa by

Mr. Stanley and his immediate predecessors, and what action should be taken by ourselves or others to turn these discoveries to the best advantage to themselves and to the world at large? In short, what do we find in Central Africa, and what should we do with it?

The first consideration is that of mere size of territory, comparing the area of the regions in question with those situated between the same latitudes in other parts of the world. They are essentially equatorial regions, as distinguished from tropical ones; that is to say, they lie within some twelve and a half degrees north and south of the equator, where the climate tends to be more hot and damp than under the tropics, and where the vegetation is peculiarly luxuriant and rank in regions little elevated above the sea-level. There cannot be a greater contrast between adjacent districts than that which, on the whole, subsists between the equatorial and tropical regions. We find in the latter the burning deserts and the arid plains of the Sahara and Arabia, of those near the Indus, of Utah and Colorado, in the Northern Hemisphere, and those of Kalahari, Central Australia, and Atacama, in the Southern. We must, therefore, carefully distinguish between equatorial and tropical lands, in making comparison between the area with which we are now concerned in Africa and that of similar districts in other parts of the globe. If we turn to a map of the world, and reckon the amount of equatorial land in Africa as five, we shall find the amount of equatorial land in South and Central America to be as four, and the aggregate of the remainder, elsewhere on the globe, to be as one. The latter is scattered in numerous fragments over all parts of the huge equatorial zone that encircles the world—the most important of these being the southernmost horn of India, Ceylon, the Malay Peninsula, Sumatra, Borneo, Celebes, New Guinea, the northern shoulder of Australia, and a multitude of islands in the Pacific, including our new colony of Fiji. But the combined area of all this is only about a fourth part of the area of the corresponding regions of South America, and, adding all together, we obtain a grand total of equatorial land that is just equivalent in size to that in Africa. The discoveries of Livingstone, Burton and Speke, Cameron, and other recent travelers, in addition to those of Stanley, have made us acquainted with a region that is as large as the whole of the equatorial lands that exist elsewhere in the world.

So much for mere size; next as regards elevation above the sea-level. The equatorial low-

¹ "Journal of Royal Geographical Society," 1853, p. 120.

lands are, on the whole, little suited to support a large population. They are mostly choked with rank vegetation; they are damp, and reeking with miasma. But a large part of Central Africa is much more favorably situated. It consists of elevated basins, one containing the upper waters of the Congo, another those of the Nile, another that of Lake Tchad, a fourth that of the Benué and Niger, and all are flanked by broad ridges near and parallel to either coast. The floors of these basins are more, sometimes much more, than one thousand feet above the sea-level, and, in consequence of this exceptional altitude, they are subjected to a climate far drier and lighter than that which characterizes the larger part of the equatorial land that exists elsewhere in the world. A considerable part of Central Africa maintains a teeming population, contrasting strongly with the sparse inhabitants of South America; and the capabilities of the country generally appear to be such as would enable it, so far as they alone are concerned, to be as populous as any part of the world.

The very causes that conduce to the comparative salubrity and to the fertility of Central Africa militate against its easy commercial intercourse with other countries. Its rivers, in traversing the mountain-ridges that confine its elevated interior basins, descend to the lower lands near the sea-shore through a succession of falls or rapids, and are, therefore, impracticable as continuous water-ways leading from the interior to the ocean. The Congo is undoubtedly the most marked of all these instances, being at the same time the river that gives the principal outlet to the waters that fall in the equatorial lands. The rapids begin within a very few miles of the head of its magnificent estuary, and are totally insurmountable by ship, boat, or canoe. The river passes through gorges, of the lowermost of which Tuekey has given us a minute description. Ascending the river still higher, those falls and rapids are reached down which Stanley's party drifted in continual danger, and in one of which Francis Pocock was drowned. Such is the narrowness and depth of the rift through which the Congo passes, in the neighborhood of the Yellala Falls, that, when looked down upon from above, the mighty river seemed to Tuekey's party as if it had shrunk to the size of a Scottish burn. It was strangely contracted in width, and even in that reduced water-way its course was further constricted and choked by masses of rock. It was difficult to believe that the mighty volume of the river could find its passage through so nar-

row a channel, and the hypothesis was freely entertained by members of the party that the bulk of the river must have found a subterranean course. They supposed that the greater part of its waters disappeared at the point where the narrows began, and rose again to the surface after their termination. Here a succession of violent whirlpools and upheavals disturb the current of the river; they are so turbulent that no vessel can venture to approach them, and it was with the greatest difficulty that the boats of Captain Tuekey's party were extricated even from their eddies.¹ Stanley's route struck overland at the point where these narrows began, and, therefore, he had not the opportunity of seeing this part of the river; but he gives a graphic description of the gorges higher up-stream, through which he and his party struggled for nearly half a year:

"While we were fighting our tragical way over the long series of falls along a distance of more than 180 miles, which occupied us five months, we lived as though we were in a tunnel, subject at intervals to the thunderous crash of passing trains. Ah! so different it was from that soft, glassy flow of the river by the black forests of Uregga and Koruru, where a single tremulous wave was a rarity, when we glided day after day through the eerie wilds, in sweet, delicious musings, when our souls were thrilled at sight of the apparently impenetrable forests on either hand, when at misty morn, or humid eve, or fervid noon, wild Nature breathes over a soft stillness. . . . But there is no fear of any other explorer attempting to imitate our work here. Nor would we have ventured upon this terrible task had we the slightest idea that such fearful impediments were before us."²

None of the other rivers of Equatorial Africa give commercial access to the interior. Thus the Ogowai, though pursued far up-stream by recent explorers, is hardly practicable for small vessels even up to its falls, some 250 miles from the sea. The navigation of the Coanza is interrupted by falls 140 miles from its mouth.

On the eastern coast the rivers are small, excepting the Zambesi, whose channel is full of shifting sand-banks, and whose mouth is closed by a dangerous bar. Moreover, its upper course is broken by the cataracts of Kebra-bassa and Mosio-tunya. Its tributary, the Shiré, up which small vessels might otherwise pass from the sea to Lake Nyassa, is blocked by 30 miles of rapids. The other rivers on the same coast have their sources on the seaward side of the ridge that con-

¹ Tuekey's "Congo," p. 340, etc.

² *Daily Telegraph*, November 22, 1877.

lines the central basins, and therefore cannot give access to them. Moreover, they are but narrow streams, little fitted even for steamers of the smallest size. The Juba has a long course, but it does not come from the central equatorial regions.

Two rivers of equatorial origin remain that require a fuller description, namely, the Niger and the Nile. The course of the former is such as to give it but little commercial value, as has been proved only too clearly by the slender results of very considerable efforts to utilize it. It does not flow from the interior, but rises so near the west coast that its sources are only some 250 miles from Sierra Leone; it then makes a vast semicircular arc, cutting a huge slice out of the Sahara, and returns to the west coast in a not very different latitude from that in which it started. The sea-coast running almost east and west, and forming the lower side of the great western protuberance of Africa, which is known by the name of the Gold Coast, is the diameter of a circle of which the great arc of the Niger forms the northern semicircumference. On the uppermost convexity of the Niger is situated Timbuctoo, whose name is well known, though it has no commercial importance beyond that of being the emporium of the desert Sahara; consequently, the main stream of the Niger does not pass through productive lands, neither does it drain any considerable portion of the central equatorial districts. Moreover, above the confluence of its little-known affluent, the Benué, its water-way is impeded by rapids. The Nile, and that river alone, affords, in some sense, a direct means of access to the interior. By waiting for the season of its flood, and by tugging and hauling up seething waters and amid rocks, a small sea-going ship of strong build could, by a *tour de force*, be transferred from the Mediterranean to the waters of the Albert Nyanza. But this long navigation of upward of two thousand miles, interrupted by six rapids between Assouan and Khartum, and by another serious one above Gondokoro, and impeded by the difficulty of forcing a passage through the rafts of floating papyrus that choke the upper White Nile, cannot be a useful commercial water-way. It requires the assistance of railways, such as that now contemplated in the Soudan, by which its cataracts may be avoided. So far as physical difficulties are concerned, and without reference to political ones, the easiest line from the Albert Nyanza to the ocean would not be by the Nile, but overland to the coast opposite the island of Zanzibar.

The difficulties that beset the approach to the

interior of Equatorial Africa by means of its rivers, contrast most remarkably with the ease with which the almost equally large equatorial regions of South America are reached by the Amazon and the Orinoco. The natural internal navigation of that continent is magnificent, and such as is to be met with in no other part of the world. South America may be traversed almost to the Andes and in all other directions by a system of rivers, whose main streams are capable of bearing large sea-going vessels for hundreds of miles from their mouths.

The interior of the several equatorial lands that are dispersed in fragments elsewhere upon the globe, is necessarily more accessible, so far as physical difficulties of distance are alone concerned, on account of their small size. They lie on the ocean highways, and whatever produce they may yield that is worth exporting can be easily made into an article of commerce. But Africa is comparatively self-contained and secluded; a vast population may thrive in its interior upon the produce of its soil; the means they have of internal communication by lake and river are excellent, but they are to an unusual degree shut out from foreign trade. The easiest of all forms of communication with the outside world is denied them by the physical structure of their continent; they are geographically doomed to commercial isolation as regards the more bulky articles of traffic.

What does the interior of Africa produce that would make it worth the trader's while to fetch from so great a distance? A long list of equatorial products has often been suggested as the subjects of a future commerce; but the objection against most of them is, that the same products can be grown with equal ease in other countries much easier of access, or on the seaboard of Africa itself. There is far more equatorial land in the world than suffices for the commercial wants of non-equatorial countries. We have so great a glut of it that an enormously large proportion of the long-known parts remains unutilized. The new discovery of an additional amount of similar country in Africa is of no importance to us as regards the products of which we have just been speaking. It is, of course, impossible to say but that further exploration may discover articles of commerce that Africa alone can afford, and of which we have as yet no knowledge. We have seen that its elevated basins under an equatorial sun are a peculiar geographical feature; therefore we may indulge in such hopes, though we do not venture to build upon them.

The mineral wealth of Africa in iron, copper, and other metals, has been often spoken of, and is no doubt of great importance to its inhabitants. It cannot, however, be seriously proposed to export these heavy articles from the far interior to the coast. It so happens that ores of malachite do exist in large quantities in Benguela, at not more than 140 miles from the sea, and that their export has been attempted by English companies. But though the mines were rich the cost of production and carriage exceeded the value of the ore; they therefore failed to repay the adventurers. If it did not pay to work these mines, so favorably situated for the purpose in many respects, how can it be reasonably hoped that foreigners will be able to work mines situated in the far interior to an advantage?

There is certainly one peculiar product of Africa, namely ivory, which has had, and which will long have, a large influence in promoting its commerce and consequent civilization. It is gratifying to learn from Mr. Stanley that ivory abounds on the Upper Congo. Near the confluence of the Aruwimi, he saw a village where the quantity of ivory lying useless about astonished him.

"There was an ivory 'temple'—a structure of solid tusks surrounding an idol; ivory logs, which, by the marks of hatchets visible on them, must have been used to chop wood upon; ivory war-horns, some of them three feet long; ivory mallets, ivory wedges to split wood, ivory pestles to grind their cassava, and before the chief's house was a veranda, or burzah, the posts of which were long tusks of ivory. We picked up 133 pieces of ivory which, according to rough calculation, would realize, or ought to realize, about \$18,000."

Unfortunately, so soon as an ivory traffic is established, and as a consequence of it, guns are freely purchased, and the export of the ivory thenceforward proceeds far more rapidly than the ivory can be reproduced. Such stores of it as may exist are soon made away with, while the elephants are shot down in such large numbers that they become rapidly exterminated. When the ivory-trade shall have died away through exhaustion of these animals, one of the agents that are best suited to promote the civilization of Africa will have disappeared. Leaving aside philanthropic considerations for the moment, and looking at Africa from the point of view of our own ancestors, and of the modern Arab, and of a very large portion of the remainder of the human race, there was a singular congruity between the old-fashioned ivory and slave traffic and the physical

as well as the social conditions of the continent. Enslavement of a weaker neighbor has ever been the recognized custom of the country; and it was a charmingly *naïve* device of turning their superfluous slaves and their collections of ivory to commercial account, to put a tusk on the back of each slave and march him with his burden to the coast, selling both the porter and the ivory on their arrival there. But we may, fortunately for Africa, with much commercial advantage, substitute the labor of cattle for that of human porters. The tsetse-fly is not so widely spread as had been feared. The Cape wagon with its yokes of oxen has already been driven inland from the coast opposite Zanzibar, and one wagon will carry the loads of sixty men. Looked at merely as beasts of burden, negro porters, even if bought for nothing, and sold at some few pounds a head on reaching the coast, are not so cheap and effective on an established route as a wagon and its team of oxen.

There is one mineral product which may possibly be destined to transfigure Africa, and that is gold. We know that it is found in many parts of the boundary ridge of the central basin. There is the gold of Abyssinia and Sennaar, and on the opposite side of the continent, gold is collected from all parts of the high land parallel to the coast between the mouths of the Senegal and the Niger. It has given its name to the Gold Coast, and our name of the guinea is derived from the gulf of Guinea. Moreover, a steady export of gold has existed from apparently the most ancient historical times, by routes leading from the landward side of the districts in which it is found across the Sahara to the Mediterranean. But above all in present productiveness are the recently-discovered gold-fields in Southeastern Africa. Its export from Sofala and the Zambesi district is of ancient date, but within the last few years a vast extent of country to the southward of this has been found to be auriferous. Should further discoveries of gold be made, they may supply the inducement that at present is needed for men of other races than the negro, such as the Chinese coolie, to emigrate, and, by occupying parts of the continent, to introduce a civilization superior to that which at present exists.

Africa affords a motive for settlements of a few white men in a line down the middle of its interior for the establishment of an overland telegraph between Alexandria and the Cape, instead of, or in addition to, the costly and precarious alternative of an ocean-cable. At first sight,

nothing can seem more absurd than the serious proposal to carry so modern and refined an application of European civilization as the electric telegraph through the heart of so savage a region as that which intervenes between Gondokoro and the Transvaal. But the subject has been much discussed by African experts, and the more it is considered the more feasible does it appear. Much experience already exists in respect to the establishment of telegraph-wires through savage or lawless countries, and the result is entirely favorable to the possibility of their maintenance in Africa. Savages do not appear to take alarm at the first sight of the pole and wires, and they become both accustomed to their presence, and to comprehend and appreciate their object as the line is progressively laid down. The savage soon learns that any injury to the line is at once found out, and its locality known, in a way that is mysterious to him, so that he acquires a superstitious respect for the wire. Again, as small subsidies are given to the chiefs through whose territories it passes, to insure its security, its presence is acceptable to them, and felt to be advantageous; moreover, it is often of local service between neighboring stations. We can have little doubt that the establishment of a line of telegraphic depots, with their European residents, from north to south in Africa, would have considerable effect in maintaining order among the tribes through which it passed.

Africa is destitute of capitalized wealth. No rich and luxurious civilization has existed in its equatorial regions, like that of Peru or of India, to tempt commercial adventurers. Excepting in the Arab kingdoms to the north, it is a land of hovels, or, at the best, of thatched houses, and of a hand-to-mouth existence. The negro has no instinct to build solidly and for perpetuity; he therefore wants the most important of the elements that conduce to civilization, for without a material nucleus of solid buildings no respectable civilization can exist.

All the circumstances we have adduced point to the general conclusion that the existing produce of Equatorial Africa is insufficient to form the basis of a really large commercial traffic. We must not allow ourselves to be over-sanguine, and fall into the often-repeated error of those who have interested themselves philanthropically in Africa, by yielding to an unjustifiable enthusiasm, and placing too much confidence in the speedy development of a great commerce with that continent.

How does the negro rank as a laborer? There

is great diversity witnessed in Africa, partly dependent on race and partly on the temporary national mood, which may at one time be inclined to peaceful pursuits and at another time to war, and which also may be inspired by a hopeful sense of success in life, or by that of despondency. It will, however, be of much use to us, in endeavoring to answer the question as fairly as possible, to consider the opinions formed of the negro when he is working side by side with men of other races. Very useful testimony upon this is given in the "Report on the Treatment of Immigrants in British Guiana," where Africans, East Indians, and Chinese, are all to be found as coolies, and where their respective national characteristics have been the subject of direct inquiry. They work in gangs; the negro gang has almost always a negro for a driver, though sometimes the driver is a Portuguese; the East Indian coolie has commonly a negro driver, and the Chinaman has always a Chinese. The African can do the best day's work at field-labor of all, and he despises the East Indian for his want of strength. The East Indian cannot earn half as much as the African in the same number of hours, but he despises him for his uncivilized ways. The Chinese is the most intelligent of the three, and is more independent than the East Indian, but he is always ready to leave field-work for any other occupation. If there were no compulsion, the negro would have idled more than the other two, his tale of work would probably have fallen below theirs, and he would have become a sturdy pauper. Such, for the most part, is the condition of the free negro in Africa.

The African is much inferior to the European, and especially to the East Indian, in his handicraft; the only manual work in which negroes show fair dexterity in their native land being that of blacksmiths. Their forge and tools are curiously rude, but as their iron is pure owing to the use of charcoal-fuel, and as they take much pleasure in working it, the results are very creditable. Their spear-heads are frequently shaped with elegance, and they are light and strong—indeed they are such as a second-rate country blacksmith in England would find difficulty in rivaling.

The negro, taken generally, is idle and clumsy, but we must not allow ourselves to speak of him in terms of universal dispraise. The fact is, that while his average pleasure in work and his average manual dexterity are low when measured by a European standard, it is by no means so low as to make it impossible for a few exceptional individuals and even communities to rise to an

equality with average Europeans. By picking and choosing the best individuals out of a multitude of negroes, we could obtain a very decent body of laborers and artisans; but if we took the same number of them just as they came, without any process of selection, their productive power, whether as regards the results of toilsome labor or of manual dexterity, would be very small.

The indolence of the African is partly constitutional and partly due to the paucity of his wants, which can be satisfied in his own country with so little effort that the stimulus to exertion is wanting. Leaving for the moment out of consideration the combative, marauding, cruel, and superstitious parts of his nature, and all that is connected with the satisfaction of his grosser bodily needs, his supreme happiness consists in idling and in gossip, in palavers and in petty markets. He has no high aspirations. Nothing that the produce of his labor can purchase for him, in addition to the supply of primary necessities, equals in his estimation those pleasures of idleness that he must perforce forego by the very act of laboring. His natural instincts are such, that the practice of hard daily labor is really bad political economy on his part. He loses more of that which is of value to him in consequence of his labor than he gains by what his labor produces. He has little care for those objects of luxury or for that æsthetic life which men of a more highly-endowed race labor hard to attain. His coarse pleasure, vigorous *physique*, and indolent moods, as compared with those of Europeans, bear some analogy to the corresponding qualities in the African buffalo, long since acclimatized in Italy, as compared with those of the cattle of Europe. Most of us have observed in the Campagna of Rome the ways of that ferocious, powerful, and yet indolent brute. We may have seen him plunged stationary for hours in mud and marsh, in gross contentment under a blazing sun; at other times we may have noticed some outbreak of stupid, stubborn ferocity; at others we may have seen him firmly yoked to the rudest of carts, doing powerful service under the persistent goad of his driver. The buffalo is of value for coarse, heavy, and occasional work, being of strong constitution, and thriving on the rankest herbage; else he would not still be preserved and bred in Italy. But he must be treated in a determined sort of way, by herdsmen who understand his disposition, or no work will be got out of him; and besides that, he is ferocious and sufficiently powerful to do a great deal of mischief.

The capacity of the negro to form kingdoms is

an important factor in our estimate of the future development of Africa, the numerous tribes by which a great part of the continent is at present occupied being a great hindrance to the maintenance of safe thoroughfares and to the inexpensive transit of produce. As a matter of fact, considerable kingdoms do exist in Equatorial Africa, though a notable proportion of them are ruled by sovereigns who are not of pure negro blood. It is well worth while to collate the accounts written by various travelers on the social and political life in the more typical of these kingdoms. Thus the following extracts relating to Kano and Uganda will show, the first the effect of Arab culture and a Hausa race, and the second will show the much lower civilization under the influence of Galla sovereigns, which nevertheless is less coarse than that of Dahomey or Cazembe.

The annexed extract is from Dr. Barth. It gives an interesting picture of the every-day life in Kano, the great commercial centre of northern Equatorial Africa:

"It was the most animated picture of a little world in itself, so different in external form from all that is seen in European towns, yet so similar in its internal principles. Here a row of shops filled with articles of native and foreign produce, with buyers and sellers in every variety of figure, complexion, and dress, yet, all intent upon their little gain, endeavoring to cheat each other; there a large shed, like a hurdle, full of half-naked, half-starved slaves torn from their native homes, from their wives or husbands, from their children or parents, arranged in rows like cattle, and staring desperately upon the buyers, anxiously watching into whose hands it should be their destiny to fall. In another part were to be seen all the necessities of life; the wealthy buying the most palatable things for their table, the poor stopping and looking eagerly upon a handful of grain; here a rich governor dressed in silk and gaudy clothes, mounted upon a spirited and richly-equiparsoned horse, and followed by a host of idle, insolent slaves; there a poor blind man groping his way through the multitude, and fearing at every step to be trodden down; here a yard neatly fenced with mats of reed, and provided with all the comforts which the country affords—a clean, snug-looking cottage, the clay walls nicely polished, a shutter of reeds placed against the low, well-rounded door, and forbidding intrusion on the privacy of life, a cool shed for the daily household work, a fine, spreading alléluia-tree affording a pleasant shade during the hottest hours of the day, or a beautiful gônda or papaya unfolding its large, feather-like leaves above a slender, smooth, and undivided stem, or the tall date-tree waving over the whole scene; the matron in a clean black

cotton gown wound round her waist, her hair neatly-dressed in 'ehókoli' or 'bejáji,' busy preparing the meal for her absent husband, or spinning cotton, and at the same time urging the female slaves to pound the corn; the children naked and merry, playing about in the sand at the 'urgin-dáwaki,' or the 'da-n-chácha,' or chasing a straggling, stubborn goat; earthenware pots and wooden bowls, all cleanly washed, standing in order. Farther on a dashing Cyprian, homeless, comfortless, and childless, but affecting merriment or forcing a wanton laugh, gaudily ornamented with numerous strings of beads round her neck, her hair fancifully dressed and bound with a diadem, her gown of various colors, loosely fastened under her luxuriant breast, and trailing behind in the sand; near her a diseased wretch covered with ulcers or with elephantiasis."¹

Speke has described in a graphic manner the life at the court of Uganda, where he resided for many months. Here the ruling caste are Gallas, or some cognate tribe, totally different in race from the people whom they govern. The moment when he first came into the presence of persons of this caste, he says that he felt and saw he was in the company of men who were as unlike as they could be to the common order of natives in the surrounding districts. They had fine oval faces, large eyes, and high noses, and in their deportment and intelligence showed themselves to be far the superiors of the negro. Under the rule of a man, Kiméra by name, of this caste, who established himself in the country, the kingdom of Uganda was formed out of an outlying portion of a much larger negro state, and it was organized in the following fashion. Kiméra formed a strong clan, apparently of his immigrant countrymen around him, whom he appointed to be his immediate officers; he rewarded well, punished severely, and soon became magnificent.

"Nothing short of the grandest palace, a throne to sit upon, the largest harem, the smartest officers, the best-dressed people, even a menagerie for pleasure—in fact only the best of everything—would content him. . . . The system of government, according to barbarous ideas, was perfect. Highways were cut from one extremity of the country to the other, and all rivers bridged. No house could be built without its necessary appendages for cleanliness; no person, however poor, could expose his person; and to disobey these laws was death."²

It must, however, be understood that the grand

palace is only a structure of palisading and thatch, and that the costume of the best-dressed people is only a piece of bark cloth.

The customs of Uganda as established by their founder continued in full force at the time of the visit of Speke. He describes how persons at court are on the watch for men who may commit some indiscretion, to confiscate their lands, wives, children, and property.

"An officer observed to salute informally is ordered for execution, when everybody near him rises in an instant; the drums beat, drowning his cries, and the victim of carelessness is dragged off, bound by cords, by a dozen men at once. Another man, perhaps, exposes an inch of naked leg while squatting, or has his mbugu (bark cloth) tied contrary to regulations, and is condemned to the same fate."

In short, the discipline in Uganda is much sharper and quite as prompt as that in a kennel of fox-hounds; and such is the character of the negro that he likes the treatment and thrives under it, as is shown by the smartness and strong national feelings of the people, who contrast very favorably with their more barbarous neighbors.

We will now consider the influence that has been exerted by white men in Africa. Of the Portuguese there is nothing good to say, and the least said the soonest mended. Their rule in Africa is effete, and we shall not further allude to it. But what of the effect of the English and American philanthropists who have formed stations and settlements to reclaim the negro from his barbarism?

The republic of Liberia was established on African soil, with more than 500 miles of seaboard, to serve as a home in Africa for such of the freed negroes of the United States as might choose to emigrate there, and to constitute an independent negro community whence civilizing influences might spread to the interior. It has been in existence, either as a colony or as a free state, for fifty-seven years, and has received altogether upward of 20,000 negro emigrants, whom the Commissioner of the Freedman's Bureau in the United States describes, in metaphorical terms that are not altogether happy, as "the cream of the colored population of the South." Since the war the emigrants have generally been quite poor, but they are spoken of as an intelligent, active, industrious, and enterprising set of men. There appear to be far more applicants than the philanthropists who keep the undertaking going are able with their funds to convey across the Atlantic. Thus in 1872 there were

¹ Barth's "Travels in Central Africa," vol. ii., p. 108.

² Speke, "The Source of the Nile," p. 253.

upward of 3,000 applicants; but, as only about 400 can be dispatched annually, we may believe that there has been much careful selection, whereby the purport of the phrase just quoted may be justified. Notwithstanding this, Liberia cannot be called a success. Its promoters, no doubt, take an enthusiastic view of its affairs, but there seems to be internal evidence in the official publications of the colony to warrant a dispassionate by-stander in sharing the opposite opinion, which is much the more widely prevalent. Thus the governor, in 1872, says: "The present condition of our national affairs is most unsatisfactory and perplexing;" and he speaks of "shameful peculations and misapplications." These strong words seem justified by a recent transaction that shows the corrupt political life of Liberia. In 1871 a shameful loan was negotiated in England in the time of the then governor, Mr. Roye. The sum nominally borrowed was £100,000, at 7 per cent. interest, but issued at 30 per cent. below par, and with an additional deduction of three years' interest (or £21). That is to say, he and a few others who acted with him agreed to give £7,000 annually for a sum of only £49,000; in other words, they borrowed at upward of 14 per cent., but, owing to their own malversations, they do not seem to have netted much more than half of even that reduced sum. Governor Roye was arrested, tried, and found guilty. He, however, escaped out of prison, found his way to the sea-shore, and, seeing a boat at anchor, plunged into the water and swam to it, to get safe away out of the country. There was no one on board; he ineffectually endeavored to climb into it, and, after swimming round it more than once, was drowned, being hampered in his efforts by the weight of a bag of money he had tied round his waist. This episode in the political life of the state is all the more disgraceful, as the emigrants pose themselves in virtuous attitudes. Thus upward of a third of the adult emigrants are described as "professors of religion."

The experience of Liberia appears strongly to show that the negro is little capable of forming a state similarly organized to those of civilized nations. If a band of selected negroes fail, what can be expected from a miscellaneous multitude of them?

There exists a belief among us that the superiority of Western ideas and civilization is so unquestionable and absolute that we have only to educate the negro in our ways, and he will adopt them gladly. We have such confidence in our own social ideas that we are apt to think that a

few hundreds of intelligent Britons are sufficient to set an example capable of spreading among millions in Africa; that by these means a widely-spread industry will prevail, and lines of peaceful commerce will open, and a negro Arcadia will easily be made to flourish in that benighted continent. Past experience does not warrant the conclusion that the immediate influence of the white man can so prevail upon the black. What it does show cannot be more clearly and justly stated than it has been in a remarkable article written in *Fraser's Magazine*, November, 1875, by a negro of pure African extraction, Mr. Blyden, who was then the principal of the Presbyterian High-School in Liberia, and is at this moment the minister of Liberia in England. It is entitled "Mohammedanism and the Negro Race," and shows forcibly, on the one hand, the civilizing influence of the Arab upon the negro, and, on the other, the harmful influence of the white man, even as a philanthropist. Mr. Blyden says:

"West Africa has been in contact with Christianity for three hundred years, and not one single tribe, as a tribe, has become Christian. Nor has any influential chief yet adopted the religion brought by the European missionary. From Gambia to Gaboon, the native rulers, in constant intercourse with Christians and in the vicinity of Christian settlements, still conduct their government according to the customs of their fathers, where those customs have not been altered or modified by Mohammedan influence. The Alkali of Port Loko, and the chief of Bullom, under the shadow of Sierra Leone, are quasi Mohammedan. The native chiefs of Cape Coast and Lagos are pagans. So in the territory ruled by Liberia the native chiefs in the four counties—Mesurado, Bassa, Sinou, and Cape Palmas—are pagans. There is not a single spot along the whole coast, except, perhaps, the little island of Corisco, where Christianity has taken any hold among large numbers of the indigenous tribes."

Christianity, often of a very emotional and of a debased kind, has had great hold on the black population of the Southern States of America; but it has not increased their manliness and self-respect, either there or elsewhere. On the contrary, as Mr. Blyden shows, it was conveyed to them by whites who socially and otherwise made it at the same time very clear to them that they were a hopelessly inferior and subordinate race. They therefore accepted Christianity as a religion suitable to men living in a servile condition, since it did not prompt them to assert themselves, but told them to acquiesce in their yoke, and to bear their present abject state with meekness, and in

the hope of happiness in a future life. He remarks:

"Wherever the negro is found in Christian lands, his leading trait is not docility, as has been often alleged, but servility. He is slow and unprogressive. Individuals here and there may be found of extraordinary intelligence, enterprise, and energy, but there is no Christian community of negroes anywhere which is self-reliant and independent. Hayti and Liberia, so-called negro republics, are merely struggling for existence, and hold their own by the tolerance of the civilized powers."

As regards the æsthetic side of the influence of the white races, Mr. Blyden lays much stress on the incongruity of the recognized forms of Caucasian beauty with those of the negro features. He speaks of the masterpieces of Italian art, and says that—

"To the negro all these exquisite representations exhibited only the physical characteristics of a foreign race; and while they tended to quicken the tastes and refine the sensibilities of that race, they had only a depressing influence upon the negro, who felt that he had neither part nor lot, so far as his physical character was concerned, in those splendid representations. . . . To him the painting and sculpture of Europe, as instruments of education, have been worse than failures. They have really raised barriers in the way of his normal development. They have set before him models for imitation; and his very effort to conform to the canons of taste thus practically suggested has impaired, if not destroyed, his self-respect."

He quotes the prayer of a negro preacher to God to extend "his lily-white hands" over the congregation, and the sermon of another, who, speaking of heaven, said, "Brethren, imagine a beautiful white man, with blue eyes, rosy cheeks, and flaxen hair—and *we shall be like him.*" The negro, when Christianized by white men, is educated falsely to his nature, and any such education must prove an ultimate failure.

On the other hand, the Arab influence in the northern parts of Equatorial Africa, whatever evil it may have wrought there, and still more in the south, has had remarkable influence in elevating the negro. Mr. Blyden says:

"Mohammedanism in Africa counts in its ranks the most energetic and enterprising tribes. It claims as adherents the only people who have any form of civil polity or bond of social organization. It has built and occupies the largest cities in the heart of the continent. Its laws regulate the most powerful kingdoms—Futah, Masina, Hausa, Bor-

nou, Waday, Darfur, Kordofan, Sennaar, etc. It produces and controls the most valuable commerce between Africa and foreign countries; it is daily gathering converts from the ranks of paganism; and it commands respect among all Africans wherever it is known, even where the people have not submitted to the sway of the Koran.

"No one can travel any distance in the interior of West Africa without being struck by the different aspects of society in different localities, according as the population is pagan or Mohammedan. Not only is there a difference in the methods of government, but in the general regulations of society, and even in the amusements of the people."

He adds:

"In traversing the region of country between Sierra Leone and Futah Jallo in 1873, we passed through populous pagan towns, but the transition from these to Mohammedan districts was striking. When we left a pagan and entered a Mohammedan community, we at once noticed that we had entered a moral atmosphere widely separated from, and loftier far than, the one we had left. We discovered that the character, feelings, and conditions of the people were profoundly altered and improved."

The Arabs coalesce with the natives, they intermarry and trade in large numbers, and they do not look upon a converted negro as an inferior. They are zealous propagators of their faith, and, as Mr. Pope Hennessy pointed out in a remarkable report, they promote with much success numerous schools for elementary education. Mr. Blyden says:

"In Sierra Leone, the Mohammedans, without any aid from Government—imperial or local—or any contributions from Mecca or Constantinople, erect their mosques, keep up their religious services, conduct their schools, and contribute to the support of missionaries from Arabia, Morocco, or Futah, when they visit them. The same compliment cannot be paid to the negro Christians of that settlement."

Of Mohammedanism and Christianity—we do not speak here or elsewhere as to their essential doctrines, but as they are practically conveyed by example and precept to the negro—the former has the advantage in simplicity. It exacts a decorous and cleanly ritual that pervades the daily life, frequent prayers, ablutions and abstinence, reverence toward an awful name, and pilgrimage to a holy shrine, while the combative instincts of the negro's nature are allowed free play in warring against the paganism and idolatry he has learned to loathe and hate. The whole of this code is easily intelligible, and is obviously self-

consistent. It is not so with Christianity, as practised by white men and taught by example and precept to the negro. The most prominent of its aggressions against his every-day customs are those against polygamy and slavery. The negro, on referring to the sacred book of the European, to which appeal is made for the truth of all doctrine, finds no edict against either the one or the other, but he reads that the wisest of men had a larger harem than any modern African potentate, and that slave-holding was the established custom in the ancient world. The next most prominent of its doctrines are social equality, submission to injury, disregard of wealth, and the propriety of taking no thought for the morrow. He, however, finds the practice of the white race from whom his instructions come, to be exceedingly different from this. He discovers very soon that they absolutely refuse to consider him as their equal; that they are by no means tame under insult, but very much the reverse of it; that the chief aim of their lives is to acquire wealth; and that one of the most despised characteristics among them is that of heedlessness and want of thrift. Far be it from us to say that the modern practice in these matters may not be justified, but it appears to require more subtlety of reasoning than the negro can comprehend, or perhaps even than the missionary can command, to show their conformity with Bible-teaching.

The influence of the English in Africa is barely felt beyond the boundaries of their colonies. We have held Sierra Leone, and many points of vantage on the West African coast, for two generations. The philanthropists and the merchants have both been busily engaged there in immediate relations with the negro, but the result is that, at the back of our settlements, paganism begins and our influence ceases. We cannot even keep open the roads of communication with the neighboring interior. They are closed by force, by passive obstruction, or by prohibitive dues. The weight of barbarism is far too great for the efforts of our few travelers to remove. We might go into lengthy details in evidence of this; two or three will suffice. First as regards land-travel: it is now only eight years ago that an Englishman, Mr. Winwood Reade, succeeded in penetrating 250 miles inland from Sierra Leone, and reaching the sources of the Niger. Another fact is the savagery among the people about the mouths of that same river, notwithstanding the persistent and costly efforts that have been made to turn its stream into a frequented and commercial water-way. For a third fact in evidence of

the flourishing barbarism in the neighborhood of our settlements, we may point to the existence of such a kingdom as Ashanti.

The failure of our influence in opening safe lines of commerce to the interior is due to three causes: In the first place, we do not travel in sufficient numbers or with sufficient frequency to maintain communications; we shall probably never do so, because the commercial gains promise to be very slight, the country is unhealthy, and the number of men who care to risk the fatigues and expense of such journeys is small. In the second place, our free trade in rum and muskets demoralizes the people. In the third place, a large part of the bulky produce shipped for us by negroes from the coast is reared and gathered in the immediate neighborhood by slave-labor, belonging to the chief who sells it; it is therefore an advantage to him to possess many slaves, so he acquires through our free trade the necessary guns and ammunition to make raids upon his neighbors to catch as many slaves as he requires. The consequence is, that adjacent to his frontiers are lands whose inhabitants are in enmity with him, and through traffic becomes impossible.

The Arabs, on the other hand, prohibit all forms of alcohol; they are easily acclimatized, and they settle and travel in multitudes; they have been great openers of routes, being urged not only by the commercial stimulus, but also by the religious one of making the pilgrimage to Mecca. Routes have been established by them across the broadest parts of the Continent of Africa. In the south, the Arabs had penetrated to Nyangwe, from either coast, earlier than our explorers. We have already shown that in the heart of Africa, in that part of the Congo most removed from Nyangwe in the east, and the Yellala Falls on the west, which had been the previous outposts of exploration by the white man, Mr. Stanley appears to have passed by that very river-bank on which Barth's literary friend stood some thirty years ago, with, so to speak, his Arabic translations from Plato in the one pocket and those from Aristotle in the other.

The Arab traders from Zanzibar are unquestionably the apostles of a lower civilization than their fellows in Northern Africa, being apparently more demoralized by the larger proportions of the horrible slave-trade prevailing there. Nevertheless, there are many men among them capable of better things, and their race is probably destined to play an increasingly important part in the whole of Equatorial Africa. The ideal of the Arab is far lower than that of the white man, but,

being as he is in more complete sympathy with the negro, he has succeeded where we have failed in materially raising him in personal dignity and in general civilization.

Africa is not wholly destitute of means of self-amelioration. There is, perhaps, no part of the world in which greater differences are to be seen among the inhabitants than are to be found there among the negroes, and it has occurred to every traveler to occasionally witness specimens of black humanity that have struck him with some admiration. By perpetual war and struggling such as have gone on from time immemorial, the tendency of the ablest to prevail will necessarily advance the average of the negro race. Already those who appear to have been the aborigines of the land, namely, the dwarf tribes of whom Schweinfurth writes, and their congeners the Bushmen, have been ousted by the negro. Again, the negro in historical times inhabited the Sahara, to the north, whence he has been driven back by the Tuarek; he inhabited districts in the south, whence he has been driven back by the Caffre; and we have seen how a Galla stock has obtained the ruling power in certain of the northeast parts of Equatorial Africa. The negro may himself disappear before alien races, just as his predecessors disappeared before him; or the better negro races may prevail and form nations and exclude the rest. It certainly appears thus far that those races who accept the Arab are more likely to succeed in the struggle for supremacy and existence than the others, and it would follow that our wisest course is to give the Arab a judicious and discriminating support.

At the present moment three Englishmen are appointed vicegerents of Arab influence in the equatorial dominions of the Khedive of Egypt. First and foremost among men, in his power of quelling disorder, without the use of violent means, stands Gordon Pasha, a real hero in his unswerving and determined pursuit of the path of duty, who is the Governor-General of the Sudan, or country inhabited by the black races of Egypt. The second is Burton, the well-known traveler in many lands, and an expert in all that relates to Mohammedanism, who has been recently appointed Governor of Darfur; and the third is Sir Frederick Goldsmith, an able Indian officer, newly appointed Governor of Massowah, on the Red Sea. The influence of the British race can hardly be exerted in a more appropriate way than this: that is to say, through men who have the sentiment and practice of statesmanship, knowing what are the traditions, the instincts,

and the capabilities, of the races over whom they are called to rule, exacting from them that which they are confident of being able to obtain, and not wrecking their venture by attempting more. An extension of some such method of governing as this, in the regions over which the Sultan of Zanzibar has more or less sovereign control, is urgently needed. The foreign export of slaves has to be absolutely stopped to put an end to the desolating raids and horrible cruelties practised in the interior, and a legitimate Arab commerce and influence has to be legalized and furthered. Thus much we may perhaps have strength and influence to effect, but the white man can never himself become the itinerant trader in Africa. The climate is unsuitable, the gains too small, the difference of race and civilization between the negro and himself is too great. The Arabs are needed as intelligent, numerous, and enterprising intermediaries, and they are the best at present to be obtained; so we must accept them with all their faults.

The remaining duty of the white man is to explore the land, partly to show what produce worthy of exportation it can yield, and partly to find out the best routes by which it can be conveyed to the coast. Let the white man originate, let him conduct the larger commerce from the sea-coast, let him crush the external slave-trade, and let him take such part in the higher politics of the continent as he can reasonably hope to exert; but let him, if possible, abandon all thoughts of annexing large districts in Eastern Africa, which, according to the experience of the West, will exercise no influence commensurate to the cost in lives and money of maintaining them, while they would impose upon England the uncongenial duty of miserable wars like that of Ashanti, and of continual petty onslaughts like those we continually bear of, upon the pirates at the mouths of West African rivers. Let the missionaries go where they will and do what good they can, but let them take the risks on their own heads, be respectful to the good points of Mohammedan precept and example, and not entangle us in a system of national interference. Equatorial Africa is never likely to become a home for large numbers of white men, certainly not for men of the Anglo-Saxon race. Let us, then, whether as a nation or as individuals, whether as cosmopolitan philanthropists or as men of commerce, confine our efforts to the more feasible task of controlling and aiding the one intelligent race, who already permeate it, by our action on the sea-coast, and by our political influence at

the headquarters of the Arab—Egypt and Zanzibar. The opinion that the interior of Africa has been thrown open to civilization and trade by Mr. Stanley's daring navigation and descent

of the Congo River, is one which requires to be supported by much stronger evidence than we at present possess before it can be adopted.—*Edinburgh Review*.

ON THE NATURE OF THINGS-IN-THEMSELVES.

By W. KINGDON CLIFFORD.

I.—MEANING OF THE INDIVIDUAL OBJECT.

MY feelings arrange and order themselves in two distinct ways. There is the internal or subjective order, in which sorrow succeeds the hearing of bad news, or the abstraction "dog" symbolizes the perception of many different dogs. And there is the external or objective order, in which the sensation of letting go is followed by the sight of a falling object and the sound of its fall. The objective order, *qua* order, is treated by physical science, which investigates the uniform relations of *objects* in time and space. Here the word *object* (or *phenomenon*) is taken merely to mean a group of my feelings, which persists as a group in a certain manner; for I am at present considering only the objective order of my feelings. The object, then, is a set of changes in my consciousness, and not anything out of it. Here is as yet no metaphysical doctrine, but only a fixing of the meaning of a word. We may subsequently find reason to infer that there is something which is not object, but which corresponds in a certain way with the object; this will be a metaphysical doctrine, and neither it nor its denial is involved in the present determination of meaning. But the determination must be taken as extending to all those inferences which are made by science in the objective order. If I hold that there is hydrogen in the sun, I mean that if I could get some of it in a bottle, and explode it with half its volume of oxygen, I should get that group of possible sensations which we call "water." The inferences of physical science are all inferences of my real or possible feelings; inferences of something actually or potentially in my consciousness, not of anything outside it.

II.—DISTINCTION OF OBJECT AND EJECT.

There are, however, some inferences which are profoundly different from those of physical science. When I come to the conclusion that

you are conscious, and that there are objects in your consciousness similar to those in mine, I am not inferring any actual or possible feelings of my own, but *your* feelings, which are not, and cannot by any possibility become, objects in my consciousness. The complicated processes of your body and the motions of your brain and nervous system, inferred from evidence of anatomical researches, are all inferred as things possibly visible to me. However remote the inference of physical science, the thing inferred is always a part of me, a possible set of changes in my consciousness bound up in the objective order with other known changes. But the inferred existence of your feelings, of objective groupings among them similar to those among my feelings, and of a subjective order in many respects analogous to my own—these inferred existences are in the very act of inference *thrown out* of my consciousness, recognized as outside of it, as *not* being a part of me. I propose, accordingly, to call these inferred existences *ejects*, things thrown out of my consciousness, to distinguish them from *objects*, things presented in my consciousness, phenomena. It is to be noticed that there is a set of changes of my consciousness symbolic of the eject, which may be called my conception of you; it is (I think) a rough picture of the whole aggregate of my consciousness, under imagined circumstances like yours; *qua* group of my feelings, this conception is like the object in substance and constitution, but differs from it in implying the existence of something that is not itself, but corresponds to it, namely, of the eject. The existence of the object, whether perceived or inferred, carries with it a group of beliefs; these are always beliefs in the future sequence of certain of my feelings. The existence of this table, for example, as an object in my consciousness, carries with it the belief that if I climb up on it I shall be able to walk about on it as if it were the ground. But the existence of my con-

ception of you in my consciousness carries with it a belief in the existence of you outside of my consciousness, a belief which can never be expressed in terms of the future sequence of my feelings. How this inference is justified, how consciousness can testify to the existence of anything outside of itself, I do not pretend to say; I need not untie a knot which the world has cut for me long ago. It may very well be that I myself am the only existence, but it is simply ridiculous to suppose that anybody else is. The position of absolute idealism may, therefore, be left out of count, although each individual may be unable to justify his dissent from it.

III.—FORMATION OF THE SOCIAL OBJECT.

The belief, however, in the existence of other men's consciousness, in the existence of *ejects*, dominates every thought and every action of our lives. In the first place, it profoundly modifies the object. This room, the table, the chairs, your bodies, are all objects in my consciousness; as simple objects they are parts of me. But I, somehow, infer the existence of similar objects in your consciousness, and these are not objects to me, nor can they ever be made so; they are *ejects*. This being so, I bind up with each object as it exists in my mind the thought of similar objects existing in other men's minds; and, I thus form the complex conception, "this table, as an object in the minds of men"—or, as Mr. Shadworth Hodgson puts it, an object of consciousness in general. This conception symbolizes an indefinite number of *ejects*, together with one object which the conception of each *eject* more or less resembles. Its character is therefore mainly *ejective* in respect of what it symbolizes, but mainly *objective* in respect of its nature. I shall call this complex conception the *social object*; it is a symbol of one thing (the *individual object*, it may be called for distinction's sake) which is in my consciousness, and of an indefinite number of other things which are *ejects* and out of my consciousness. Now, it is probable that the individual object, as such, never exists in the mind of man. For there is every reason to believe that we were gregarious animals before we became men properly so called. And a belief in the *eject*—some sort of recognition of a kindred consciousness in one's fellow-beings—is clearly a condition of gregarious action among animals so highly developed as to be called conscious at all. Language, even in its first beginnings, is impossible without that belief; and any sound which, becoming a sign to my neighbor, becomes there-

by a mark to myself, must by the nature of the case be a mark of the social object, and not of the individual object. But if not only this conception of the particular social object, but all those that have been built up out of it, have been formed at the same time with, and under the influence of, language, it seems to follow that the belief in the existence of other men's minds like our own, but not part of us, must be inseparably associated with every process whereby discrete impressions are built together into an object. I do not, of course, mean that it presents itself in consciousness as distinct; but I mean that as an object is formed in my mind, a fixed habit causes it to be formed as social object, and insensibly embodies in it a reference to the minds of other men. And this sub-conscious reference to supposed *ejects* is what constitutes the impression of *externality* in the object, whereby it is described as *not-me*. At any rate, the formation of the social object supplies an account of this impression of outness, without requiring me to assume any *ejects* or things outside my consciousness except the minds of other men. Consequently, it cannot be argued from the impression of outness that there is anything outside of my consciousness except the minds of other men. I shall argue presently that we have grounds for believing in non-personal *ejects*, but these grounds are not in any way dependent on the impression of outness, and they are not included in the ordinary or common-sense view of things. It seems to me that the prevailing belief of uninstructed people is merely a belief in the social object, and not in a non-personal *eject*, somehow corresponding to it; and that the question "Whether the latter exists or not?" is one which cannot be put to them so as to convey any meaning without considerable preliminary training. On this point I agree entirely with Berkeley, and not with Mr. Spencer.

IV.—DIFFERENCE BETWEEN MIND AND BODY.

I do not pause to show how belief in the *eject* underlies the whole of natural ethic, whose first great commandment, evolved in the light of day by healthy processes wherever men have lived together, is, "Put yourself in his place." It is more to my present purpose to point out what is the true difference between body and mind. Your body is an object in my consciousness; your mind is not, and never can be. Being and object, your body follows the laws of physical science, which deals with the objective order of my feelings. That its chemistry is or-

dinary chemistry, its physics ordinary physics, its mechanics ordinary mechanics, may or may not be true; the circumstances are exceptional, and it is conceivable (to persons ignorant of the facts) that allowance may have to be made for them, even in the expression of the most general laws of Nature. But in any case, every question about your body is a question about the physical laws of matter, and about nothing else. To say: "Up to this point science can explain; here the soul steps in," is not to say what is untrue, but to talk nonsense. If evidence were found that the matter constituting the brain behaved otherwise than ordinary matter, or if it were impossible to describe vital actions as particular examples of general physical rules, this would be a fact in physics, a fact relating to the motion of matter; and it must either be explained by further elaboration of physical science, or else our conception of the objective order of our feelings would have to be changed. The question, "Is the mind a force?" is condemned by similar considerations. A certain variable quality of matter (the rate of change of its motion) is found to be invariably connected with the position relatively to it of other matter; considered as expressed in terms of this position, the quality is called force. Force is thus an abstraction relating to *objective* facts; it is a mode of grouping of my feelings, and cannot possibly be the same thing as an eject, another man's consciousness. But the question, "Do the changes in a man's consciousness *run parallel* with the changes of motion, and therefore with the forces in his brain?" is a real question, and not *prima-facie* nonsense. Objections of like character may be raised against the language of some writers, who speak of changes in consciousness as *caused* by actions on the organism. The word *cause*, *πoλλὰ χῶς λεγόμενον* and misleading as it is, having no legitimate place in science or philosophy, may yet be of some use in conversation or literature, if it is kept to denote a relation between objective facts, to describe certain parts of the phenomenal order. But only confusion can arise if it is used to express the relation between certain objective facts in my unconsciousness, and the ejective facts which are inferred as corresponding in some way to them and running parallel with them. For all that we know at present, this relation does not in any way resemble that expressed by the word *cause*.

To sum up, the distinction between eject and object, properly grasped, forbids us to regard the eject, another man's mind, as coming into

the world of objects in any way, or as standing in the relation of cause or effect to any changes in that world. I need hardly add that the facts do very strongly lead us to regard our bodies as merely complicated examples of practically universal physical rules, and their motions as determined in the same way as those of the sun and the sea. There is no evidence which amounts to a *prima-facie* case against the dynamical uniformity of Nature; and I make no exception in favor of that *slykick* force which fills existing lunatic asylums and makes private houses into new ones.

V.—CORRESPONDENCE OF ELEMENTS OF MIND AND BRAIN-ACTION.

I have already spoken of certain ejective facts—the changes in your consciousness—as running parallel with the changes in your brain, which are objective facts. The parallelism here meant is a parallelism of complexity, an analogy of structure. A spoken sentence and the same sentence written are two utterly unlike things, but each of them consists of elements; the spoken sentence of the elementary sounds of the language, the written sentence of its alphabet. Now the relation between the spoken sentence and its elements is very nearly the same as the relation between the written sentence and its elements. There is a correspondence of element to element; although an elementary sound is quite a different thing from a letter of the alphabet, yet each elementary sound belongs to a certain letter or letters. And the sounds being built up together to form a spoken sentence, the letters are built up together, *in nearly the same way*, to form the written sentence. The two complex products are as wholly unlike as the elements are, but the manner of their complication is the same. Or, as we should say in the mathematics, a sentence spoken is the same function of the elementary sounds as the same sentence written is of the corresponding letters.

Of such a nature is the correspondence or parallelism between mind and body. The fundamental "deliverance" of consciousness affirms its own complexity. It seems to me impossible, as I am at present constituted, to have only one absolutely simple feeling at a time. Not only are my objective perceptions, as of a man's head or a candlestick, formed of a great number of parts ordered in a definite manner, but they are invariably accompanied by an endless string of memories, all equally complex. And those massive organic feelings with which, from their ap-

parent want of connection with the objective order, the notion of consciousness has been chiefly associated—those also turn out, when attention is directed to them, to be complex things. In reading over a former page of my manuscript, for instance, I found suddenly, on reflection, that although I had been conscious of what I was reading, I paid no attention to it; but had been mainly occupied in debating whether faint red lines would not be better than blue ones to write upon, in picturing the scene in the shop when I should ask for such lines to be ruled, and in reflecting on the lamentable helplessness of nine men out of ten when you ask them to do anything slightly different from what they have been accustomed to do. This debate had been started by the observation that my handwriting varied in size according to the nature of the argument, being larger when that was diffuse and explanatory, occupied with a supposed audience; and smaller when it was close, occupied only with the sequence of propositions. Along with these trains of thought went the sensation of noises made by poultry, dogs, children, and organ-grinders; and that vague, diffused feeling in the side of the face and head which means a probable toothache in an hour or two. Under these circumstances, it seems to me that consciousness must be described as a succession of groups of changes, as analogous to a rope made of a great number of occasionally interlacing strands.

This being so, it will be said that there is a unity in all this complexity, that in all these varied feelings it is I who am conscious, and that this sense of personality, the self-perception of the Ego, is one and indivisible. It seems to me (here agreeing with Hume) that the "unity of apperception" does not exist in the instantaneous consciousness which it unites, but only in subsequent reflection upon it; and that it consists in the power of establishing a certain connection between the memories of any two feelings which we had at the same instant. A feeling, at the instant when it exists, exists *an und für sich*, and not as *my* feeling; but when on reflection I remember it as my feeling, there comes up not merely a faint repetition of the feeling, but inextricably connected with it a whole set of connections with the general stream of my consciousness. This memory, again, *qua* memory, is relative to the past feeling which it partially recalls; but in so far as it is itself a feeling, it is absolute, *Ding-an-sich*. The feeling of personality, then, is a certain feeling of connection between faint

images of past feelings; and personality itself is the fact that such connections are set up, the property of the stream of feelings that part of it consists of links binding together faint reproductions of previous parts. It is thus a relative thing, a mode of complication of certain elements, and a property of the complex so produced. This complex is consciousness. When a stream of feelings is so compacted together that at each instant it consists of (1) new feelings, (2) fainter repetitions of previous ones, and (3) links connecting these repetitions, the stream is called a consciousness. A far more complicated grouping than is necessarily implied here is established when discrete impressions are run together into the perception of an object. The *conception* of a particular object, as object, is a group of feelings, symbolic of many different perceptions, and of links between them and other feelings. The distinction between Subject and Object is twofold: first, the distinction with which we started between the subjective and objective *orders* which simultaneously exist in my feelings; and, secondly, the distinction between me and the social object, which involves the distinction between me and you. Either of these distinctions is exceedingly complex and abstract, involving a highly-organized experience. It is not, I think, possible to separate one from the other; for it is just the objective order which I do suppose to be common to me and to other minds.

I need not set down here the evidence which shows that the complexity of consciousness is paralleled by complexity of action in the brain. It is only necessary to point out what appears to me to be a consequence of the discoveries of Müller and Helmholtz in regard to sensation: that at least those distinct feelings which can be remembered and examined by reflection are paralleled by changes in a portion of the brain only. In the case of sight, for example, there is a message taken from things outside to the retina, and therefrom sent in somewhither by the optic nerve; now we can tap this telegraph at any point and produce the sensation of sight, without any impression on the retina. It seems to follow that what is known *directly* is what takes place at the inner end of this nerve, or that the consciousness of sight is simultaneous and parallel in complexity with the changes in the gray matter at the internal extremity, and not with the changes in the nerve itself, or in the retina. So also a pain in a particular part of the body may be mimicked by neuralgia due to lesion of another part.

We come, finally, to say then that, as your

consciousness is made up of elementary feelings grouped together in various ways (ejective facts), so a part of the action in your brain is made up of more elementary actions in parts of it, grouped together *in the same ways* (objective facts). The knowledge of this correspondence is a help to the analysis of both sets of facts; but it teaches us in particular that any feeling, however apparently simple, which can be retained and examined by reflection, is already itself a most complex structure. We may, however, conclude that this correspondence extends to the elements, and that each simple feeling corresponds to a special comparatively simple change of nerve-matter.

VI.—THE ELEMENTARY FEELING IS A THING-IN-ITSELF.

The conclusion that elementary feeling co-exists with elementary brain-motion in the same way as consciousness coexists with complex brain-motion, involves more important consequences than might at first sight appear. We have regarded consciousness as a complex of feelings, and explained the fact that the complex is conscious, as depending on the mode of complication. But does not the elementary feeling itself imply a consciousness in which alone it can exist, and of which it is a modification? Can a feeling exist by itself, without forming part of a consciousness? I shall say *no* to the first question, and *yes* to the second, and it seems to me that these answers are required by the doctrine of evolution. For if that doctrine be true, we shall have along the line of the human pedigree a series of imperceptible steps connecting inorganic matter with ourselves. To the later members of that series we must undoubtedly ascribe consciousness, although it must, of course, have been simpler than our own. But where are we to stop? In the case of organisms of a certain complexity, consciousness is inferred. As we go back along the line, the complexity of the organism and of its nerve-action insensibly diminishes; and for the first part of our course, we see reason to think that the complexity of consciousness insensibly diminishes also. But if we make a jump, say to the tunicate mollusks, we see no reason there to infer the existence of consciousness at all. Yet not only is it impossible to point out a place where any sudden break takes place, but it is contrary to all the natural training of our minds to suppose a breach of continuity so great. All this imagined line of organisms is a series of objects in my consciousness; they form an insensible gradation, and yet

there is a certain unknown point at which I am at liberty to infer facts *out* of my consciousness corresponding to them! There is only one way out of the difficulty, and to that we are driven. Consciousness is a complex of ejective facts—of elementary feelings, or rather of those remoter elements which cannot even be felt, but of which the simplest feeling is built up. Such elementary ejective facts go along with the action of every organism, however simple; but it is only when the material organism has reached a certain complexity of nervous structure (not now to be specified) that the complex of ejective facts reaches that mode of complication which is called Consciousness. But as the line of ascent is unbroken, and must end at last in inorganic matter, we have no choice but to admit that every motion of matter is simultaneous with some ejective fact or event which might be part of a consciousness. From this follow two important corollaries:

1. A feeling can exist by itself, without forming part of a consciousness. It does not depend for its existence on the consciousness of which it may form a part. Hence a feeling (or an ejective element) is *Ding-an-sich*, an absolute, whose existence is not relative to anything else. *Sentitur* is all that can be said.

2. These ejective-elements, which correspond to motions of matter, are connected together in their sequence and coexistence by counterparts of the physical laws of matter. For otherwise the correspondence could not be kept up.

VII.—MIND-STUFF IS THE REALITY WHICH WE PERCEIVE AS MATTER.

That element of which, as we have seen, even the simplest feeling is a complex, I shall call *Mind-stuff*. A moving molecule of inorganic matter does not possess mind, or consciousness; but it possesses a small piece of mind-stuff. When molecules are so combined together as to form the film on the under-side of a jelly-fish, the elements of mind-stuff which go along with them are so combined as to form the faint beginnings of sentience. When the molecules are so combined as to form the brain and nervous system of a vertebrate, the corresponding elements of mind-stuff are so combined as to form some kind of consciousness; that is to say, changes in the complex which take place at the same time get so linked together that the repetition of one implies the repetition of the other. When matter takes the complex form of a living human brain, the corresponding mind-stuff takes the form of a

human consciousness, having intelligence and volition.

Suppose that I see a man looking at a candlestick. Both of these are objects, or phenomena, in my mind. An *image* of the candlestick, in the optical sense, is formed upon his retina, and nerve-messages go from all parts of this to form what we may call a *cerebral image* somewhere in the neighborhood of the optic thalamus in the inside of his brain. This cerebral image is a certain complex of disturbances in the matter of these organs; it is a material or physical fact, therefore a group of my possible sensations, just as the candlestick is. The cerebral image is an imperfect representation of the candlestick, corresponding to it point for point in a certain way. Both the candlestick and the cerebral image are matter; but one material complex *represents* the other material complex in an imperfect way.

Now the candlestick is not the external reality whose existence is represented in the man's mind; for the candlestick is a mere perception in *my* mind. Nor is the cerebral image the man's perception of the candlestick; for the cerebral image is merely an idea of a possible perception in my mind. But there *is* a perception in the man's mind, which we may call the *mental image*; and this corresponds to some external reality. *The external reality bears the same relation to the mental image that the (phenomenal) candlestick bears to the cerebral image.* Now the candlestick and the cerebral image are both matter; they are made of the same stuff. Therefore the external reality is made of the same stuff as the man's perception or mental image, that is, it is made of mind-stuff. And as the cerebral image represents imperfectly the candlestick, in the same way and to the same extent the mental image represents the reality external to his consciousness. Thus, in order to find the thing in itself which is represented by any object in my consciousness such as a candlestick, I have to solve this question in proportion, or rule of three:

As the physical configuration of my cerebral image of the object

is to the physical configuration of the object,

so is my perception of the object (the object regarded as complex of my feelings) to the thing in itself.

Hence we are obliged to identify the thing-in-itself with that complex of elementary mind-stuff which on other grounds we have seen reason to think of as going along with the material object. Or to say the same thing in other words, the reality external to our minds which is represented in our minds as matter, is in itself mind-stuff.

The universe, then, consists entirely of mind-stuff. Some of this is woven into the complex form of human minds containing imperfect representations of the mind-stuff outside them, and of themselves also, as a mirror reflects its own image in another mirror, *ad infinitum*. Such an imperfect representation is called a material universe. It is a picture in a man's mind of the real universe of mind-stuff.

The two chief points of this doctrine may be thus summed up:

Matter is a mental picture in which mind-stuff is the thing represented.

Reason, intelligence, and volition, are properties of a complex which is made up of elements themselves not rational, not intelligent, not conscious.

NOTE.—The doctrine here expounded appears to have been arrived at independently by many persons; as was natural, seeing that it is (or seems to me) a necessary consequence of recent advances in the theory of perception. Kant threw out a suggestion that the *Ding-an-sich* might be of the nature of mind; but the first statement of the doctrine in its true connection that I know of, is by Wundt. Since it dawned on me, some time ago, I have supposed myself to find it more or less plainly hinted in many writings; but the question is one in which it is peculiarly difficult to make out precisely what another man means, and even what one means one's self.

Some writers (e. g., Dr. Tyndall) have used the word *matter* to mean the phenomenon *plus* the reality represented; and there are many reasons in favor of such usage in general. But for the purposes of the present discussion I have thought it clearer to use the word for the phenomenon as distinguished from the thing-in-itself.—*Mind*.

THE PROPOSED SUBSTITUTES FOR RELIGION.

BY PROFESSOR GOLDWIN SMITH.

THERE appears to be a connection between the proposed substitutes for religion and the special training of their several authors. Historians tender us the worship of Humanity, professors of physical science tender us Cosmic Emotion. Theism might almost retort the apologue of the spectre of the Brocken.

The only organized cultus without a God, at present before us, is that of Comte. This in all its parts—its high-priesthood, its hierarchy, its sacraments, its calendar, its hagiology, its literary canon, its ritualism, and we may add in its fundamentally intolerant and inquisitorial character—is an obvious reproduction of the Church of Rome, with Humanity in place of God, great men in place of the saints, the Founder of Comtism in place of the Founder of Christianity, and even a sort of substitute for the Virgin in the shape of womanhood typified by Clotilde de Vaux. There is only just the amount of difference which would be necessary to escape from servile imitation. We have ourselves witnessed a case of alternation between the two systems which testified to the closeness of their affinity. The Catholic Church has acted on the imagination of Comte at least as powerfully as Sparta acted on that of Plato. Nor is Comtism, any more than Plato's "Republic" and other Utopias, exempt from the infirmity of claiming finality for a flight of the individual imagination. It would shut up mankind forever in a stereotyped organization which is the vision of a particular thinker. In this respect it seems to us to be at a disadvantage compared with Christianity, which, as presented in the Gospels, does not pretend to organize mankind ecclesiastically or politically, but simply supplies a new type of character, and a new motive power, leaving government, ritual, and organization of every kind to determine themselves from age to age. Comte's prohibition of inquiry into the composition of the stars, which his priesthood, had it been installed in power, would perhaps have converted into a compulsory article of faith, is only a specimen of his general tendency (the common tendency, as we have said, of all Utopias) to impose on human progress the limits of his own mind. Let his hierarchy become masters of the world, and the effect would probably be like that produced by the ascendancy of

a hierarchy (enlightened no doubt for its time) in Egypt, a brief start forward, followed by consecrated immobility forever.

Lareveillère Lepaux, the member of the French Directory, invented a new religion of Theophilanthropy, which seems, in fact, to have been an organized Rousseauism. He wished to impose it on France, but finding that, in spite of his passionate endeavors, he made but little progress, he sought the advice of Talleyrand. "I am not surprised," said Talleyrand, "at the difficulty you experience. It is no easy matter to introduce a new religion. But I will tell you what I recommend you to do. I recommend you to be crucified, and to rise again on the third day." We cannot say whether Lareveillère made any proselytes, but if he did their number cannot have been much smaller than the reputed number of the religious disciples of Comte. As a philosophy, Comtism has found its place, and exercised its share of influence among the philosophies of the time; but as a religious system it appears to make little way. It is the invention of a man, not the spontaneous expression of the beliefs and feelings of mankind. Any one with a tolerably lively imagination might produce a rival system with as little practical effect. Roman Catholicism was, at all events, a growth, not an invention.

Cosmic Emotion, though it does not affect to be an organized system, is the somewhat sudden creation of individual minds, set at work apparently by the exigencies of a particular situation, and on that account suggestive *prima facie* of misgivings similar to those suggested by the invention of Comte.

Now, is the worship of Humanity or Cosmic Emotion really a substitute for religion? That is the only question which we wish, in these few pages, to ask. We do not pretend here to inquire what is or what is not true in itself.

Religion teaches that we have our being in a Power whose character and purposes are indicated to us by our moral nature, in whom we are united, and by the union made sacred to each other; whose voice conscience, however generated, is; whose eye is always upon us, sees all our acts, and sees them as they are morally, without reference to worldly success, or to the

opinion of the world; to whom at death we return; and our relations to whom, together with his own nature, are an assurance that, according as we promote or fail to promote his design by self-improvement, and the improvement of our kind, it will be well or ill for us in the sum of things. This is an hypothesis evidently separable from belief in a revelation, and from any special theory respecting the next world, as well as from all dogma and ritual. It may be true or false in itself, capable of demonstration or incapable. We are concerned here solely with its practical efficiency, compared with that of the proposed substitutes. It is only necessary to remark that there is nothing about the religious hypothesis as here stated, miraculous, supernatural, or mysterious, except so far as those epithets may be applied to anything beyond the range of bodily sense, say the influence of opinion or affection. A universe self-made, and without a God, is at least as great a mystery as a universe with a God; in fact, the very attempt to conceive it in the mind produces a mortal vertigo which is a bad omen for the practical success of Cosmic Emotion.

For this religion are the service and worship of Humanity likely to be a real equivalent in any respect, as motive power, as restraint, or as comfort? Will the idea of life in God be adequately replaced by that of an interest in the condition and progress of Humanity, as they may affect us and be influenced by our conduct, together with the hope of human gratitude and fear of human reprobation after death, which the Comtists endeavor to organize into a sort of counterpart of the day of judgment?

It will probably be at once conceded that the answer must be in the negative as regards the immediate future and the mass of mankind. The simple truths of religion are intelligible to all, and strike all minds with equal force, though they may not have the same influence with all moral natures. A child learns them perfectly at its mother's knee. Honest ignorance in the mine, on the sea, at the forge, striving to do its coarse and perilous duty, performing the lowliest functions of humanity, contributing in the humblest way to human progress, itself scarcely sunned by a ray of what more cultivated natures would deem happiness, takes in as fully as the sublimest philosopher the idea of a God who sees and cares for all, who keeps account of the work well done or the kind act, marks the secret fault, and will hereafter make up to duty for the hardness of its present lot. But a vivid interest—such an interest as

will act both as a restraint and as a comfort—in the condition and future of humanity, can surely exist only in those who have a knowledge of history, sufficient to enable them to embrace the unity of the past, and an imagination sufficiently cultivated to glow with anticipation of the future. For the bulk of mankind the humanity-worshipper's point of view seems unattainable, at least within any calculable time.

As to posthumous reputation, good or evil, it is, and always must be, the appanage of a few marked men. The plan of giving it substance by instituting separate burial-places for the virtuous and the wicked is perhaps not very seriously proposed. Any such plan involves the fallacy of a sharp division where there is no clear moral line, besides postulating, not only an unattainable knowledge of men's actions, but a knowledge, still more manifestly unattainable, of their hearts. Yet we cannot help thinking that, with the men of intellect, to whose teaching the world is listening, this hope of posthumous reputation, or, to put it more fairly, of living in the gratitude and affection of their kind by means of their scientific discoveries and literary works, exerts an influence of which they are hardly conscious; it prevents them from fully feeling the void which the annihilation of the hope of future existence leaves in the hearts of ordinary men.

Besides, so far as we are aware, no attempt has yet been made to show us distinctly what "humanity" is, and wherein its "holiness" consists. If the theological hypothesis is true, and all men are united in God, humanity is a substantial reality; but otherwise we fail to see that it is anything more than a metaphysical abstraction converted into an actual entity by philosophers who are not generally kind to metaphysics. Even the unity of the species is far from settled; science still debates whether there is one race of men, or whether there are more than a hundred. Man acts on man, no doubt; but he also acts on other animals, and other animals on him. Wherein does the special unity or the special bond consist? Above all, what constitutes the "holiness?" Individual men are not holy; a large proportion of them are very much the reverse. Why is the aggregate holy? Let the unit be a "complex phenomenon," an "organism," or whatever name science may give it, what multiple of it will be a rational object of worship?

For our own part, we cannot conceive worship being offered by a sane worshiper to any but a conscious being, in other words, to a person. The fetish-worshiper himself probably invests his fe-

tich with a vague personality, such as would render it capable of propitiation. But how can we invest with a collective personality the fleeting generations of mankind? Even the sum of mankind is never complete, much less are the units blended into a personal whole, or, as it has been called, a colossal man.

There is a gulf here, as it seems to us, which cannot be bridged, and can barely be thatched over by the retention of religious phraseology. In truth, the anxious use of that phraseology betrays weakness, since it shows that you cannot do without the theological associations which cling inseparably to religious terms.

You look forward to a closer union, a more complete brotherhood of man, an increased sacredness of the human relation. Some things point that way: some things point the other way. Brotherhood has hardly a definite meaning without a father; sacredness can hardly be predicated without anything to consecrate. We can point to an eminent writer who tells you that he detests the idea of brotherly love altogether; that there are many of his kind whom, so far from loving, he hates, and that he would like to write his hatred with a lash upon their backs. Look again at the inhuman Prussianism which betrays itself in the New Creed of Strauss. Look at the oligarchy of enlightenment and enjoyment which Renan, in his "Moral Reform of France," proposes to institute for the benefit of his own circle, with sublime indifference to the lot of the vulgar, who, he says, "must subsist on the glory and happiness of others." This does not look much like a nearer approach to a brotherhood of man than is made by the Gospel.

In an article on "The Ascent of Man," we referred to doctrines broached by science at the time of the Jamaica massacre. We neither denied nor had forgotten, but, on the contrary, most gratefully remembered, that among the foremost champions of humanity on that occasion stood some men of the highest eminence who are generally classed with the ultra-scientific school; but they were men in whose philosophy we are persuaded an essentially theological element still lingers, however anti-theological the language of some of them may be.¹

We are speaking, of course, merely of the comparative moral efficiency of religion and of the proposed substitutes for it, apart from the influence exercised over individual conduct by the

¹ We are not aware that in the writings of Mr. Darwin there is anything to prove, or even to suggest, that he is not a theist.

material needs and other non-theological forces of society.

For the immortality of the individual soul, with the influences of that belief, we are asked to accept the immortality of the race. But here, in addition to the difficulty of proving the union and intercommunion of all the members, we are met by the objection that unless we live in God, the race, in all probability, is not immortal. That our planet and all it contains will come to an end appears to be the decided opinion of science. This "holy" being, our relation to which is to take the place of our relation to an eternal Father, by the adoration of which we are to be sustained and controlled, if it exists at all, is as ephemeral compared with eternity, as a fly. We shall be told that we ought to be content with an immortality extending through tens of thousands, perhaps hundreds of thousands, of years. To the *argumentum ad verecundiam* there is no reply. But will this banish the thought of ultimate annihilation? Will it prevent a man, when he is called upon to make some great sacrifice for the race, from saying to himself, that, whether he makes the sacrifice or not, one day all will end in nothing?

Evidently these are points which must be made quite clear before you can, with any prospect of success, call upon men either to regard Humanity with the same feelings with which they have regarded God, or to give up their own interest or enjoyment for the future benefit of the race. The assurance derived from the fondness felt by parents for their offspring, and the self-denying efforts made for the good of children, will hardly carry us very far, even supposing it certain that parental love would remain unaffected by the general change. It is evidently a thing apart from the general love of Humanity. Nobody was ever more extravagantly fond of his children, or made greater efforts for them, than Alexander Borgia.

It has been attempted, however, with all the fervor of conviction, and with all the force of a powerful style, to make us see not only that we have this corporate immortality as members of the "colossal man," but that we may look forward to an actual, though impersonal, existence in the shape of the prolongation through all future time of the consequences of our lives. It might with equal truth be said that we have enjoyed an actual, though impersonal, existence through all time past in our antecedents. But neither in its consequences nor in its antecedents can anything be said to live except by a figure. The characters and actions of men surely will never be influenced by such a fanciful use of lan-

guage as this! Our being is consciousness; with consciousness our being ends, though our physical forces may be conserved, and traces of our conduct—traces utterly undistinguishable—may remain. That with which we are not concerned cannot affect us either presently or by anticipation; and, with that of which we shall never be conscious, we shall never feel that we are concerned. Perhaps, if the authors of this new immortality would tell us what they understand by non-existence, we might be led to value more highly by contrast the existence which they propose for a soul when it has ceased to think or feel, and for an organism when it has been scattered to the winds.

They would persuade us that their impersonal and unconscious immortality is a brighter hope than an eternity of personal and conscious existence, the very thought of which they say is torture. This assumes, what there seems to be no ground for assuming, that eternity is a boundless extension of time; and, in the same way, that infinity is an endless space. It is more natural to conceive of them as emancipation respectively from time and space, and from the conditions which time and space involve; and among the conditions of time may apparently be reckoned the palling of pleasure or of existence by mere temporal protraction. Even as we are—sensual pleasure palls; so does the merely intellectual: but can the same be said of the happiness of virtue and affection? It is urged too that by exchanging the theological immortality for one of physical and social consequences, we get rid of the burden of self, which otherwise we should drag forever. But surely in this there is a confusion of self with selfishness. Selfishness is another name for vice. Self is merely consciousness. Without a self, how can there be self-sacrifice? How can the most unselfish emotion exist if there is nothing to be moved? "He that findeth his life, shall lose it; and he that loseth his life, shall find it," is not a doctrine of selfishness, but it implies a self. We have been rebuked in the words of Frederick to his grenadiers, "Do you want to live forever?" The grenadiers might have answered: "Yes; and therefore we are ready to die."

It is not when we think of the loss of anything to which a taint of selfishness can adhere—it is not even when we think of intellectual effort cut short forever by death just as the intellect has ripened and equipped itself with the necessary knowledge—that the nothingness of this immortality of conserved forces is most keenly felt:

it is when we think of the miserable end of affection. How much comfort would it afford any one bending over the death-bed of his wife to know that forces set free by her dissolution will continue to mingle impersonally and indistinguishably with forces set free by the general mortality? Affection at all events requires personality. One cannot love a group of consequences, even supposing that the filiation could be distinctly presented to the mind. Pressed by the hand of sorrow craving for comfort, this Dead Sea fruit crumbles into ashes, paint it with eloquence as you will.

Humanity, it seems to us, is a fundamentally Christian idea, connected with the Christian view of the relations of men to their common Father and of their spiritual union in the Church. In the same way the idea of the progress of Humanity seems to us to have been derived from the Christian belief in the coming of the kingdom of God through the extension of the Church, and to that final triumph of good over evil foretold in the imagery of the Apocalypse. At least the founders of the Religion of Humanity will admit that the Christian Church is the matrix of theirs: so much their very nomenclature proves; and we would fain ask them to review the process of disengagement, and see whether the essence has not been left behind.

No doubt there are influences at work in modern civilization which tend to the strengthening of the sentiment of humanity by making men more distinctly conscious of their position as members of a race. On the other hand, the unreflecting devotion of the tribesman, which held together primitive societies, dies. Man learns to reason and calculate; and when he is called upon to immolate himself to the common interest of the race he will consider what the common interest of the race, when he is dead and gone, will be to him, and whether he will ever be repaid for his sacrifice.

Of Cosmic Emotion it will perhaps be more fair to say that it is proposed as a substitute for religious emotion rather than as a substitute for religion, since nothing has been said about embodying it in a cult. It comes to us commended by glowing quotations from Mr. Swinburne and Walt Whitman, and we cannot help saying that, for common hearts, it stands in need of the commendation. The transfer of affection from an all-loving Father to an adamant universe is a process for which we may well seek all the aid that the witchery of poetry can supply. Unluckily, we are haunted by the consciousness that

the poetry itself is blindly ground out by the same illimitable mill of evolution which grinds out virtue and affection. We are by no means sure that we understand what Cosmic Emotion is, even after reading an exposition of its nature by no ungifted hand. Its symbola, so to speak, are the feelings produced by the two objects of Kant's peculiar reverence, the stars of heaven, and the moral faculty of man. But, after all, these are only like anything else, aggregations of molecules in a certain stage of evolution. To the unscientific eye they may be awful, because they are mysterious; but let science analyze them and their awfulness disappears. If the interaction of all parts of the material universe is complete, we fail to see why one object or one feeling is more cosmic than another. However, we will not dwell on that which, as we have already confessed, we do not feel sure that we rightly apprehend. What we do clearly see is that to have cosmic emotion, or cosmic anything, you must have a cosmos. You must be assured that the universe is a cosmos and not a chaos. And what assurance of this can materialism or any non-theological system give? Law is a theological term: it implies a lawgiver, or a governing intelligence of some kind. Science can tell us nothing but facts, single or accumulated as experience, which would not make a law though they had been observed through myriads of years. Law is a theological term, and cosmos is equally so, if it may not rather be said to be a Greek name for the aggregate of laws. For order implies intelligent selection and arrangement. Our idea of order would not be satisfied by a number of objects falling by mere chance into a particular figure, however intricate and regular. All the arguments which have been used against design seem to tell with equal force against order. We have no other universe wherewith to compare this so as by the comparison to assure ourselves that this is not a chaos but a cosmos. Both on the earth and in the heavens we see much that is not order but disorder, not cosmos but acosmia. If we divine, nevertheless, that order reigns, and that there is design beneath the seemingly undesigned, and good beneath the appearance of evil, it is by virtue of something not dreamed of in the philosophy of materialism.

Have we really come to this, that the world has no longer any good reason for believing in a God or a life beyond the grave? If so, it is difficult to deny that with regard to the great mass of mankind up to this time Schopenhauer and the pessimists are right, and existence has been a cruel misadventure. The number of those who

have suffered life-long oppression, disease, or want, who have died deaths of torture or perished miserably by war, is limited though enormous; but probably there have been few lives in which the earthly good has not been outweighed by the evil. The future may bring increased means of happiness, though those who are gone will not be the better for them; but it will bring also increase of sensibility, and the consciousness of hopeless imperfection and miserable futility will probably become a distinct and growing cause of pain. It is doubtful even whether, after such a raising of Mokanna's veil, faith in everything would not expire and human effort cease. Still we must face the situation: there can be no use in self-delusion. In vain we shall seek to cheat our souls and to fill a void which cannot be filled by the manufacture of artificial religions and the affectation of a spiritual language to which, however persistently and fervently it may be used, no realities correspond. If one of these cults could get itself established, in less than a generation it would become hollower than the hollowest of ecclesiasticalisms. Probably not a few of the highest natures would withdraw themselves from the dreary round of self-mockery by suicide; and if a scientific priesthood attempted to close that door by sociological dogma or posthumous denunciation the result would show the difference between the practical efficacy of a religion with a God and that of a cult of "Humanity" or "Space."

Shadows and figments, as they appear to us to be in themselves, these attempts to provide a substitute for religion are of the highest importance, as showing that men of great powers of mind, who have thoroughly broken loose not only from Christianity but from natural religion, and in some cases placed themselves in violent antagonism to both, are still unable to divest themselves of the religious sentiment, or to appease its craving for satisfaction. There being no God, they find it necessary, as Voltaire predicted it would be, to invent one; not for the purposes of police (they are far above such sordid Jesuitism), but as the solution of the otherwise hopeless enigma of our spiritual nature. Science takes cognizance of all phenomena; and this apparently ineradicable tendency of the human mind is a phenomenon like the rest. The thorough-going materialist, of course, escapes all these philosophical exigencies; but he does it by denying Humanity as well as God, and reducing the difference between the organism of the human animal and that of any other animal to a mere question of complexity. Still, even in this quarter, there has

appeared of late a disposition to make concessions on the subject of human volition hardly consistent with materialism. Nothing can be more likely than that the impetus of great discoveries has carried the discoverers too far.

Perhaps with the promptings of the religious sentiment there is combined a sense of the immediate danger with which the failure of the religious sanction threatens social order and morality. As we have said already, the men of whom we specially speak are far above anything like social Jesuitism. We have not a doubt but they would regard with abhorrence any schemes of oligarchic illuminism for guarding the pleasures of the few by politic deception of the multitude. But they have probably begun to lay to heart the fact that the existing morality, though not dependent on any special theology, any special view of the relations between soul and body, or any special theory of future rewards and punishments, is largely dependent on a belief in the indefeasible authority of conscience, and in that without which conscience can have no indefeasible authority—the presence of a just and all-seeing God. It may be true that in primeval society these beliefs are found only in the most rudimentary form, and, as social sanctions, are very inferior in force to mere gregarious instincts or the pressure of tribal need. But man emerges from the primeval state, and, when he does, he demands a reason for his submission to moral law. That the leaders of the anti-theological movement in the present day are immoral, nobody but the most besotted fanatic would insinuate; no candid antagonist would deny that some of them are in every respect the very best of men. The fearless love of truth is usually accompanied by other high qualities, and nothing could be more unlikely than that natures disposed to virtue, trained under good influences, peculiarly sensitive to opinion and guarded by intellectual tastes, would lapse into vice as soon as the traditional sanction was removed. But what is to prevent the withdrawal of the traditional sanction from producing its natural effect upon the morality of the mass of mankind? The commercial swindler or the political sharper, when the divine authority of conscience is gone, will feel that he has only the opinion of society to reckon with, and he knows how to reckon with the opinion of society. If Macbeth is ready, provided he can succeed in this world, to “jump the life to come,” much more ready will villainy be to “jump” the bad consequences of its actions to humanity when its own

conscious existence shall have closed. Rate the practical effect of religious beliefs as low and that of social influences as high as you may, there can surely be no doubt that morality has received some support from the authority of an inward monitor regarded as the voice of God. The worst of men would have wished to die the death of the righteous; he would have been glad, if he could, when death approached, to cancel his crimes; and the conviction, or misgiving, which this implied, could not fail to have some influence upon the generality of mankind, though no doubt the influence was weakened rather than strengthened by the extravagant and incredible form in which the doctrine of future retribution was presented by the dominant theology.

The denial of the existence of God and of a future state, in a word, is the dethronement of conscience; and society will pass, to say the least, through a dangerous interval before social science can fill the vacant throne. Avowed skepticism is likely to be disinterested and therefore to be moral; it is among the unavowed skeptics and conformists to political religions that the consequences of the change may be expected to appear. But more than this, the doctrines of Natural Selection and the Survival of the Fittest are beginning to generate a morality of their own, with the inevitable corollary that the proof of superior fitness is to survive—to survive either by force or cunning, like the other animals which by dint of force or cunning have come out victorious from the universal war and asserted for themselves a place in Nature. The “irrepressible struggle for empire” is formally put forward by public writers of the highest class as the basis and the rule of the conduct of this country toward other nations; and we may be sure that there is not an entire absence of connection between the private code of a school and its international conceptions. The feeling that success covers everything seems to be gaining ground, and to be overcoming, not merely the old conventional rules of honor, but moral principle itself. Both in public and private there are symptoms of an approaching failure of the motive power which has hitherto sustained men both in self-sacrificing effort and in courageous protest against wrong, though as yet we are only at the threshold of the great change, and established sentiment long survives, in the masses, that which originally gave it birth. Renan says, probably with truth, that had the Second Empire remained at peace, it might have gone on forever; and in the history

of this country the connection between political effort and religion has been so close that its dissolution, to say the least, can hardly fail to produce a critical change in the character of the nation. The time may come, when, as philosophers triumphantly predict, men, under the ascendancy of science, will act for the common good, with the same mechanical certainty as bees; though the common good of the human hive would perhaps not be easy to define. But in the mean time mankind, or some portions of it, may be in danger of an anarchy of self-interest, compressed for the purpose of political order, by a despotism of force.

That science and criticism, acting—thanks to the liberty of opinion won by political effort—with a freedom never known before, have delivered us from a mass of dark and degrading superstitions, we own with heart-felt thankfulness to the deliverers, and in the firm conviction that the removal of false beliefs, and of the authorities or institutions founded on them, cannot prove in the end anything but a blessing to mankind. But at the same time the foundations of general morality have inevitably been shaken, and a crisis has been brought on the gravity of which nobody can fail to see, and nobody but a fanatic of ma-

terialism can see without the most serious misgiving.

There has been nothing in the history of man like the present situation. The decadence of the ancient mythologies is very far from affording a parallel. The connection of those mythologies with morality was comparatively slight. Dull and half-animal minds would hardly be conscious of the change which was partly veiled from them by the continuance of ritual and state creeds; while in the minds of Plato and Marcus Aurelius it made place for the development of a moral religion. The Reformation was a tremendous earthquake; it shook down the fabric of mediæval religion, and as a consequence of the disturbance in the religious sphere, filled the world with revolutions and wars. But it left the authority of the Bible unshaken, and men might feel that the destructive process had its limit, and that adamant was still beneath their feet. But a world which is intellectual and keenly alive to the significance of these questions, reading all that is written about them with almost passionate avidity, finds itself brought to a crisis, the character of which any one may realize by distinctly presenting to himself the idea of existence without a God.—*Macmillan's Magazine.*

SPONTANEOUS GENERATION: A REPLY.

By H. CHARLTON BASTIAN, M. D., F. R. S.

IN my capacity as teacher of an important section of the scientific basis of medicine, I felt constrained in 1869 to give an attentive study to the evidence adduced by M. Pasteur in favor of the germ-theory of fermentation. It was necessary for me to do this, since his views as to the essential cause of fermentative processes were being widely adopted by many medical men in illustration of the pathology of a most important class of the diseases which afflict the human race—namely, those of a communicable nature, knit together in their diversity by the common characteristic that they are capable of spreading by infection from person to person. I was compelled to endeavor to come to some conclusion as to what should be taught in reference to these new doctrines, which, after the manner of the diseases themselves, were beginning to spread somewhat rapidly.

The restoration of such views, in their modern form, was so new that the occasion had not arisen for my own teachers to impress me with any doctrines in regard to this subject. I came, therefore, with a perfectly open mind to the study of the question, having no party bias in either direction. If I had any bias at all on the general question in regard to spontaneous generation—which was, and always must be, that upon which the derivative problem in regard to the pathology of infectious diseases ultimately rests—this was to be found in favor of the view which was adverse to the present occurrence of any such process. It is true I had not specially concerned myself, up to this time, with the evidence bearing upon the question, but neither had I seen any reason for not accepting what was at that time the general undercurrent of scientific teaching.

But my scrutiny of the evidence in favor of

the germ-theory and against spontaneous generation, as embodied in the writings of M. Pasteur, did not by any means convince me as to the irrefragable nature of this evidence, notwithstanding all the skill and care with which the experiments had evidently been conducted. It was not, indeed, the experiments themselves, so far as they went, with which I was dissatisfied; but rather that I could not assent to the validity of the inferences which M. Pasteur had drawn from them. An experimentalist may be ever so skilled in the art of manipulation, and even of devising new experiments, and yet his judgment may not be faultless, his reasonings in regard to his experiments may not be without flaw. It is only by free discussion that truth can be eliminated from error. Yet my temerity in venturing to question the validity of M. Pasteur's inductions and inferences has many times been commented upon in terms of severe reprobation by Prof. Tyndall.

Notwithstanding all this, the fact remains that the cardinal inductions and inferences of M. Pasteur¹—those on which he based his germ-theory, and which were challenged by me in 1870 and 1871—have now (as I have recently shown in vol. xiv. of the Zoölogical Section of the *Journal of the Linnean Society*) been finally overturned. Yet it was on such bases that the germ-theory was also proclaimed by Prof. Huxley,² as President of the British Association, in 1870, to be "victorious along the whole line."

Whether or not M. Pasteur's germ-theory may ultimately be established on other grounds, it is now perfectly obvious that it was not tenable on the grounds alleged in 1870, and that my work, together with that of others who have sought either to confirm or refute me, has proved to demonstration that his original positions were erroneous. This assuredly is worthy of note, as bringing us one long step the nearer to the ultimate truth.

My experiments have from the first met with the most sturdy opposition and denial, a fate not unusually crossing the labors of those who venture to attack popular and deeply-rooted doctrines. Yet on several notable occasions it has happened that experimenters, who have at first repudiated the reality of my results, have in the end been compelled, however reluctantly, to acknowledge their correctness. This was the case, for instance, in regard to the seemingly simple, though very important, question whether a boiled fluid inclosed in a sealed vessel, from which the

air had been expelled during the process of ebullition, could or could not subsequently ferment and swarm with living organisms. My statement that this would occur was at first again and again denied, on the ground that the process of boiling to which the fluid was subjected would have killed all the organisms and their germs within the narrow-necked experimental vessel, and that a generation *de novo* of living matter was not to be thought of.

My critics did not at that time suggest that the temperature of 212° Fahr. was not adequate to kill all preëxisting organisms and their germs in fluids: this was taken for granted; and accordingly they roundly stated that I had grossly deceived myself in supposing that living organisms had appeared under such circumstances. A couple of quotations from important reviews by well-known men of science will afford an index of the extent to which this opinion prevailed among men of science in this country.

In an adverse review of my then recently-published work, "The Beginnings of Life," which appeared in the *Academy* of November 1, 1872, signed by H. N. Moseley, who has since greatly distinguished himself by his investigations as one of the naturalists of the Challenger Expedition, the reader may find the following passage:

"Dr. Bastian seals the flasks with which he is experimenting during ebullition of the contained fluid, and by this means, when the apparatus has become cool, a partial vacuum is formed in the vessel. Experiments were made in this way with hay and turnip infusions, in which every possible precaution appears to have been taken to exclude or destroy germs. In nearly all cases, after the lapse of some time, the solutions became turbid, or exhibited a scum, and microscopic examination showed the existence of organic bodies in the fluids, and in some cases of bacteria in active motion.

"Now the only possible answer to be made to experiments such as these is that the turbidity or scum in the solutions was not caused by a development of organisms, but by some coagulation or similar alteration in the fluid, and that the bodies seen in the solutions were not living, but dead, and had been there all the time. . . .

"Considering, on the one hand, the *a priori* improbability of the formation of bacteria, etc., *de novo*, with the great weight and high value of the evidence already adduced against its occurrence, and estimating, on the other, the value of the evidence here put forth, it seems very unlikely that Dr. Bastian's results will be confirmed."

Two months later, on the 1st of January,

¹ *Annales de Chimie et de Physique*, t. i., 1862.

² *Nature*, September 15, 1870.

1873, there appeared another review of my work in the *Quarterly Journal of Microscopical Science*. This time the article was unsigned; but it has since become known to many persons that it was written by a now distinguished Professor of Comparative Anatomy. After referring to some unsuccessful attempts which had been made by Prof. Burdon-Sanderson to obtain such results as I had indicated, and after dwelling upon other evidence which the reviewer considered adverse to the recognition of the truth of these results, he says: "This evidence is overpowering; but still Dr. Bastian does not yield." He then continues as follows:

"We set ourselves at the commencement of this notice the task of determining whether Dr. Bastian had made out a *prima-facie* case. We cannot say that the various considerations adduced above allow us to hold that he has. . . . Biologists would, we hold, be perfectly justified in refusing to be troubled by him any further. Time and skill are not to be wasted in confuting statements manifestly unceritcal. . . . Nevertheless, in consequence of the interest which Dr. Bastian's work has excited, we have made the experiment, and that repeatedly. This is not the occasion on which to give the details of the experiments in question. It will, however, perhaps add some value to the remarks which it has been our duty to make when we state that, carefully following Dr. Bastian's directions, using at the same time great care as to cleanliness and due boiling, we have obtained results which, *in every single instance*, out of more than forty tubes closed on four separate occasions, simply contradict Dr. Bastian."

But in the intervening month of December my colleague, Dr. Burdon-Sanderson, had accepted my invitation to allow me to show him the nature of my method and the reality of my results, with the understanding that he should subsequently publish an account of them. His description of these experiments bears the date of the 1st of January, 1873, viz., the very day of the publication of the last-mentioned review; and it is to be found in *Nature* of January 8th. As a sequel to the previous quotations, it will be useful to reproduce its closing paragraph:

"The accuracy of Dr. Bastian's statements of fact, with reference to the particular experiments now under consideration, has been publicly questioned. I myself doubted it, and expressed my doubts, if not publicly, at least in conversation. I am content to have established—at all events to my own satisfaction—that, by following Dr. Bastian's directions, infusions can be prepared which are not deprived, by an ebullition of from five to ten minutes, of the faculty of undergoing those

chemical changes which are characterized by the presence of swarms of bacteria, and that the development of these organisms can proceed with the greatest activity in hermetically-sealed glass vessels, from which almost the whole of the air has been expelled by boiling."

Subsequently these results were also confirmed by Prof. Huizinga, of Groningen, and by two or three most competent German investigators. The matter of fact, therefore, was at last considered to be definitely established.¹

The view enunciated by Mr. Moseley in the *Academy* in regard to my experiments was substantially similar to that which Prof. Huxley had started at one of the sectional meetings of the British Association in 1870; and although in less than three years from that time it had been, as we have seen, abundantly refuted both in this country and on the Continent, Prof. Tyndall three years later—that is, early in 1876—attempted to deny that such experimental results as mine could be legitimately obtained, and sought to convince the Royal Society and a crowded audience at the Royal Institution that I had fallen into error, and that no such results could be obtained by a skilled experimentalist like himself. In evidence of this he brought forward a "cloud of witnesses," all of which, if rightly interpreted, gave very different testimony from that which Prof. Tyndall imagined. But, while he at first strenuously denied my facts, he is now able only to demur to my interpretation.

All this opposition, as will readily be seen, is to be taken as the measure of the antecedent certainty that all living matter is killed by a brief but real exposure to a temperature of 212° Fahr.

The modern opponents and supporters of the doctrine of "spontaneous generation" have always been principally concerned with two sets of problems: 1. As to the nature of the material in the air, the access of which is so apt to induce fermentation in suitable fluids; 2. As to whether some degree of heat below 212° Fahr. can be proved to be always sufficient to destroy the life of different kinds of living matter in the moist state, but especially that of bacteria and fungus germs.

In regard to the first set of problems, it has been generally agreed for some time that the air

¹ This, of course, was the point originally in dispute, and concerning which it was of most importance that there should be no discrepancy. It was to this matter of fact only that Dr. Burdon-Sanderson testified as above.

contains some germs of living organisms, but that what proportion these bear to the much more bulky, and probably more numerous, organic particles and fragments resulting from the breaking up of previous living matter of various kinds, is uncertain. It has been also generally admitted that any living organisms or germs which chanced to fall from the air into suitable fluids would initiate fermentation or putrefaction therein. The question really requiring to be solved has always been (though it has not been uniformly recognized) whether mere organic *débris* from the air, either in the form of particles or of larger fragments, could or could not also bring about such changes in suitable fluids.

The legitimacy of this doubt is perfectly obvious. The doctrine of fermentation generally adopted anterior to that of M. Pasteur was the one promulgated by Baron Liebig. This latter has been known as the physical or the chemico-physical theory, in contradistinction to that of M. Pasteur, which is commonly spoken of as the germ-theory, or the vital theory of fermentation. Now, according to the original doctrine of Liebig, a *ferment* was a portion of organic matter in a state of *motor-decay*. The molecular movements communicated to a suitable liquid by such changing organic matter were supposed by him to be capable of initiating fermentative changes. In short, Liebig attributed to decaying organic matter just such functions as Pasteur has striven to concede only to living units or organisms.

It is Liebig's doctrine, therefore, which legitimately suggests the doubt above mentioned in regard to the possible potencies of atmospheric particles other than actual germs. It was his view which from the first made it desirable that absolute proof should be looked for from the germ-theorists before their doctrine was accepted, and before effects referable, it is true, to the influence of atmospheric dust are declared not to be in part accounted for by the fermentative agency of some of the dead organic particles and fragments with which the air is known to teem.

This is a view which is not peculiar to myself. It is, and has long been, held by others, in proof of which I need only quote the following brief passage from the writings of another celebrated German chemist. Speaking of experiments which had been made with suitable boiled fluids, exposed first of all to air which had been either calcined or filtered, and then to ordinary air, Prof. Gerhardt (*"Chimie Organique,"* t. iv., p. 545) says by way of comment upon the conclusions drawn from them by the germ-theorists:

"Si dans les premières expériences l'air calciné ou tamisé s'est montré beaucoup moins actif que l'air non soumis à ce traitement, c'est que la chaleur rouge ou le tamisage enlève à l'air non-seulement les germes des infusoires et des moisissures, mais encore les débris des matières en décomposition qui y sont suspendues, c'est-à-dire les *ferments* dont l'activité viendrait s'ajouter à celle de l'oxygène de l'air."

All this seems to me perfectly plain, yet Prof. Tyndall is pleased to find fault in the last number of this Review, because, as he says, the name of Baron Liebig has been unwarrantably or needlessly introduced into these discussions. He further accuses me of speaking in "vague" terms, because I have not quoted Baron Liebig for more than that to which he has given his testimony.

The correlation of organisms with the majority of fermentations is now freely admitted on all sides. But it was not a fact so well known to Liebig when he originally published his doctrine as to the causes of fermentation. Baron Liebig lived, however, into the time when the fact of this correlation was generally known and admitted, and he saw nothing therein to make him renounce his previous views. On the contrary, he slightly widened them after the correlation of organisms with fermentations had become established, and endeavored to show that the admitted actions of living units in initiating fermentations were but other exemplifications of his general doctrine, that fermentations are induced by certain communicated molecular movements, sometimes emanating from organic matter in a state of decay, and sometimes resulting from the vital processes of living units.

I quite agree with Prof. Tyndall in thinking that Liebig's was a truly scientific doctrine, founded, as the former tells us, on "profound conceptions of molecular instability."

If, then, as Liebig contended, organic matter in a state of decay is capable of acting as a ferment, and of initiating the common fermentations and putrefactions, there surely can be no error in quoting him in support of such views. And if it has also been shown that the appearance and increase of the lowest living particles are always a correlative of these processes, Liebig's view, if it is true at all, must be true for the whole of the processes which are essentially included under the term fermentation.

The heterogenist has, therefore, perfectly good ground for demanding proofs of error from the germ-theorist rather than more or less probable guesses based solely upon the germ-theorist's

way of thinking, before he abandons Liebig's fertile idea, supported by Gerhardt and others, that the mere organic matter of the air can engender fermentative changes in suitable fluids, leading, though it may, among other phenomena, to a new birth of living particles. This, too, the reader will observe, is a very different notion concerning the mode of origin of such new living particles from that which Prof. Tyndall persists in attributing to me—viz., the absurd idea that mere dead particles from the air are themselves "miraculously kindled into living things."

Now, it is to this first part of the subject that the great bulk of Prof. Tyndall's experiments belong. He has sought to throw light upon such problems as these: what ordinary air contains in the way of solid matter, what air subjected to different kinds of treatment contains, how the contents of the atmosphere differ in various places, how in these different conditions and places it affects previously-boiled fluids; and, by way of speculation only, as to the exact nature of the material which, falling into organic fluids from the air, incites fermentation therein. He has renewed the proofs of things which were not before doubted, and he claims in addition to have shown that the air contains invisible or "ultra-microscopical particles," which by their subsidence are, like larger particles or *débris*, also capable of contaminating organic infusions. But I fail to find in this latter fact, however much it may be confirmed, and however frequently it may be reiterated, any proof that such particles are "germs" of bacteria, especially when, on Prof. Tyndall's own testimony, the behavior of these invisible particles in regard to heat is altogether opposed to that of all known visible germs of which I or anybody else have any cognizance.

Burdach exhibited much sagacity some forty years ago when he said in reference to the invisible germs which were also postulated in his time:

"Les dit-on trop petits pour être aperçus, c'est avouer qu'on ne peut rien savoir de leur existence. . . . Croire que partout où l'on rencontre des infusoires, ils ont été précédés d'œufs, c'est donc admettre une pure hypothèse, qui n'a d'autre fondement que l'analogie. . . . Si c'est seulement par l'analogie qu'on suppose des œufs chez eux, il faut accorder à ces œufs des propriétés semblables à celles de tous les œufs connus: car ce serait jouer sur les mots que de supposer qu'ils en ont de particulières à eux seuls."¹

¹ "Traité de Physiologie." Translation by Jourdan, 1897, t. i., p. 22.

All this discussion about the nature of the atmospheric dust, visible and invisible, together with elaborate and ingenious experimentation to prove its infective nature, so far as fermentations are concerned, has not really advanced the main question one iota. It is, as we have seen, impossible for Prof. Tyndall, by all the refinements which he has introduced into the study of this part of the subject, to get beyond the simple conclusion of Schwann, long anterior to the labors of Pasteur, that the air contains a "something" which is infective; but we are no more able to say now than Schwann was in 1837 what is the precise nature of this something. In this view I am, as I shall subsequently show, supported by high authority.

My more simple experiments with glass vessels, from which most of the air had been expelled by boiling, and in which heat was relied upon as the scourge of all antecedent life, had, moreover, thoroughly shown that the essential question does not lie in the direction of Prof. Tyndall's experiments. The verdict in connection with spontaneous generation essentially depends on the answer which can be given to another problem. As the late Prof. Jeffries Wyman said,¹ "The issue between the advocates and the opponents of the doctrine in question clearly turns on the extent to which it can be proved that living things resist the action of water at a high temperature."

When any one asks what explanation can be given of the appearance of the lowest forms of living matter in previously-boiled and guarded infusions, only two interpretations are possible. There must have been (1) a survival of organisms or germs, or else (2) a new and independent birth of living particles. Yet, if we look at them merely in the light of previous experience, each of these interpretations seems alike at variance with our actual knowledge.

Many considerations and much thought will be required before any one would be likely to entertain the conclusion that the forms of living matter which appear in the previously-boiled fluids are primordial, and had arisen independently, in a mother liquid, somewhat after the fashion of incipient crystals; and similarly we ought, if our minds are free and unbiased, to hesitate much and long before we conclude that forms of living matter which are so minute as to be beyond the reach of present microscopes not only exist, but have properties totally different,

¹ *American Journal of Science and Art*, September, 1867.

in regard to their amenability to the destructive influence of heat, from all visible forms of living matter of similar nature. Yet these are the two alternatives which have to be considered by those who seek to interpret the experiments above referred to. It is not safe in such a question to lean too strongly upon analogy, and even if it were, it so happens, as I have elsewhere shown, that the arguments from analogy are very evenly balanced in their bearing upon these opposite views.¹

Should it be asked what warrant there is for supposing that living particles ever could come into being by an independent birth from fluids, somewhat after the fashion of incipient crystals, I would reply that the general kinship between living and not-living matter is freely admitted by men of science at the present day, as the following quotation may suffice to indicate. Prof. Huxley says:² "It is not probable that there is any real difference in the nature of the molecular forces which compel the carbonate of lime to assume and retain the crystalline form, and those which cause the albuminoid matter to move and grow, select and form, and maintain its particles in a state of incessant motion. The property of crystallizing is to crystallizable matter what the vital property is to albuminoid matter (protoplasm). The crystalline form corresponds to the organic form, and its internal structure to tissue-structure. Crystalline force being a property of matter, vital force is but a property of matter."

But the same inquirer may ask, Does anybody go so far as to say that living matter ever has come into being independently? To which I can only answer, It is the belief of our profoundest thinkers and foremost men of science that such a process did take place in the early history of this planet. This is the declared belief of many, both at home and abroad, of whom I will only mention among ourselves the names of Herbert Spencer and G. H. Lewes, together with those of Charles Darwin and Prof. Huxley. And that it may be seen that this is a view shared in even by a man who is notable for great caution and sobriety in regard to the acceptance of mere fanciful hypotheses, it will only be necessary to quote from an address delivered last autumn before the German Association of Naturalists and Physicians by Prof. Virchow. After demurring to the promulgation of different doctrines which he regarded as unproved, Virchow says:³ "Nevertheless, I admit that if we indeed *want* to

form an idea how the first organic being *could* have originated by itself, nothing remains but to go back to spontaneous generation. This is clear. If I do not want to suppose a creation-theory, if I do not want to believe that a special creator existed, who took the clod of clay and blew his living breath into it, if I want to form some conception in my own way, then I must form it in the sense of *generatio aquivoca*."¹

But does any one, other than Dr. Bastian, hold that some such process as is here supposed could have taken place more than once—that it does take place even now? This is a question which an ingenuous reader may well put after reading Prof. Tyndall's denunciation of my views in the last number of this Review. To this, again, I can only reply that there are such men—men, too, who occupy an exalted position in the world of science. As a botanist I can name M. Trécul, and as a chemist M. Fremy, both of them members of the Institute of France; while in Italy I can cite Prof. Cantoni, who holds the chair of Physics at Pavia, as well as Prof. Oehl and Prof. Leopoldo Maggi. There are others whom I might mention, but it would be of little use, and instead I will subjoin a quotation from one of our own most eminent thinkers. As this is taken from a work published only last summer,² its author may be presumed to have been fully aware of the major part of the evidence and reasoning of an adverse kind which Prof. Tyndall has of late adduced. Mr. G. H. Lewes writes (page 122): "I cannot see the evidence which would warrant the belief that life originated solely in one microscopic lump of protoplasm on one single point of our earth's surface; on the contrary, it is more probable that from innumerable and separate points of this teeming earth myriads of protoplasts sprang into existence *whenever* and *wherever* the conditions of the formation of organized substance were present. It is probable that this has been incessantly going on, and that every day new protoplasts appear, struggle for existence, and serve as food for more highly-organized rivals."

Such processes could not come within the common knowledge of mankind. What can ordinary persons know on the question whether specks of living matter less than $\frac{1}{1000000}$ of an inch in diameter are constantly coming within visible limits after an independent birth from fluids? Yet this supposition has been spoken of

¹ Virchow distinctly states, however, that in his opinion the occurrence of any such process at the present day has never been proved.

² "The Physical Basis of Mind," by G. H. Lewes, 1877.

¹ "Evolution and the Origin of Life," 1874, pp. 50-57, and 15-29.

² *Fortnightly Review*, February, 1869.

³ See *Nature*, November 29, 1877, p. 93.

by Prof. Tyndall as an interpretation of the appearance of such specks which "violates all antecedent knowledge." This cannot be true; it may be at variance with a favorite argument from analogy, but, as regards the cause of the phenomenon itself, this is, and ever has been, beyond the reach of "antecedent knowledge." As I have elsewhere¹ pointed out, living matter, like crystalline matter, can originate or come into being only by a synthesis of its elements; but because organisms (owing to the intrinsic properties of living matter) have well-known powers of self-multiplication, the obviousness of these modes of reproduction has sufficed to cast doubts upon the reality of the independent origin of the lowest living units, by supplying material for the building up of a plausible but one-sided analogical argument against the reality of that which must always remain beyond the sphere of actual observation.

After the before-mentioned confirmation of my experiment by others in 1873, and after witnessing the ease with which the old beliefs as to the destructive influence of fluids at 212° Fahr. upon ferment organisms and their germs were then thrown aside,² I immediately instituted new inquiries concerning the death-point of such organisms in fluids, in order to try and ascertain again whether there was or was not any justification for this procedure.

This new series of experiments, of which a record is to be found in the "Proceedings of the Royal Society" for 1873, seems to show conclusively that the bacteria and all the reproductive particles which they may possess, which were purposely immersed in the organic infusions with which the experiments were made, were killed, as I had previously ascertained, at a temperature of 140° Fahr. Similar experiments were made very shortly afterward, in the same manner, by Prof. Cohn, of Breslau, assisted by Dr. Horvath, and they also arrived at the conclusion that the common bacteria were killed in fluids by a brief exposure of from five to ten minutes to a temperature of 140° Fahr. Although these experiments were made after mine, they seem to have been executed without any knowledge of my results, so that the independent confirmation which they afford is all the more satisfactory.

The method of procedure employed in these experiments was of such a nature that the conclusion arrived at was, as I pointed out at the time, applicable to any germs, whether visible or

invisible, by which bacteria may multiply in fluids, as much as to the parent organisms themselves.

When Prof. Tyndall was at last, after his unsuccessful "Combat with an Infective Atmosphere,"¹ compelled to turn his attention from this side of the subject to the heat-resisting powers of living matter, in order to find some hypothesis which would explain the very contradictory results of his first and of his second series of experiments, the public generally was told through the *Times* of the 9th of June last, as his audience at the Royal Institution had been on the previous evening, that "the gravest error ever committed by biological writers on this question consists in the confounding of the germ and its offspring." Though the parent organisms were, as he was prepared to admit, killed at 140° Fahr., it was far otherwise with the "germs," which, though invisible, were described as "indurated and resistant."

Now, it is difficult to conceive any statement more hopelessly incorrect than this of Prof. Tyndall with respect to the supposed "error" of biological writers. As above indicated, any distinction existing between germs and finished organisms in regard to their resistance to heat had always been thoroughly borne in mind by me, and the same may be said of all the principal workers from the Abbé Spallanzani downward. Moreover, in my "Evolution and the Origin of Life" I devoted many pages (pp. 141-168) to a discussion of all the most important facts which were then known in regard to this question.

But again our attention has been called to another thoroughly familiar fact, as though it were one which had hitherto escaped attention. In order seemingly to explain Prof. Tyndall's supposition that the invisible germs whose existence he postulates are really "indurated and resistant," as he imagines, we have been more than once reminded that the (wholly different) desiccated seeds of many plants which are provided with thick and horny coats can resist the penetration of water for a very long time, and can even retain their vitality occasionally after they have been boiled in water for four hours.

But Prof. Tyndall tries to make even a more specific use of this fact. In this Review last month, after referring to some statements which I have made in reference to the influence of boiling water upon living matter, he adds:

"But to invalidate the foregoing statements it is only necessary to say that eight years before they were made it has been known to the wool-

¹ "The Beginnings of Life," vol. ii., p. 77

² *British Medical Journal*, January 27, 1877.

staplers of Elbœuf, and Pouchet had published the fact in the *Comptes Rendus* of the Paris Academy of Sciences, that the desiccated seeds of the Brazilian plant *medicago* survived fully four hours' boiling. . . . So much for the heterogenist's mistake in regard to ordinary seeds."

Now my readers will be surprised to learn that this particular example, which is to invalidate my statements, had been discussed by me, in 1872, in my "Beginnings of Life" (vol. i., p. 314), as may be seen from the following quotation:

"Seeds of higher plants, provided with a hard coat, may—especially after prolonged periods of desiccation—germinate even after they have been boiled for a long time in water. This was ascertained by M. Pouchet to be the case with an American species of *medicago*. Some of the seeds were completely disorganized by this boiling temperature, while a few remained intact, and it was these latter which were afterward found to germinate. They had been protected from the influence of the hot water by their very dry and hardened coats. On this subject Prof. Jeffries Wyman says: 'Water penetrates the seeds of many plants, and especially of some of the *Leguminosæ*, very slowly; in the case of *Gleditschia* and *Laburnum* we have found several days and even weeks necessary for the penetration of cold water, though when the water is hot it penetrates much more readily. If, therefore, the seeds are dry when immersed, and are boiled for a few minutes only, they may still germinate. If they are moistened beforehand, the action of boiling water has been found uniformly fatal.' . . . All the organisms in which we are interested at present, however, have no such protection. These are mere specks or masses of protoplasm, which are either naked or provided only with thin coverings."

Thus it will be seen that the facts newly discovered by Prof. Tyndall, which were to invalidate my views, were with others nearly five years ago referred to by me—and their value was, I trust, duly estimated. But upon this subject I must notice another instance in which Prof. Tyndall has misinformed the public in regard to my mode of dealing with these questions. At page 43 of the last number of this Review, he says, "Throughout his long disquisitions on this subject, Dr. Bastian makes special kinds of living matter do duty for *all* kinds." But the real fact is wholly different, since my reference to the question of the power of resisting unaccustomed heat which is possessed by living matter had included a reference to all the forms of it with which experiment had been made (so far as I had been able to ascertain) up to the date of my last con-

tribution to this subject, in 1874. These inquiries were thus summarized:¹

TEMPERATURES AT WHICH DEATH OCCURS.

Are killed at

Simple aquatic organisms (<i>Spallanzani</i> , <i>Max Schultze</i> , and <i>Kühne</i>)	104°–113° F.
Tissue-elements of cold-blooded animal—frog (<i>Kühne</i>)	104°
Tissue-elements of warm-blooded animal—man (<i>Stricker</i> and <i>Kühne</i>)	111°
Tissue-elements of plants— <i>Urtica</i> , <i>Tradescantia</i> , and <i>Vallisneria</i> (<i>Max Schultze</i> and <i>Kühne</i>)	116½°–118½°
Eggs, fungus-spores, and bacteria-germs (<i>Spallanzani</i> , <i>Liebig</i> , <i>Tarnowski</i> , and others)	122°–140°

In respect to such results of independent investigation I made the following comments: "We have only to bear in mind two or three general principles in order to be able to harmonize the several experimental results arrived at with the now very generally admitted doctrine as to the oneness or generic resemblance existing between all forms of living matter. We must bear in mind, first of all, the consideration enforced by Spallanzani, that there are different grades of vitality, or, in other words, different kinds of living matter, exhibiting more or less of the phenomena known as vital; and that of these kinds those which would exhibit the most active life are those which would be most easily killed by heat. Thus we should expect the latent life of the germ, egg, or seed, to be less easily extinguished than the more subtle and, at the same time, more active life of the fully-developed tissue-element or organism; and we should also expect that the vegetal element or organism would, as a rule, be less readily killed than the more highly-vitalized animal organism. These principles, based upon the relative complexity of life, are, however, subject to the influence of a disturbing cause. . . . Custom or habitual conditions may tend to render the more active tissue-elements of warm-blooded animals better able to resist the influence of heat than similar elements of less highly-vitalized cold-blooded animals."

These considerations I have thought it best to quote, partly because they throw light upon the independent results above tabulated, and partly because they illustrate the degree of truth contained in another of Prof. Tyndall's statements concerning facts or views which I have adduced. But even if I had, as he says, made

¹ "Evolution and the Origin of Life," p. 166.

"special kinds of living matter do duty for all kinds," I should not have lacked the countenance of high authority for the assumption that the fundamental properties of all living matter are similar. I may perhaps be permitted to call his attention to what Prof. Huxley¹ has eloquently said on this subject: "Beast and fowl, reptile and fish, mollusk, worm, and polyp, are all composed of structural units of the same character—namely, masses of protoplasm with a nucleus. . . . What has been said of the animal world is no less true of plants. . . . Protoplasm, simple or nucleated, is the formal basis of all life. . . . Thus it becomes clear that all living powers are cognate, and all living forms are fundamentally of one character."

On the all-important subject of the death-point of living matter, therefore, and on the degree to which a power of resisting prolonged and higher temperatures is conferred upon bacteria or their germs by virtue of their previous desiccation, I am quite unable to accept Prof. Tyndall's assumptions. I go no further than to say that in the present state of the evidence bearing upon the subject I regard the hypothesis of spontaneous generation as the most logical and consistent interpretation of the facts which are at present known. I am far from asserting that further experiments *may* not shift the balance of evidence in the opposite direction, but in order that this may be brought about something more than assumption must be forthcoming.

When legitimate evidence is adduced, I hope I shall not be unamenable to its influence. I shall, however, continue quite obdurate in face of the "reasoning" in which Prof. Tyndall indulges on this subject. In the early part of his recent communication he referred to the mental bias which had influenced the late M. Pouchet; but he has himself shown an even more obvious bias in the contrary direction. Thus he has informed me through the columns of the *Times*, in one of those replies with which he has favored me from time to time, that only one interpretation of the fermentation of superheated fluids is possible. The notion of the survival of germs alone finds favor with him, and he roundly dismisses the interpretation that the phenomena may have been caused by a new birth of living particles as no interpretation at all. Thus, in a letter which appeared on the 18th of June, 1877, he said:

"Dr. Bastian says that two interpretations of my facts are equally admissible. He is again wrong;

there is but one interpretation possible. An interpretation which violates all antecedent knowledge is no interpretation at all. . . . The inference that a particle which when sown produces a thistle is the seed of a thistle is not surer than the inference that the particles described in the *Times* as rising in clouds from shaken hay are the seeds of bacteria."

Having thus set his seal upon Nature's possibilities, a corresponding interpretation of his experiments and those of other workers is freed from all difficulty. Whenever fermentation occurs in guarded and previously superheated fluids, the interpretation is, to Prof. Tyndall, always plain and simple. He says: "I have had several cases of survival after four and five hours' boiling, some survivals after six, and one survival after eight hours' boiling. Thus far has experiment actually reached, but there is no valid warrant for fixing upon even eight hours as the extreme limit of vital resistance." He holds out the hope that further researches "might reveal germs more obstinate still." Now, one's comment upon all this is, that with Prof. Tyndall it is not a question of revelation at all, but rather one of mere assumption. What could be clearer than his reasoning? He argues from a one-sided analogy that bacteria *must* spring from seeds, and then uses this *must* as the ready interpretation of all his experiments, shutting his eyes apparently to all other considerations, even though this interpretation "violates all antecedent knowledge," as it certainly does. What present warrant is there for supposing that a naked, or almost naked, speck of protoplasm can withstand four, six, or eight hours' boiling? To which I can only answer, none.

Let Prof. Tyndall's statements in regard to the existence of invisible bacteria-germs and their properties be contrasted with those which other more sober believers in the same germ-theory, who are similarly indisposed to admit spontaneous generation, feel entitled to make.

The medical profession has recently been told, through the Pathological Society, by Prof. Lister,¹ that he thinks it highly improbable that bacteria have any germs at all, and that, whether they have or not, he has never met with any whose reproductive elements (in whatsoever stage or condition they may exist) could survive an immersion for half an hour to a temperature 2° below the boiling-point of water (212° Fahr.). He says:

"I am aware that there are two instances, the

¹ "Lay Sermons," pp. 126-129.

¹ See *British Medical Journal*, December 22, 1877, pp. 905 and 902.

Bacillus anthracis and the *Bacillus subtilis*, in which it is said that the actual germs of bacteria do exist. I have seen nucleated bacteria myself. I confess I have never seen things which resisted such treatment as these germs are said to have resisted in the hands of others. But even these germs are not ultra-microscopic. They are bright points that are seen, bright granules. There has never been evidence of any ultra-microscopic germ. . . . For my own part I think it extremely improbable that bacteria in general have germs. They are actual reproductive organs, constantly multiplied by segmentation; and, if there be any organism in existence that does not require germs, I should say it is the bacterium. . . . I have never yet found any organism which resisted the temperature of 210° continued for half an hour—I mean to say in the moist state. I have seen no organism in a liquid continue fertile after exposure to 210° Fahr. for half an hour.”

On the other hand, in direct reply to Prof. Tyndall, Prof. Burdon-Sanderson¹ recently made the following statements before the Royal Society:

“Dr. Tyndall has demonstrated, by the experiments to which I have already alluded, that the ordinary air also contains *germinal particles* of ultra-microscopic minuteness. . . . That such particles exist there can be no question; but of their size, structural attributes, or mode of development, we know nothing. . . . If, for the sake of clearness, we call the particle *a*, and the organism to which it gives rise *A*, then what is known about this matter amounts to no more than this, that the existence of *A* was preceded by the existence of *a*.”²

While at the meeting of the Pathological Society, shortly afterward, to which I have above referred, Prof. Burdon-Sanderson said concerning the question whether things can be shown to exist which are the seeds of bacteria, “I entirely

¹ See *Nature*, November 29, 1877.

² I would here point out that Dr. Sanderson does not state that the invisible particle (*a*) grows bodily into the visible organism; he is, of course, quite unable to make any such affirmation, because such particles may give rise to organisms by inciting chemical changes in the organic fluid of such a nature as to determine an independent development of the particles of living matter which subsequently show themselves, and develop into bacteria (*A*). His use of the epithet “germinal” is, therefore, as it appears to me, rather open to misconception. It carries with it an unproved implication.

agree with Prof. Lister in the opinion that no proof has been given of any such seed with reference to common bacteria.”

Having had to occupy so much space in attempting to correct the very erroneous impressions which Prof. Tyndall's paper in the last number of this Review was calculated to spread abroad, I have no room, even if it were desirable for me, to add anything further as to my present views on this question, or on that of the derivative problems concerning the origin of communicable diseases. It has only been with great reluctance and inconvenience to myself that I have been compelled to come forward now as I have done, to defend my views from the misrepresentations of them which have of late been made by Prof. Tyndall. I felt also that it was incumbent upon me to endeavor to rescue the general question from the confusion in which it is fast being involved by so many contradictory utterances on all sides. All scientific readers who care to go further in regard to my views, will find that I have pretty fully considered the present bearings of the evidence in relation to these problems in a recent paper in the Zoölogical Section of the *Journal of the Linnean Society*.

What I have said, however, in these pages will, I trust, be sufficient to make it clear how much the weight of reason is on my side, and to show that the doctrine of “spontaneous generation,” far from being worthy of almost universal repudiation, as it was thought to be when I first wrote on the subject in 1870, is one which is now well supported by evidence. Even if it cannot be considered to be absolutely proved, I hope I may have made it perfectly clear that those who would show that the balance of evidence is against its being a common process at the present day can only do so by bringing forward proofs that ferment organisms are really able to withstand a brief exposure to 212° Fahr. in fluids—proofs that are stronger than the evidence which, up to 1870, had engendered the almost universal belief that nothing of the kind was possible. As I have said, a good measure of the intensity of this previous belief is afforded by the incredulity with which my now admitted experiments were at first received—*Nineteenth Century*.

BENEDICT DE SPINOZA.¹

By FREDERICK POLLOCK.

IT is now two hundred years since there died, in an obscure lodging at the Hague, Benedict de Spinoza, a philosopher appreciated in his own time only by a very few. His name was indeed widely known, but it was for the most part known only to be execrated. For some time after his death *Spinozist* was current among the theologians of Holland as a term of opprobrium. Spinoza's thought, however, was of that vital kind which sooner or later cannot fail to make for itself a way into its due place. Some three-quarters of a century after his death came the great awakening of letters and philosophy in Germany, and the leaders of that movement, among whom the name of Lessing must be mentioned first, were not slow to perceive Spinoza's importance. Ever since that time his influence has been a widening and increasing one: not that I stop to maintain this in the strictest sense which can be put upon the words, for I do not think a philosopher's influence is properly measured by the number of persons who agree with his doctrines. Philosophical doctrines have been, and will doubtless continue to be, matter of controversy, but it is no matter of controversy that the life of a righteous man who gives up all else that he may seek the truth for its own sake is a sure and priceless possession for all the generations of men who come after him.

BARUCH DE SPINOZA was born at Amsterdam on the 24th of November, 1632. His parents were members of the Portuguese synagogue, a community established toward the end of the sixteenth century by Jewish exiles from Spain and Portugal, who had turned to the United Provinces as a safe asylum. For at this critical time Holland, it should be remembered to her eternal honor, was the most tolerant commonwealth in Europe. Spinoza was brought up in the course of Hebrew learning then usual, and at the age of fifteen was already distinguished for his knowledge of the Talmud. He was also familiar from his youth up, as his writings bear witness, with the masterpieces of the golden age of modern Jewish literature. From the tenth

to the twelfth centuries there flourished at the Mohammedan courts of Spain and Africa a series of Arab and Hebrew philosophers who held a position with regard to the societies in which they lived much like that of the Catholic schoolmen afterward with regard to Western Christendom. Like the schoolmen, they set themselves to effect a fusion of the Aristotelian philosophy with the accepted theology of their churches; and the schoolmen were in fact acquainted with their work to a considerable extent, and referred to it quite openly, and in general with respect.¹

The Jewish schoolmen, if we may so call them, cannot be said to have founded any distinct philosophical doctrine; in philosophy they were hardly distinguishable, if at all, from their Mohammedan compeers. But they gave a distinct philosophical cast to Jewish theology, and thereby to Jewish education. Two names stand out foremost among them. Ibn-Ezra (1088–1166 A. D.) was a traveler, astronomer, grammarian, and poet, in addition to the learning in theology and philosophy which made his commentaries on the Scriptures classical. But the chief of all is Moses ben Maimon (1135–1205 A. D.), who became known in Europe as Maimonides, the father of modern Jewish theology. He was regarded with such veneration as to be compared to the great Law-giver himself, so that it passed into a proverb, "From Moses until Moses there arose none like unto Moses."² The Jewish peripatetic school was also represented in Provence, where, in the fourteenth century, Levi ben Gerson, the most daring of all the Jewish philosophers, and Moses of Nar-

¹ The names of Ibn-Roshd (Averroes) and Ibn-Sinā (Avicenna) were familiar in Europe, and Dante groups them ("Inferno," iv., 143) with the leaders of classical science and philosophy. Ibn-Gebirol (Avicbron), a Jewish member of the school, broke with the Aristotelian tradition to take up Neo-Platonic ideas. His philosophical work was discredited and fell into oblivion among his own people; but it became current in Europe in a Latin form, and was used by Giordano Bruno, through whom it may have thus come round to Spinoza.

² In later times the proverb received an extended application in honor of Moses Mendelssohn, the grandfather of the musician, himself a philosopher and the restorer of Jewish culture in Germany. Maimonides's reputation was not established without conflict. About 1235 his opinions were formally condemned by the synagogue of Montpellier.

¹ In the course of this paper I shall have to refer several times to Dr. A. van der Linde's "*Benedictus Spinoza: Bibliografie*" (the Hague, 1871), which gives a full account of the literature of the subject.

bonne, were its most conspicuous members. This philosophical treatment of theology was on the whole generally accepted, but did not pass without controversy: in particular R. Chasdai Creskas, of Barcelona (flour. 1410 A. D.), whom Spinoza cites by name,¹ combated the peripatetics with great zeal and ability from an independent point of view. A mind like Spinoza's could not well have found anything more apt to stir it to speculation and inquiry than the works of the men I have named. They handled their subjects with extreme ingenuity, and with a freedom and boldness of thought which were only verbally disguised by a sort of ostentatious reserve. Both Maimonides and Ibn-Ezra delighted to throw out hints of meanings which could not or must not be expressly revealed. Maimonides, in the introduction to his principal work, entreats the reader who may perceive such meanings not to divulge them. Ibn-Ezra says in his commentaries: "Herein is a mystery; and whoso understandeth it, let him hold his peace."² The mysteries were, however, not so carefully concealed but that an open-eyed reader like Spinoza might easily find in them the principles of rational criticism which he afterward developed in the "*Tractatus Theologico-Politicus*."

At the same time Spinoza was far from neglecting secular learning and even accomplishments. His master in Latin, after he had acquired the rudiments elsewhere, was Francis van den Ende, a physician of Amsterdam who had a high reputation as a teacher, and was also well versed in the natural sciences. It is highly probable that he communicated this part of his knowledge also to Spinoza, who certainly had very sound instruction of that kind at some time; for it is remarkable (as Mr. G. H. Lewes has well pointed out) that Spinoza seldom or never makes mistakes in physics. The references and allusions in Spinoza's writings show that he had a fair knowledge of Latin literature; of Greek he knew something, but not much.³ He wrote a Latin which, though not classical, was a very sufficient instrument for his purposes, and which he handled with perfect freedom. He seems to have been also familiar with Italian; and Spanish and Portuguese must have been almost as native to him as Dutch. About this time the philosophy of Descartes was in the first flush of its renown, and, like most new and brilliant things, was ve-

hemently suspected of heresy. Spinoza made himself thoroughly familiar with it, his companions in this study being Henry Oldenburg and Dr. Lewis Meyer, the most constant of his friends in after-life. It is at least doubtful, however, whether he was at any time a Cartesian. When he published a short exposition of the system in 1663 (the only work he ever set his name to), it was with an express warning that it did not represent his own opinions. At the same time it is beyond question that Descartes exercised a powerful influence upon the form and direction of Spinoza's speculations. Until of late years his part in this matter has been unduly exalted, and that of the Jewish philosophers underrated, or rather forgotten; but it would be very possible to carry the reaction to excess. In Spinoza's own time it is pretty certain that those who knew him only at second hand looked on him as a sort of erratic Cartesian. We know what Locke thought of the Cartesians as a body, and thus Locke's entire neglect of Spinoza may be explained. Those who followed Locke in England seem to have taken for granted, after his example (though in Berkeley we do find specific references to Spinoza), that Spinoza's philosophy was not worth serious attention.

To these graver studies Spinoza found time to add no small skill in drawing. He filled a book with sketches of distinguished persons of his acquaintance, as we are told by his biographer Colemus,¹ who had the book in his possession. The same writer tells us that Spinoza's master, Van den Ende, had a learned, witty, and accomplished daughter, who took part in teaching his pupils, and Spinoza among them. From a learner, the tale says, he became a lover, but was supplanted by a fellow-pupil named Kerkerling, who wooed and won the lady, not unassisted by the material persuasion of a valuable pearl necklace. The story passed current until it was rudely called in question by the facts which Dr. van Vloten discovered and published in 1862. True it is that Van den Ende had a daughter, but she was only eleven years old at the latest time when Spinoza can have been her father's pupil. True it is that she married Theodore Kerkerling, but not till several years after, in 1671. He was, like her father, a physician, and earned a considerable scientific reputation by his work in medicine, chemistry, and anatomy. The match appears to have been a very natural and proper one, and the

¹ "*Judæum quendam, Rab Ghasdai vocatum*."—Ep. XXIX., *ad fin.*

² Ap. Spinoza, "*Tract. Theol. Pol.*," c. 8, § 9. The mystery seems innocent enough to a modern reader.

³ He expressly disclaims anything like critical competence in it ("*Tract. Theol. Pol.*," cap. 10, *ad fin.*).

¹ The name is a Latinized form of Köhler. He was the minister of the German Lutheran congregation at the Hague.

rivalry with Spinoza and the pearl necklace must be dismissed as inventions. It does not necessarily follow, however, that the tale of Spinoza's love for Clara van den Ende is wholly without foundation. Van den Ende probably continued to see something of his former pupil until, to his misfortune, he left Holland;¹ and we know that Spinoza was from time to time at Amsterdam. Besides this, nothing forbids us to suppose that even from an earlier date there may have sprung up a half-romantic, half-childish affection between Spinoza and Klaartje. Beatrice was only nine years old, and Dante himself only ten, when the "glorious lady of his soul" first showed herself to his eyes, and the word came to him, *Ecc deus fortior me, qui veniens dominabitur mihi*. So that if any one is minded to cling to this one piece of romance in Spinoza's life, I think he may do so by taking the story with some such qualification as here suggested.² I must confess, however, that my own inclination is, on reflection, toward entire unbelief. The story as told by Colerus is not credible, and any credible story we may devise in its stead must be so different from that given by Colerus as to rest in turn on no evidence at all. Besides, the testimony of Colerus is here at its weakest; he does not report this matter, as he does many others, as being within the actual knowledge of himself or his informants, but refers for confirmation to authorities which are all but worthless.³

¹ Van den Ende migrated to France, where he involved himself in a political conspiracy, hoping that it might turn to the profit of his own country, and was hanged at Paris in 1674.

² Most recent writers, including Auerbach, to whom it must have given a pang to cast away the foundation of his charming novel, treat the whole story as a fable. Dr. van Vloten himself ("Benedictus de Spinoza," second edition, 1871, p. 21), and Dr. H. J. Betz, of the Hague ("Levensschets van Baruch de Spinoza," 1876), take a line not unlike what I have given in the text. Dr. Rothschild ("Spinoza: zur Rechtfertigung seiner Philosophie n. Zeit," Leipzig, 1877) boldly maintains Colerus's account as historical, and dismisses the objection as to dates with the remark, "Es giebt frühreife Naturen."

³ Kortholt ("Detribus Impostoribus Magnis," No. 82 in Van der Linde, cf. No. 287), and the article on Spinoza in Bayle's Dictionary. Kortholt's "three impostors" are Hobbes, Lord Herbert of Cherbury, and Spinoza. The book has nothing to do (beyond the studied similarity of title) with the famous, perhaps mythical, "Detribus Impostoribus," which is a standing riddle of bibliography. Of this, however, a spurious French version circulated in manuscript in the eighteenth century, under the name of "L'Esprit"—or, bound up with Lucas's biography, "La Vie et l'Esprit—de M. Benoit de Spinoza." (See Van der Linde, Nos. 99-102.)

So much we know of Spinoza for the first twenty-three years of his life. We may well believe that he had not long attained man's estate before the freedom of his thought and discourse, and perhaps also laxity in ceremonial observances, began to excite attention among the elders of his people; but, whatever suspicions may have been conceived, and whatever informal warnings may have been given, no action was taken till 1656. A community which owed its existence to flight from repeated persecutions might be expected by a hasty observer of human nature to practise toleration itself; but experience is far from warranting such an inference. Witness the example of the settlers of New England, whose first use of their freedom from the yoke of Episcopacy was to set up a new ecclesiastical tyranny after their own patterns, of a kind not less oppressive and infinitely more vexatious. There is too much reason to fear that the Jewish exiles from Spain and Portugal had learned some of the evil lessons of the Inquisition.¹ Apart from this, the synagogue of Amsterdam had good reasons of secular policy for being scrupulous, even to excess, in its appearance to the outer world. Holland was indeed the land of toleration; but toleration was not such as we are nowadays accustomed to, and at this very time theological controversy ran high. The battle of Remonstrants and Contra-remonstrants was yet fresh in men's minds; and it behooved a society of men foreign in religion, language, and manners, which had been at first received with suspicion, and which existed only on sufferance, to let nothing pass among them which could lay them open to a charge of promoting new heresies or being indifferent to the general interests of religion. Hence we can understand the extreme anxiety to avoid an open schism, which marked the first proceedings in Spinoza's case. The elders would have preferred to retain Spinoza in apparent conformity, and offered him as the price of this a pension of a thousand florins. This being declined, it was probably considered that the only safe course remaining, though not a desirable one in itself, was for the congregation to renounce its freethinking member as completely as possible. Meanwhile, some obscure fanatic, thinking himself, no doubt, a messenger

¹ Dr. Grätz ("Geschichte der Juden," x., 14) says: "They had brought with them from Spain the fatal passion for maintaining the purity of the faith and exterminating heresy. The rabbis of Amsterdam introduced the new practice of sitting in judgment on religious opinions and beliefs, setting themselves up as a kind of Inquisition."

of divine justice, outran the zeal of his masters. One evening an unknown assailant set upon Spinoza with a dagger;¹ but he was on his guard in time, and the blow pierced only his coat, which he kept afterward as a memorial. This was a sufficient warning that Amsterdam was no safe place for him, and he left the city without waiting for the final decision of the congregation upon the charge of heresy against him. This was given on the 27th of July, 1656, to the following effect:

"The chiefs of the council do you to wit, that having long known the evil opinions and works of Baruch de Espinoza, they have endeavored by divers ways and promises to withdraw him from his evil ways, and they are unable to find a remedy, but on the contrary have had every day more knowledge of the abominable heresies practised and taught by him, and of other enormities² committed by him, and have of this many trustworthy witnesses, who have deposed and borne witness in the presence of the said Espinoza, and by whom he stood convicted; all which having been examined in the presence of the elders, it has been determined with their assent that the said Espinoza should be excommunicated and cut off from the nation of Israel; and now he is hereby excommunicated with the following anathema:

"With the judgment of the angels and of the saints we excommunicate, cut off, curse, and anathematize Baruch de Espinoza, with the consent of the elders and of all this holy congregation, in the presence of the holy books: by the 613 precepts which are written therein, with the anathema wherewith Joshua cursed Jericho, with the curse which Elisha laid upon the children, and with all the curses which are written in the law. Cursed be he by day and cursed be he by night. Cursed be he in sleeping and cursed be he in waking, cursed in going out and cursed in coming in. The Lord shall not pardon him, the wrath and fury of the Lord shall henceforth be kindled against this man, and shall lay upon him all the curses which are written in the book of the law. The Lord shall destroy his name under the sun, and cut him off for his undoing from all the tribes of Israel, with all the curses of the firmament which are written in the book of the law. But ye that cleave unto the Lord your God, live all of you this day.

"And we warn you, that none may speak with

¹ The exact place and circumstances, which, however, are not material, are variously related.

² "Ynormes obras que obrava." This I had supposed to be a piece of "common form" with no definite meaning; but I learn from a friend possessing special knowledge that it probably refers to distinct breaches of the ceremonial law; some such overt act, beyond mere speculative opinions, being required to justify the excommunication.—Cf. Grätz, *op. cit.*, 172, 175.

him by word of mouth nor by writing, nor show any favor to him, nor be under one roof with him, nor come within four cubits of him, nor read any paper composed or written by him."

Thus was Baruch de Spinoza cut off from his own people and from his father's house. Not only was he an outcast from Israel and deprived of all fellowship of his nation and kindred—and the ties of kindred are with his people of exceeding strength and sanctity—but he became as it were a masterless man, a member of no recognized community, having none to stand up by him or answer for him. Such a position might well seem a grave one in itself apart from the shock to his personal feelings.¹ Altogether the blow must have been such as it is at this time hard for us to understand. Spinoza, however, received the news of the excommunication with perfect equanimity. "This compels me," he said, "to nothing which I should not otherwise have done." Henceforth he disused his Hebrew name Baruch, and adopted the Latin form Benedict, which has the same meaning, and by which he is generally known. He now had to depend on his own work for a livelihood. It was a rabbinical precept that every one should learn a handicraft; and, in compliance with this, Spinoza had learned the trade of making lenses for optical instruments, which was, no doubt, chosen as congenial to his philosophical and scientific studies. He became so skillful in this art that the lenses of his make were much sought after, and some which were left undisposed of at his death fetched a high price. By this means he earned an income sufficient for his limited wants, and also a reputation for a thorough knowledge of optics, which appears to have spread more quickly than his fame as a philosopher. In this manner he was brought into correspondence with Huygens and Leibnitz. We find Leibnitz, for instance, writing to him in 1671 to ask his opinion on certain optical questions, and treating him as a person of recognized authority. Leibnitz's behavior to Spinoza, some years later, can only be called shabby. He professed great interest in Spinoza's philosophy, and endeavored to get a sight of the unpublished MS. of the "Ethics," which Spinoza's prudence did not allow him. On his return from a stay in Paris, Leibnitz visited Spinoza in person. In later years he joined the vulgar cry against him, and borrowed a funda-

¹ It is said that the Jewish elders represented to the civil authorities of Amsterdam that Spinoza was a dangerous person, that the Reformed clergy supported their request, and that Spinoza was actually banished from Amsterdam for a time. But Colerus knows nothing of this, nor is it in itself probable.

mental idea from his philosophy—which he also marred in the borrowing—without the slightest acknowledgment. The letter now in question begins thus :

"Among your other titles to fame," he says, "I understand that you have excellent skill in optics. To you, therefore, I have chosen to send this attempt of mine for what it may be worth, as on this subject it would be difficult to find a better critic."

The friends who were best acquainted with his work believe that if he had lived longer he would have made some important addition to the science.¹ As it was, Spinoza's "excellent skill in optics" was only indirectly useful for the advancement of knowledge by affording him the means of cultivating philosophy. On the death of his father, indeed, he became entitled to share with his two sisters an inheritance of some value. The sisters, imagining, as it is conjectured, that the excommunication had deprived him of civil rights, endeavored to exclude him from his share. Spinoza was of opinion, as we know from his writings, that in a country where just laws prevail it is every citizen's duty to resist injustice to himself for the sake of the common weal, lest, peradventure, evil men find profit in their evil-doing. He now acted on this principle, and asserted his rights before the law with success. Having done this, however, he declined to profit by them, and when the division came to be effected he gave up everything to his sisters but one bed, which he kept as a visible symbol of the established justice of his claim.

We know little of Spinoza's movements with certainty till the end of 1660 or beginning of 1661, when we find him at Rhijnsburg, a village near the mouth of the Rhine not far from Leyden. Thence he paid frequent visits to the Hague, where he increased his acquaintance with men of learning and eminence. This society must have had growing attractions for him as time went on, for in 1664 he moved to Voorburg, which is almost a suburb of the Hague, and finally about 1670 to the Hague itself. The greater part of what we know of his doings in after-years is derived from the selection of his letters which was made—with a far too sparing hand, unfortunately—by the editors of his posthumous works. The series of letters begins in 1661: the most important of Spinoza's correspondents, and also the most interesting to Englishmen, is Henry Olden-

¹ The only scientific work left by him was a small treatise on the rainbow. It was supposed to have been lost, but it was, in fact, published at the Hague in 1687 (Van der Linde, *Bibliografie*, No. 36), and has recently been discovered and republished in Van Vloten's "Supplement."

burg. Oldenburg spent the best part of his time in this country, where he settled in 1653. He was acquainted with Milton, and was the intimate friend of Robert Boyle; he shared Boyle's scientific tastes, and was the first secretary to the Royal Society (1662), and editor of its "Transactions." His friendship with Spinoza was already of long standing at the time now in question; he had lately visited Spinoza at Rhijnsburg, and the letters are a sort of continuation of the philosophical conversation they had then held. The first of Spinoza's answers to him contains a characteristic point: "It is not my way," he says, "to expose the mistakes of others." A thoroughly constructive habit of mind, an almost insuperable aversion to enter on criticism for criticism's sake, runs through the whole of Spinoza's philosophical work.

In 1662 Oldenburg strongly advises Spinoza not to hesitate about publishing some work relating partly to theology, partly to philosophy, which means presumably the "Tractatus Theologico-Politicus."

"I would by all means advise you not to begrudge to men of letters the ripe fruits of your ingenuity and learning in philosophy and theology, but let them go forth into the world, notwithstanding any possible grumbling from petty theologians. Your commonwealth is most free [Oldenburg was writing from England]; and therein the philosopher should work most freely. . . . Come then, my friend, cast out all fear of stirring up the feeblers of our time against you; we have sacrificed enough to their ignorance and trifling scruples; let us spread our sails to the wind of true knowledge, and search out the secrets of Nature more thoroughly than has yet been done. In Holland I should think it will be quite safe to print your treatise, and there is no reason to fear its giving the least offense, among men of learning at any rate. If such are your promoters and patrons—and such, I answer for it, you will find—why should you fear the detraction of the ignorant?"¹

In the following year Oldenburg was again pressing Spinoza to finish and publish a little book on "The Amendment of the Understanding," of which we now have only a fragment, published among the "Opera Posthuma."

"Surely, my excellent friend, I believe nothing can be published more pleasant or acceptable to men of true learning and discernment than a treatise such as yours. This is what a man of your wit and genius should regard, more than what pleases theologians, as their manner now is; they care less for truth than for their own advantage."

¹ Ep. VI.

And he conjures Spinoza by the bond of their friendship, by every duty of increasing and spreading abroad the truth, not to withhold the publication, or, if he indeed has grave reasons for withholding it, at least to write and explain them.¹ Oldenburg was a sincere friend to Spinoza, and a person worthy of all respect; but one cannot help observing that it is extremely easy for a man to be thus valiant in counsel when he does not risk anything on his own part. When Oldenburg in later years became better acquainted with Spinoza's results, he was himself not a little taken aback. Now, in spite of answers which were not encouraging, Oldenburg returned again and again to the charge; he would never desist till his request was satisfied; meanwhile it would be the greatest possible favor if Spinoza would give him some summary of the contents of the treatise. All this while Spinoza and Boyle were holding a scientific correspondence on chemistry and pneumatics in the form of long messages contained in the letters between Spinoza and Oldenburg, though they seem to have exchanged nothing directly. There is no doubt that Boyle knew a good deal of Spinoza, and took much interest in his work. In 1665 Oldenburg writes, "Mr. Boyle and I often talk of you and of your learning and philosophy." Boyle is also mentioned as joining in Oldenburg's exhortations to Spinoza to persevere in philosophical research. We find allusions in Oldenburg's letters of this time to the miseries of the plague and of the war between England and Holland. A certain book about which Spinoza had asked has not yet reached England "because the plague has almost put an end to all communication, besides which this fearful war brings a very *Iliad* of mischiefs (*nomisi malorum Iliada*) in its train, and is like to leave but little civility in the world." He adds that, though the meetings of the Royal Society are suspended, Boyle and others go on working in private.

After 1665 there is an unexplained break of ten years in this correspondence, which is but imperfectly supplied by letters between Spinoza and other persons.

The most interesting of Spinoza's other correspondents is Simon de Vries. He was a man younger than Spinoza, his pupil in philosophy, and of much promise. He died in his master's lifetime, having shown his gratitude by material benefactions, so far as he was allowed. Once he offered Spinoza a present of 2,000 florins; this was declined. He was unmarried, and it was his intention to make a will leaving the bulk of his

Ep. VIII.

property to Spinoza. But Spinoza, knowing that Simon de Vries had a brother living, pressed on him the duty of thinking first of his own kindred, so that De Vries finally made the brother his heir, and charged his estate with an annuity of 500 florins to Spinoza. After his death Spinoza would not entirely accept even this; when the annuity came to be paid in due course, he refused to take more than 300 florins, which he said was quite enough for him. The letters between Spinoza and his young friend belong to the year 1663, and throw light both on Spinoza's manner of life and on the growth of his philosophical system. They show that the leading definitions and propositions of the first part of the "Ethics" were already sketched out in MS., and were in the hands of several of Spinoza's friends, who had formed a kind of philosophical club at Amsterdam, and held regular meetings for the study and discussion of the work. De Vries was commissioned, it seems, to write to Spinoza for the explanation of such points as remained obscure to the company. He says, in the same letter:

"At times I complain of my fate in being so far from you. Happy, most happy is the companion who dwells with you under the same roof, and who can at all times, dining, supping, or walking, hold discourse with you of the most excellent matters!"¹

Spinoza willingly gave the desired explanations, and replied thus to the complaint:

"You need not envy my fellow-lodger. There is no one I like less, or with whom I have been more cautious; so that I must warn you and all our friends not to communicate my doctrines to him till he has come to riper years. He is still too childish and inconstant, and cares more for novelty than truth. Still I hope he will amend these youthful failings some years hence; indeed, so far as I can guess from his disposition, I am pretty sure of it; and so his general character moves me to be friendly with him."²

It is worth observing that these and other letters of the same time, such as the very important one to Dr. Meyer, in which the notions of space, time, and infinity, are discussed, show that as early as 1663 Spinoza's philosophy was fully formed as to its main features. This at once fixes the permissible limits of any speculation upon the growth of Spinoza's ideas, which may be founded on a comparison of his earlier and

¹ Ep. XXVI., a. I use Auerbach's notation for references to the lately-discovered letters and parts of letters.

² Ep. XXVII., a. These two letters are for the time given in full in Van Vloten's "Supplement."

later works. For instance, the avoidance of purely metaphysical discussion in the "*Tractatus Theologico-Politicus*," published in 1670, must be set down not to uncertainty or immaturity of thought, but to deliberate reserve dictated by reasons of policy.

At this time (1663) Spinoza published the "*Principles of Cartesian Philosophy*." It has already been mentioned that in this book he was not speaking for himself, and he attached no value to it (as he informed Oldenburg), save as a means of attracting attention and patronage in certain places (alluding, probably, to the De Witts), such as might encourage him to publish something more substantial of his own. The book seems to have done its work in assuring the author's reputation. In 1664 we find William van Blyenbergh, a worthy merchant of Dort, and a man of good family, introducing himself to Spinoza by letter in these terms:

"DEAR SIR AND UNKNOWN FRIEND: I have already several times carefully read over your treatise lately published with its appendix. It will be more proper for me to speak to others than to yourself of the instruction I found in it and the pleasure I derived from it. This much I cannot forbear saying, that the oftener I go over it with attention, the more I am pleased with it, and I constantly find something which I had not marked before."

He proceeds to ask several metaphysical questions.¹ Spinoza received his unknown correspondent with a warm welcome.

"UNKNOWN FRIEND: From your letter I understand your exceeding love of truth, and how that only is the aim of all your desires; and, since I direct my mind upon naught else, this constrains me to determine, not only fully to grant your request, which is to answer to the best of my skill the questions which you now send or shall send hereafter, but to perform all else on my part which may avail for our better acquaintance and sincere friendship. For myself, there is, among things out of my own control, none I prize more than entering into the bond of friendship with men who are sincere lovers of truth. For I believe that nothing in the world, not being under our control, can be so securely taken for the object of our love as men of this temper; since 'tis no more possible to dissolve that love they have for one another (seeing it is founded on the love each of them hath for the knowledge of truth) than not to embrace the truth itself when once perceived."

Blyenbergh sent to this a very long reply, from which Spinoza discovered that their notions of philosophical inquiry did not agree so well as he

¹ Ep. XXXI.

had supposed. "So that," he says, "I fear we shall get little mutual instruction by our correspondence. For I perceive that no proof, however firm it may be as a proof, may have weight with you unless it agrees with the construction which you or certain other theologians may put upon the Scriptures." For my part, he continues in effect, I confess I find the Scriptures obscure, though I have studied them several years; and on the other hand, when I obtain sufficient proof of anything, I know not how to refuse assent to it. And he goes on to show that Blyenbergh has completely misunderstood his position. This, however, did not put an end to the correspondence, and sundry other letters passed. In one of these, Van Blyenbergh throws in, by way of postscript, the sage question "whether we cannot avoid, by the exercise of prudence, that which otherwise would happen to us;" to which Spinoza could only say, "As to the question added to the end of your letter, since we might put a hundred like it in an hour, and never settle one of them, and you hardly press for an answer yourself, I shall not answer it." Soon after this they met, and had a friendly conversation. Blyenbergh attempted to renew the correspondence, but this time Spinoza distinctly declined it.

We have also letters to various persons, chiefly on scientific topics, which approximately cover the next few years. Mr. Lewes has called attention to the interest shown by Spinoza in an experiment in alchemy, to which he was at the time disposed to give credit.¹ And at the time there was nothing surprising or absurd in this; we have evidence, however, that some years later Spinoza had become more skeptical. For in 1675, when his friend Dr. Schaller had written to him from Paris, describing some similar process, Spinoza replied almost bluntly that he had no mind to repeat the experiment, and felt quite sure that no gold had been produced which was not there before.²

In 1670 was published the "*Tractatus Theologico-Politicus*," of which I give the title from an early English translation (London, 1689):

"A Treatise partly theological and partly political, containing some few discourses to prove that the Liberty of Philosophizing (that is, making use of Natural Reason) may be allowed without any prejudice to Piety, or to the Peace of any Commonwealth; and that the Loss of Public Peace and Religion itself must necessarily follow, when such a Liberty of Reasoning is taken away."

¹ Ep. XLV., Lewes, "*Hist. Phil.*," ii., 180 (3d edition).

² Ep. LXV., b. (Van Vloten, "*Supp.*," p. 318).

The final thesis of the book is, that "in a free commonwealth it should be lawful for every man to think what he will, and speak what he thinks." And little more than two centuries ago, in the freest country in Europe, this opinion was put forth without the name of the author, and with the name of an imaginary printer at Hamburg, and had to be gradually led up to by an investigation of the principles of Scriptural interpretation and the true provinces of theology and philosophy. To modern eyes the introduction looks much bolder than the conclusion. I forbear to say more of the contents and character of the work, as Mr. Matthew Arnold has already given an admirable account of it in his essay on "Spinoza and the Bible."

The opposition which Spinoza, doubtless, expected was not long in showing itself. Early in 1671 Spinoza writes to a friend not named :

"When Prof. N. N.¹ lately saw me, he told me, among other things, he had heard that my 'Theologico-Political Treatise' was translated into Dutch, and that a person, whose name he did not know, was on the point of printing the translation. I therefore earnestly entreat you to inquire diligently into this matter and stop the printing, if it can be done. The request is not from me alone, but also from many friends and acquaintances, who would be sorry to see the book prohibited, as it certainly will be if it appears in Dutch." ²

The book was, in fact, formally condemned some time after; it does not appear exactly when, but it must have been before 1673, in which year no less than three editions appeared at Amsterdam, with entirely false titles, purporting to be works on medicine or history. It is hardly needful to say that it was also put on the Roman Index, and in that catalogue it may still be seen in a very mixed company.

In the same year a Doctor Lambert van Velthuysen sent to Spinoza, through a common friend, a long letter, which repeated in violent language all the current topics against the "*Tractatus Theologico-Politicus*," and finally charged the writer with covertly teaching atheism. This fashion of controversy survives to our own day, and has been improved upon. We have invented the term *materialist*, which makes a fine gradation possible. When we want to say in a short and decided form that we disagree with a man's philosophical opinions, we call him a *materialist*. If we wish to add to this that the disagreement rests on theological grounds also, we call him an *atheist*.

Spinoza, having a fancy for the exact use of words, did not like these controversial amenities, and replied (though it was unwillingly that he replied at all) more sharply than was usual with him; he obviously thought the criticism almost too perverse to have been made in good faith. But here, too, we may note his even temper and peaceable disposition. The letter ends thus :

"I do not think you will find anything in this which can be considered too harsh in manner toward my critic. But, if anything does so appear to you, pray strike it out, or alter it, if you think fit. Whoever he may be, I have no wish to exasperate him and make enemies by my work; in fact, since this is a common result of discussions like the present, I could hardly prevail on myself to write this answer; nor should I have prevailed on myself, unless I had promised you." ¹

Nevertheless, Van Velthuysen and Spinoza were afterward on friendly terms. One of the latest of Spinoza's letters is addressed to Van Velthuysen, and relates to a project of publishing some notes and explanations to the "*Tractatus Theologico-Politicus*," including, it seems, this very correspondence, or something founded on it. The letter is a model of literary courtesy and good feeling, and as such is worth giving :

"I am surprised at our friend Neustadt having told you that I thought of replying to the various writings against my treatise which have been published, and intended to include your MS. in the number. I am sure I never intended to refute any of my opponents, for none of them have seemed to me worth answering. All I remember to have said to Mr. Neustadt is, that I purposed to publish some notes explaining the more difficult passages of the treatise, and to add to these your MS. and my answer, if I had your leave for so doing. This I desired him to ask of you, and added that in case you should be unwilling to grant it on the score of certain expressions in the answer being rather severe, you should be at full liberty to strike out or alter them. Meanwhile I have no cause of offense against Mr. N.; but I thought it well to show you the real state of the case, so that, if I cannot obtain your leave, I might at any rate make it clear that I had no intention of publishing your MS. against your will. I believe, indeed, it may be done without any risk to your reputation, if your name is not affixed to it; but I will do nothing unless you grant me leave and license to publish it. But I am free to confess you would do me a far greater favor if you would set down the arguments with which you think you can attack my treatise; and this I most heartily beseech you to do. There is no one whose arguments I should be

¹ The name is deliberately suppressed by the editors of the "*Opera Posthuma*."

² Ep. XLVII.

¹ Epp. XLVIII. XLIX.

more glad to consider; for I am aware that your only motive is affection for the truth, and I know the candor of your mind; in the name of which I again entreat you not to decline giving yourself this trouble."

Van Velthuysen afterward expanded his letter into one of the many answers to Spinoza's treatise that were published in the next few years. In 1674 Spinoza mentions that he had seen an answer to the "*Tractatus Theologico-Politicus*," written by a professor at Utrecht, in a bookseller's window, but on looking into it found it not worth reading, much less answering. "So there I left the book and its author. I smiled inwardly as I considered how the most ignorant of men are everywhere the boldest and the most ready to write books."

In 1672 occurred the one striking incident of Spinoza's life after his excommunication. The public misfortunes of that year, the French invasion of the Netherlands, the outbreak of popular discontent, and the massacre of the brothers De Witt by the infuriated mob of the Hague, belong to general history. Spinoza was a personal friend of John De Witt's, had accepted a small pension from him, and may through his means have taken some part in politics. He was moved by this event, it is said, so much beyond his wont, that he could hardly be restrained from expressing his indignation in public at the risk of his life. Shortly afterward the Prince of Condé, being then in command of the French army, invited Spinoza to his headquarters at Utrecht. His only motive appears to have been a genuine desire to make the philosopher's acquaintance. The invitation was accepted, and Spinoza betook himself to Utrecht with a safe-conduct. Condé, however, had in the mean time been called away, and Spinoza went home without seeing him, having turned a deaf ear to the suggestion of the French officers who entertained him that he might probably insure a pension from their king if he would dedicate some work to him. On Spinoza's return to the Hague sinister rumors got abroad concerning his journey, and Spinoza's landlord was for a time in fear that the mob would attack and storm the house for the purpose of seizing him as a spy.

Spinoza, however, comforted his host with these words:

"Fear nothing on my account, I can easily justify myself; there are people enough, and of chief men in the country too, who well know the motives of my journey. But, whatever come of it, so soon as the crowd make the least noise at your door, I will

go out and make straight for them, though they should serve me as they have done the unhappy De Witts. I am a good republican, and have never had any aim but the honor and welfare of the state."

The danger passed off, but Spinoza's conduct under it is none the less worthy of admiration; and the incident has its value in the light it throws on the general esteem in which he then stood. For the consciousness, not merely of an innocent purpose, but of a character above the possibility of rational suspicion, was necessary to make Spinoza's visit to the French headquarters prudent or justifiable; and the authorities of his own country would assuredly never have consented to it had they not felt absolute confidence that the public good would in no way suffer by it.

In 1673 Spinoza received a courteous letter from Prof. Fabritius, of Heidelberg, who was commanded by Charles Lewis, the elector palatine, to offer him the chair of Philosophy at that university. This letter contained the following sentence: "You will have the largest freedom of speech in philosophy, which the prince is confident you will not misuse to disturb the established religion." It seems by no means unlikely that this condition was inserted merely as a matter of form. The elector probably knew the "*Tractatus Theologico-Politicus*;" and if he seriously meant to impose restrictions, he would have laid down something much more definite. Spinoza, however, answered thus:

"Had it ever been my desire to occupy a chair in any faculty, I could have wished for no other than that which the Most Serene Elector Palatine offers me by your hands: and especially on account of that freedom in philosophy which the prince is pleased to grant, to say nothing of the desire I have long entertained to live under the rule of a prince whose wisdom is the admiration of all men. But since I have never been minded to give public lectures, I cannot persuade myself to accept even this splendid opportunity, though I have given long consideration to it. For I reflect in the first place that I must give up philosophical research, if I am to find time for teaching a class. I reflect, moreover, that I cannot tell within what bounds I ought to confine that philosophical freedom you mention, in order to escape any charge of attempting to disturb the established religion. Religious dissensions arise not so much from the ardor of men's zeal for religion itself, as from their various dispositions and love of contradiction, which leads them into a habit of decrying and condemning everything, however justly it be said. Of this I have already had experience in my private and solitary life; much more then should I have to

fear it after mounting to this honorable condition. You see, therefore, that I am not holding back in the hope of some better post, but for mere love of quietness, which I think I can in some measure secure if I abstain from lecturing in public. Wherefore I heartily beseech you to desire the Most Serene Elector that I may be allowed to consider further of this matter."¹

In 1674 Spinoza had an amusing discussion with a person whose name is withheld on the existence of ghosts. In his first answer Spinoza gives an exquisite turn of politeness to his incredulity. He was delighted, he says, to get his friend's letter and have news of him:

"Some people might think it a bad omen that ghosts should be the occasion of your writing to me; but I find something much better in it when I consider that not only real things, but even trifles of the imagination, may thus do me good service."

The correspondence continues, on Spinoza's part, in a tone of courteous banter. At last his friend attempts to overpower him with the authority of ancient philosophers. The reply to this last argument has a distinct importance, as showing what were Spinoza's notions about the philosophical systems of Greece:

"The authority of Plato, Aristotle, and Socrates, has not much weight with me. I should have been surprised, indeed, if you had brought forward Epicurus, Democritus, Lucretius, or any of the supporters of the doctrine of atoms. It is no wonder that those who devised occult qualities, intentional species, substantial forms, and a thousand other fond things, should have imagined ghosts and apparitions, and given ear to old wives to diminish the authority of Democritus, whose fame they so envied that they burned all his books. If you choose to believe these, how can you deny the miracles of the Virgin and all the saints, recorded by so many renowned philosophers, historians, and theologians, of whom one hundred can be produced for one that has recorded a ghost?"²

It is obvious that Spinoza's knowledge of Greek philosophy was slight and at second hand; but it is significant that his sympathy, so far as his knowledge went, was all with Democritus and the atomic school. The sort of metaphysic which in our own time is always clamoring against supposed encroachments by physical science would have found no favor in his eyes.

In 1674 he wrote an important letter explaining the difference between his view and Descartes's on free-will:

"I call a thing *free* if it exists and acts merely

from the necessary laws of its own nature, but *constrained* if it is determined by something else to exist and act in a certain determinate way. Thus God exists necessarily, and yet freely, because he exists by the necessity of his own nature alone. So God freely understands himself and everything else, because it follows solely from the necessity of his own nature that he must understand everything. You see, then, that I make freedom consist not in a free decision of the will, but in free necessity. . . .

"Imagine, if you can, that a stone, while its motion continues, is conscious, and knows that so far as it can it endeavors to persist in its motion. This stone, since it is conscious only of its own endeavor and deeply interested therein (*minime indifferens*), will believe that it is perfectly free and continues in motion for no other reason than that it so wills. Now, such is this freedom of man's will which every one boasts of possessing, and which consists only in this, that men are aware of their own desires and ignorant of the causes by which those desires are determined. So an infant thinks his appetite for milk is free; so a child in anger thinks his will is for revenge, in fear that it is for flight. Again, a drunkard thinks he speaks of his free-will things which, when sober, he would fain not have spoken."³

In 1675 the correspondence with Oldenburg is resumed.³ By this time the "Ethics" were completely written, and Oldenburg exhorts him to publish the book, though not with such pressing earnestness as he used in former years. He wishes to have some copies sent over to England, and will undertake to dispose of them; yet he wishes their consignment to him not to be talked of. His temper had probably become less valiant since he read the "Tractatus Theologico-Politicus."

Spinoza writes, in answer to Oldenburg,³ that he did go to Amsterdam to see about printing the "Ethics." But the rumor had gone before him that he had in the press an utterly atheistic book; and certain theologians had actually commenced proceedings against him. The Cartesians, who had by this time a respectable reputation to preserve, were only too glad to find a convenient and edifying occasion for disclaiming Spinoza, and joined eagerly in the cry against him. He determined accordingly to put off the publication; and the result was that the "Ethics" did not

¹ Ep. LXII., §§ 2-4. The latest editor of the Letters objects to Bruder's division into paragraphs as pedantic: a principle which, if consistently carried out, would make it impossible to give a reference to any passage in most of the classics, to say nothing of the chapters and verses in the Bible.

² Ep. XVII., *et seq.*

³ Ep. XIX.

¹ Ep. LIV.

² Ep. LX.

appear in his lifetime. The work had a certain private circulation, however, among Spinoza's friends. In the same year, 1675, we have a series of letters raising sundry questions on the most abstruse points in the system. The objections here stated are by far the most acute of those which Spinoza had to encounter from his various correspondents, and it gave him no small trouble to answer them. He does not, indeed, give a complete answer, and all but admits that he cannot. The chief part in these letters is now assigned to Ehrenfried Walter von Tschirnhausen, a young German nobleman, who was intimate with both Leibnitz and Spinoza, and afterward became a member of the French Academy of Sciences, and was distinguished in mathematics and physics, and most chiefly by advances in optics. In the construction of lenses, in particular, he arrived at brilliant results; and one may guess that this special study was the common ground on which his acquaintance with Spinoza was first formed.¹

In 1676 Spinoza received an extraordinary letter dated from Florence, and written by one Albert Burgh, identified by Van Vloten's plausible conjecture with the fellow-lodger whose facilities of intercourse with Spinoza Simon de Vries had envied, and of whose temper and capacities Spinoza had expressed the doubtful opinion already quoted. He now informed Spinoza that he had been received into the Church of Rome, and proceeded to denounce with all the zeal of a proselyte the profane philosophy he had abandoned. He tells Spinoza that all his learning is merely chimerical, and laments that he should suffer himself to be so deceived by the devil. He asks, with delightful simplicity:

"How do you know that your philosophy is the best of all that are, or have been, or will be taught in the world? Have you examined all the ancient and modern systems of philosophy which are taught here, in India, and all over the face of the earth? And even if you have, how do you know you have chosen the right one?"

Spinoza framed the obvious retort in the easiest

and most effective manner by repeating the convert's own words:

"How do you know that your teachers are the best of all those who teach, or have taught, or will teach, other systems of religion? Have you examined all the ancient and modern systems of religion which are taught here, in India, and all over the face of the earth? And even if you have, how do you know you have chosen the right one?"

Burgh's letter runs to a great length, and is a curious specimen of unrefined theological amenity. I can give only a condensed extract as a specimen:

"Do not flatter yourself," he cries, "with the reflection that the Calvinists, or so-called Reformers, the Lutherans, the Menmonites, the Socinians, etc., cannot refute your doctrine. All those poor creatures, as I have already said, are in as wretched a state as you, and are sitting along with you in the shadow of death.

"Worm and ashes and food for worms that you are, how dare you set up for knowing better than all the Church? What foundation have you for this rash, insane, deplorable, accursed arrogance? What business have you to judge of mysteries which Catholics themselves declare to be incomprehensible?"

One of his arguments is, that it is presumptuous to disbelieve in alchemy and ghosts because Julius Cæsar would probably not have believed a prophecy of gunpowder. Finally, he threatens Spinoza with eternal damnation if he is not convinced. The immortal discourse delivered by Brother Peter in the "Tale of a Tub," which ends with invoking similar consequences on those who offer to believe otherwise, is hardly a caricature of this effusion.

Spinoza's answer,¹ which I have anticipated in part, was much the sharpest he ever wrote. As far as argument went he had no serious task; the letter contains, however, some striking passages. "As for your argument about the common consent of multitudes, the unbroken succession of the Church, etc., that is just the story I know of old from the Pharisees: for they produce their multitudes of witnesses with no less confidence than the adherents of Rome." They are the most ancient, the most persistent, the most obstinate of all the Churches; and if martyrs are evidence, they have more to show than any other. Even in ecclesiastical discipline, he says, Rome is surpassed by the Mohammedans, for they have had no schisms. This seems a rash statement for a writer versed in Jewish

¹ Tschirnhausen has received, I think, hard measure from Van Vloten and others for the unacknowledged use of Spinoza's work in his "*Medicina Mentis*." Not only was it the habit of the time to be careless in this duty, but Tschirnhausen may not unreasonably have been of opinion that his only way to secure a fair hearing for Spinoza's ideas was to conceal their true authorship. It is certain, however, that he gave offense to both Huygens and Leibnitz by appropriating, without acknowledgment, unpublished ideas which they had communicated to him (Van Vloten, "*Benedictus de Spinoza*," App. iii.).

¹ Ep. LXXIV.

philosophy, which abounds in allusions to the different Mohammedan sects. It is, however, true in the sense that there has been in Islam no great visible rupture like the Reformation in Europe.

Of Spinoza's habits in daily life we know just so much as to make us regret that we do not know more. In outward appearance he was unpretending, but not careless. His way of living was exceedingly modest and retired; often he did not leave his room for many days together. He was likewise almost incredibly frugal; his expenses sometimes amounted only to a few pence a day. But it must not be supposed that he shared the opinion of those who profess to despise man and the world. There was nothing ascetic in his frugality, nothing misanthropic in his solitude. He kept down his expenses simply in order to keep them within his means; and his means remained slender because he did not choose to live at other people's charges. He used to say of himself that he was like a snake with its tail in its mouth, just making both ends meet. Doubtless he was indifferent as to money and the world's goods, but with the genuine indifference which is utterly removed from the affected indifference of the cynic. A man to whom he had lent two hundred florins—which must have been a considerable sum in proportion to Spinoza's income—became bankrupt. Spinoza's remark on hearing of it was this: "Then I must lessen my expenses to make up the loss; that is the price I pay for equanimity." In like manner he kept himself retired not because he was unsociable, but because he found retirement necessary for his work. There is ample evidence that he was none of those who hate or disdain the intercourse of mankind. He kept up, as we have seen, an extensive correspondence, of which we must regret that so little has been preserved. He was free and pleasant in familiar conversation with the people of his house. On Sundays he would talk with them of the sermon they had heard, and would praise the sound learning and morality of their worthy Lutheran pastor, a certain Dr. Cordes, who was succeeded in his office by Spinoza's biographer Colerus. Thus he won the esteem and affection not only of his philosophic friends, but of the simple folk among whom he lived; and such affection, as M. Renan has well said, is in truth the most precious of all.

Thus he showed in action the ideal of life set forth in those writings which he could not venture to publish in his lifetime, and which were supposed to strike at the foundations of religion and morality. And what is the rule proposed

for the guidance of conduct by this man whose opinions have been called abominable, execrable, and atheistic? In one word, it is this: to use the world with cheerfulness and content, not abusing it, and remembering that the good of mankind consists in doing good to one another. Here are some of his precepts:

"Nothing is more useful to man than man; men can desire nothing more excellent for their welfare than that all should so agree in all things that the minds and bodies of all should make up as it were one mind and one body, and all together strive to maintain their welfare to the best of their power, and all together seek the common good of all. Therefore reasonable men desire no good for themselves which they do not also desire for other men, and so they are righteous, faithful, and honorable."¹

Again he says that discontent and melancholy are good for no man: that it is the part of a wise man to use the world and take all reasonable pleasure in it. It is good to refresh one's self not only with moderate food and drink, but with pleasant prospects, music, the theatre, and other things which every man may enjoy without harm to his neighbor.² In the same way, though his own life was most quiet and sedentary, he strongly points out the advantage of being many-sided (as we should now say) in both mind and body, and thereby being apt to receive new impressions and put forth new activities.³ This is one of the points in which he curiously anticipates modern ideas about development and adaptation to one's environment.

He insists in the strongest terms on the importance of society to man's well-being:

"Society is imperfect" (he says), "but even as it is men get far more good than harm by it. Therefore let satirists laugh at men's affairs as much as they please, let theologians deery them, let misanthropes do their utmost to extol a rude and brutish life; but men will still find that their needs are best satisfied by each other's help, and that the dangers which surround them can be avoided only by joining their strength."⁴

Again he says:

"He who chooses to avenge wrong by returning hatred for it is assuredly miserable. But if a man strives to cast out hatred by love, he fights his fight in all joy and confidence, being able to withstand many foes as easily as one, and having no need to call on Fortune for aid. As for those he conquers, they yield to him joyfully, and that not from failing strength, but because they are made stronger."⁵

¹ "Ethics," iv., 18, schol. ² *Ib.*, 45, schol. 2.

³ *Ib.*, 33. ⁴ *Ib.*, 35, schol. ⁵ *Ib.*, 46, schol.

Again:

"The spirit of men is overcome, not by force of arms, but by love and high-mindedness."¹

The following maxim contains a lofty refinement of morality, if one may so speak, to which it would be difficult to find a parallel even in Marcus Aurelius:

"If a man wishes to help others by word or deed to the common enjoyment of the highest good, he shall first of all endeavor himself to win their love to him; but not to draw them into admiration of him, that a doctrine may be called after his name, nor in any manner to give cause for offense. Also in common talk he will avoid telling of men's faults, and will speak but sparingly of human weakness. But he will speak largely of man's excellence and power, and the means whereby it may be perfected; that so men may strive to live after the commandment of reason, so far as in them lies, being moved thereto not by fear or disgust, but in pure joyfulness."²

The mention of M. Aurelius suggests a parallel which I must note in passing, though I have not room to work it out. There is a singular coincidence between the ethical theory of Spinoza and that of the Stoics; I say coincidence, for Spinoza's slender acquaintance with Greek philosophy precludes the supposition of borrowing. The effort or impulse of self-preservation, which in his system is the mainspring of action, is really involved in the Stoic conception of "following Nature." He holds that right action for man lies in the preservation—taken in the largest sense—of mankind; not of the individual merely, because, as a matter of fact shown by experience, man is a social animal, and the welfare of the individual can be found only in society. He likewise constantly speaks of a *moral* life as equivalent to a life which is *reasonable* or according to reason. Both these positions are thoroughly Stoic. Nor are these the only resemblances.

Spinoza's health had been failing for some years before his death, and he was attacked by consumption, which possibly was aggravated by his work of glass-polishing. The last illness was short and almost sudden. It came on the 21st of February, 1677. The day was a Sunday, and in the morning Spinoza had been talking to his hosts, Van der Spyck and his wife, as was his custom. His friend and physician, Lewis Meyer, came from Amsterdam at his request, and was alone with him at the last. When the people of the house came home in the afternoon, they found Spinoza dead.

¹ "Ethics," Append., cap. 11. ² *Ib.*, Append., cap. 25.

Some time before this Spinoza had committed to Van der Spyck the trust of sending his unpublished papers to a bookseller at Amsterdam. This was duly fulfilled, and in the course of the same year the philosopher's posthumous works, including the "Ethics," appeared. They were received with even more violent opposition than the "Theologico-Political Treatise," and were forbidden by the States-General of Holland.¹

Spinoza's first biographer Colerus,² whose frank and honest admiration of Spinoza's personal character went along with a no less frank detestation of his philosophy, calls the "Opera Posthuma" abominable productions, and states that divers champions were providentially raised up to confute them, who had all the success they could desire. At this day there is probably no man living who has read these refutations, while the fame of Spinoza stands higher than ever.

He was an outcast from the synagogue, a stranger to the Church, a solitary thinker who cast his thought in difficult and startling forms. Notwithstanding all this, men of divers nations and of widely different opinions have joined together to do honor to the memory of Benedict de Spinoza, the philosopher, whose genius has made him in some sort the founder of modern speculation, and the man who in modern times has given us the highest example of a true and perfect philosophic life.

It is impossible to attempt in this place any account of Spinoza's philosophy; and I may add that he is eminently one of those writers whose thought cannot be learned at second hand. It may be worth while, however, to give a very brief sketch of the manner in which his influence has risen and spread in modern times.

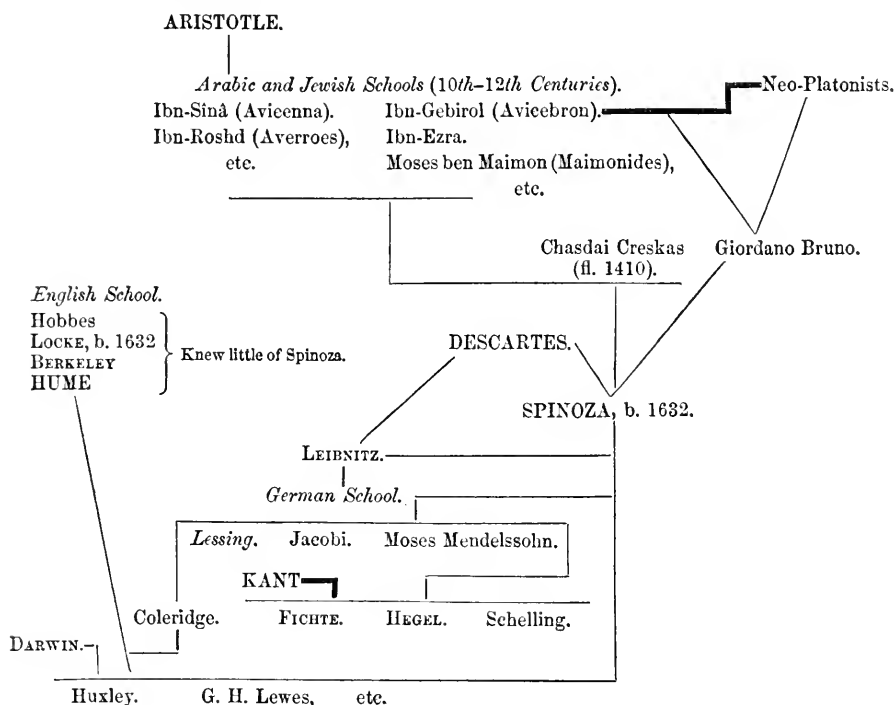
Spinoza very soon had eccentric followers as well as bitter enemies in his own country;³ but in the European world of letters he was entirely misunderstood and neglected for the best part of

¹ June 20, 1678. The full text of the ordinance is given in Van der Linde's *Bibliografie*, No. 24.

² The Dutch original of his book (No. 88 in *Bibliografie*) is extremely scarce. There is one copy in the Royal Library at the Hague: the only other known one is, according to Dr. Van der Linde, at Halle. The French version, by which it is commonly known, and which is often taken for the original, is also scarce, but has been several times reprinted. The last reprint is in Dr. Ginsberg's edition of Spinoza's correspondence (Leipsic, 1876).

³ See Van der Linde's "Spinoza, seine Lehre und dessen erste Nachwirkungen in Holland" (Göttingen, 1862), and M. Paul Janet's article in the *Revue des Deux Mondes* for July 15, 1867.

TABLE SHOWING SPINOZA'S POSITION IN THE HISTORY OF PHILOSOPHY.



a century. Leibnitz, the man most capable of doing him justice, preferred to take the opposite course, and he was ill-treated even by the people who might have been expected to take him up if only for the reason that he was hateful to the theologians. He fared little better at the hands of Bayle and Voltaire than at the hands of orthodox apologists. To Lessing, the founder in some sort of German literature and criticism, belongs the credit of having seen and announced Spinoza's real worth. In a certain memorable conversation with Jacobi he said, in so many words, "There is no philosophy but the philosophy of Spinoza." This and much more came out after Lessing's death in a long correspondence between Jacobi and Moses Mendelssohn, which finally degenerated into a controversy. After the report of that one conversation, the record of all this is now of little interest; from these, however, and from other letters preserved among Lessing's works, the fact comes out that Lessing thoroughly understood Spinoza, and had grasped the leading points more firmly than many of Spinoza's later critics.

Meanwhile Goethe too had found out Spinoza

for himself, and he has recorded how the study of the "Ethics" had a critical effect on the development of his character.¹ And his statement is fully borne out by the witness of his mature work. Goethe's poems are full of the spirit of Spinoza; not that you can often lay your finger on this or that idea and give a reference to this or that proposition in the "Ethics," but there is a Spinozistic atmosphere about all his deeper thoughts. There is a set of speculative poems, "Gott und Welt," which gives the most striking instances; but the same ideas are woven into all parts of Goethe's work, and may be found alike in romance, tragedy, lyrics, and epigrams.

The influence thus started in philosophy and literature spread rapidly. Kant's great work in philosophy was independent of it; but a strong current of Spinozism set in immediately after Kant, and acted powerfully on his successors. Fichte, though his system widely departs from Spinoza's, had obviously mastered his philosophy and felt the intellectual fascination of it; and many of his metaphysical ideas are simply taken from Spinoza. Hegel said, "You are much of a

¹ "Aus meinem Leben," book xiv.

Spinozist or no philosopher at all." In like manner Schelling said that no one could arrive at philosophical truth who had not once at least plunged into the depths of Spinozism. Novalis, Schleiermacher, Heine, and many others have spoken of Spinoza in words of enthusiastic praise. There is in Germany a whole recent literature of exposition and discussion about him, which is fast increasing, and to give an account of which would itself need a monograph.

In France the prevailing tone of philosophy has not been one that accords well with Spinoza; but he has met there with keen and intelligent criticism, which is the next best thing to intelligent admiration; and the beautiful address lately delivered by M. Renan at the Hague (besides the serious attention given to the subject by M. Paul Janet and others) is a sufficient proof that Spinoza has now at least found a response in the highest thought of France.

In England Coleridge, in this as in other things the advanced guard of the peaceful invasion of German culture and philosophy, spread the name of Spinoza, and much of his ideas, among the friends whom he delighted by his conversation. He used to say that the three great works since the introduction of Christianity were Bacon's "Novum Organum," Spinoza's "Ethics," and Kant's "Kritik." Coleridge's own position as to Spinoza was something like Jacobi's; he admired and honored him without accepting his teaching. It may well be that some part of the Nature-worship of Wordsworth's poetry, which has been a most important element in our later English literature, was derived through Coleridge from Spinoza. But we must come down many years later before we find any certain manifestation of this part of Coleridge's influence. Those who have spoken of Spinoza to English readers as

he deserves to be spoken of are still among us and working for us. We have Mr. G. H. Lewes's various articles and writings on Spinoza, to which he has given a finished form in his "History of Philosophy." We have Mr. Froude's essay on Spinoza, perhaps the best general account of his doctrine which has been given in our language for those who do not make philosophy their special study. There is Mr. Matthew Arnold's admirable monograph on the "Tractatus Theologico-Politicus," whose only fault is that he has not completed it by a companion-piece on the "Ethics." There are Mr. Huxley's contributions to pure philosophy, which do not treat of Spinoza directly, but have done much to put Spinoza's fundamental ideas into shapes adapted to the present state of our knowledge. The same may be said of Mr. G. H. Lewes's most recent work in "Problems of Life and Mind." Nor are other signs wanting of an active and increasing interest in Spinoza both at home and abroad.

It has been said of Spinoza by an able and not unfair critic (M. Saisset), that his theory was after all but a system, which has passed away like all other systems, never to come back. It is true that Spinoza did not found a school, and had few or no disciples in the proper sense. It would be difficult to name any one who ever formally accepted his system as a whole. But the worth of a philosopher to the world is measured not by the number of people who accept his system, or by the failure of criticism to detect logical flaws in it, but by the life and strength of the ideas he sets stirring in men's minds. Systems are the perishable body of philosophy, ideas are the living soul. Judged by this test, Spinoza stands on a height of eminence such as very few other thinkers have attained.

—*Nineteenth Century.*

SOME REMARKS ON THE LIBERTY OF SCIENCE.¹

By FRIEDRICH VON HELLWALD.

REPEATEDLY, during the last few years, have we made the curious observation that the bitterest and most formidable opponents of the monistic conception of the cosmos, as based on the theory of evolution, are to be found not at all in that camp which is commonly sup-

posed to be most hostile to progress and free thought, and which in political life we are wont to designate as orthodox and ultramontane; but rather in the camp of those whose boast it is that they uphold the banner of political liberalism, of progress, and of free thought. These "obscurantists in the liberal camp," as I am wont to call them, are far more dangerous foes of the

¹ Translated from the German by J. Fitzgerald, A. M.

development of science than are its professed adversaries, who, almost without an exception, can oppose to the teachings of modern science only their unproved and indemonstrable church dogmas. The others, on the contrary, wrap themselves in the mantle of strict science, whose most zealous followers they pretend to be, in order under the name of science, and with the aid of ostensibly scientific arguments, to check, as far as they may, the propagation of the new and more matured conception of the universe. For these scientific "reactionists," for such they are in the strictest sense of the term, Darwinism, together with, or rather on account of, its consequences, is simply an abomination, against which they strive with might and main. And often they meet with success. Thus they have contrived to win over to their views the majority of the organs of the Liberal party in Germany. Centuries hence, the historian will note it as a singular and hardly credible thing that, nearly two decenniums after the appearance of Darwin's famous work, influential organs of established reputation, as for instance the *Scientific Supplement of the Allgemeine Zeitung*, could sail in the current of this reaction. The tactics of these reactionists consists in representing the evolution theory, and consequently monism, as an hypothesis the acceptance of which is unscientific, so long as it is not demonstrated—as if an hypothesis could still be an hypothesis *after* it had been demonstrated. Every argument that can be with justice brought to bear against it from the scientific point of view, all new facts discovered by research that appear to contradict the theory of evolution, are sedulously brought to the knowledge of the public—the Bathybius affair is an instance of this; every new publication, in so far as it opposes Darwinian ideas, is fully and favorably reviewed; while, on the other hand, researches and publications which favor Darwinism either are not noticed at all, or but briefly, and even then, as far as possible, in a tone of condemnation. Men who day after day are thundering against Roman Jesuitry seem to be quite unconscious that they themselves practise scientific Jesuitry in permitting to appear only those doctrines which are pleasing to themselves. Alongside of these there are other and more honorable men, who, in their no less energetic opposition to Darwinism, are actuated only by scientific considerations; but they are ever in danger of being regarded by the less scrupulous opponents as colleagues and confederates, those people being always glad when a man of distinguished name is found fighting on

their side. An illustration of this we have in what took place at the fiftieth Congress of German Naturalists and Physicians last September at Munich, when Prof. Virchow opposed Ernst Haeckel's teaching in a fashion which calls for some remark in this place.

Haeckel, at the first public session of September 18th, delivered an address on "The Evolution Theory in its Relation to the Philosophy of Nature."¹ He there explained the idea of the History of Evolution, by which term we are to understand not only embryology or ontogeny, but also phylogeny or genealogy. This evolution theory is an *historical* science, of which we can never have exact or even experimental demonstration. Whoever looks for such demonstration, thereby simply betrays his ignorance of what constitutes an historical science. Haeckel very ingeniously compares phylogeny to geology, both having the same method of research. In both of these sciences, by minute comparison of multitudinous individual facts, by critical appreciation of their historical significance, and by speculative and conjectural filling up of the actual gaps, we reconstruct the historic course of development, whether of the earth or of its inhabitants. Whoever regards phylogeny or lineage-history as a mythical science, must hold the same opinion as to geology and paleontology, and this no reasonable man is prepared to do. The influential position now held by the doctrine of evolution is due entirely to the application to man of the theory of descent. "If the doctrine of evolution is true in general," says Haeckel, "if there is, indeed, a natural and historic genealogy of living beings, then man, too, the lord of creation, is descended from the sub-kingdom Vertebrata, the class Mammalia, the sub-class Placentalia, and the order Monkeys." Haeckel then meets the objection so frequently made—that in this theory only the origin of man's body is explained, and not that of his mental faculties—by saying that on the theory of evolution all *organized* matter at least is, in some sense, possessed of psychic properties. "This view rests upon the study of Infusoria, Amœbæ, and other one-celled organisms. . . . Further, we know that in moneres and other rudimentary organisms, mere detached bits of protoplasm possess sensation and the power of movement, just as does the entire cell. From this we should conclude that the *cell-soul*, which is the basis of scientific psychology, is itself only a compound, i. e., the sum of the psychic properties of the protoplasmic molecules, called also *plastidules*. Thus

¹ See SUPPLEMENT No. X., p. 239.

the soul of the plastidule would be the ultimate factor to which could be reduced the psychic life of living things.”¹ And inasmuch as the theory of evolution shows itself to be a unifying and monistic bond between the most diverse sciences, it must also be, in Haeckel’s opinion, the most powerful instrument in education, and should find a place in the schools. A reform of our educational systems in this sense he declares to be inevitable, and destined to lead to the happiest results. True, we have at the same time to meet the requirements of practical philosophy, and to construct a new doctrine of morals; but this may be confidently expected to spring forth from the germ of natural religion that lives in the breast of every man. As for the sense of duty, it is simply a social instinct. The ethics of the evolution theory does not need to go in search of new principles, but has only to trace back to their scientific basis the immemorial precepts of the moral law.

Such is the substance of Haeckel’s thoughtful address. For those who are acquainted with his writings, his conclusions contain nothing that is surprising, though we must confess that to us the fulfillment of Haeckel’s hopes appears still to lie in the distant future. Haeckel speaks with all confidence in the correctness of his views, which are based on the Darwinian theory. That many points connected with that theory are still hypothetical is not to be denied; nevertheless we must not, as does Karl Grün, in the *Allgemeine Zeitung*, represent the theory itself as pure hypothesis, for the firm ground on which it rests, namely, paleontology, is a vast science of experience admitting only of one or other of just two theories, the theory of evolution and the theory of supernatural creation. Perhaps Herr Grün can imagine a third. Again, granting that Haeckel’s doctrine of the development of the plastidule soul into the human mind is, in the eyes of “exact science,” nothing but a “grand hypothesis,” we must bear in mind that all the other explanations with which hitherto we vainly would have contented ourselves are also, when tried by “exact science,” simply hypotheses, only less grand, less ingenious, less conformable to demonstrated facts. Again, we may differ with Haeckel about that true “rational religion” which he contrasts with the dogmatic, mythological religion of the churches, but we do the latter no service by pronouncing monism to be “religionless.” However, I entirely agree with

Haeckel where he represents the natural moral law as resulting from the social instincts of animals, and hence as far more ancient than any church religion. To the philosophical historian and the ethnologist it appears a perfectly obvious idea to trace ethics up back from man; in other words, to trace the natural moral law, which was common to primitive man with social animals, from that early period down through the course of history to the present time, and among every race of mankind. Such an investigation would infallibly prove that in the ethics of the most advanced nations—aside from the refinements and polish of the more recent periods of civilization—that only can lay claim to legitimacy which is in agreement with the natural law of morals spoken of by Haeckel. The moral ideas of mankind vary according to latitude, race, and time; but it were impossible to name, in any age, a race of people, however rude or however civilized, who are entirely without the natural moral law of love and sense of duty which appears in the social life of animals. Hence, in my judgment, Haeckel’s proposition is perfectly correct, that ethics does not have to offer any new laws. Other laws than those just mentioned it never has had. And if once we come to understand that only those moral rules which are ours in common with all social animals constitute the sole permanent contents of an ethical code for all men without exception, while all that is outside of this, being variable according to time and place, must be regarded as non-essential and accessory—in other words, that only the former class of rules constitute the inalterable “moral law”—it is clear that we have the primordial precepts of duty referred to their scientific basis. It cannot be denied that this moral code existed long before the advent of any church religion whatever. Those systems of morals which from time to time have crystallized around the main stem of the natural moral law found expression in the divers church religions, and so existed prior to them. Does any one suppose that, for instance, Christianity, as a popular religion, could have won adherents as it did, had not a mighty revolution in the morality of the heathen world preceded it—a revolution which needed for its sanction a new edifice of religion? Besides, how are we to explain the unquestioned existence of systems of morality—crude though they be—among savage tribes who never have heard of a church religion?

As may be seen from the foregoing, Haeckel’s discourse gives occasion to the expression of very diverse opinions. But it was not upon these

¹ SUPPLEMENT No. X., p. 293, where a faulty punctuation materially alters the sense of the second sentence in this passage.

really debatable topics of the discourse that Rudolph Virchow¹ thought it incumbent on him to remark in his one hour's speech on the closing day of the Congress of Naturalists. The distinguished scholar of Berlin had, from the beginning, announced his intention of addressing the meeting, but the subject of his discourse was, as the programme had it, "not yet decided upon." No one acquainted with the method of Virchow's speeches would expect to find in his address an orderly discussion of a clearly-defined theme, but rather a sprightly "talk" (*causerie*) about this, that, and the other thing. There is no preparation, but the orator brusquely attacks whatever subject he chooses, and talks *ex tempore*. Therefore, no one was very much surprised on learning that Virchow was to speak of "The Liberty of Science in the Modern State." He reminded his hearers how large is the measure of liberty now acceded to science, and said that more could hardly be asked, citing the addresses delivered in the Congress as proofs of this. A few years ago, such discourses, he said, would not have been allowed, whether in Munich or anywhere else. He told of how Oken, the founder of the Naturalists' Congresses, had been doomed to perish in exile in that same canton in which Hutten had found his last permanent resting-place; and how the first meeting at Leipsic had, of necessity, to be held in secret. In our joy over the possession of entire liberty, it must be our care, he said, to retain it, and to guard scrupulously against all abuse of it, for, in that way, we might cause restrictions to be imposed again. Lest the liberty of science should be again taken away, nothing but demonstrated facts must be put forward as "science." Schoolmasters must not be allowed to decide between the problems they are to teach and those they are not to teach: the man of science himself must tell them what is demonstrated truth and what is still under investigation. Such doctrines as those of the plastidule soul, the genesis of soul by the combination of carbon, hydrogen, and nitrogen, are simply statements of problems. To lay them down as propositions, or even to permit the schoolmaster to import them into his instruction, would be to imperil the liberty of science and to compromise science itself.

The attentive reader will have noticed that, in this discourse, Virchow mainly opposed the pedagogical value of the evolution theory on which Haeckel lays much stress. I freely admit that I am a hearty admirer of the learned Berlin professor (Virchow), and that I fully recognize the im-

portance of being on our guard against accepting, too readily, hypotheses not yet fully confirmed. But, on the other hand, I cannot but deeply regret that Prof. Virchow should not have spared the shafts of his irony, and the skill of his dialectics, for a more fitting occasion; for we are compelled, in the name of scientific research, to enter our strongest protest against the whole tone and tenor of his speech. The aim of that discourse is simply a restriction of research—a restriction that never can be of benefit to science. A few years ago, at a meeting of the Naturalists' Association, we heard, this time also from the lips of a Berlin professor, the sentence *Ignorabimus*;¹ and now, from Munich, there comes to us a sentence which goes much further than that—*Restringamur*. True, Virchow was right when he declared that an hypothesis is, after all, only an hypothesis. But herein he said nothing new; we all were aware of that long ago; and, what is more, there was at the time no occasion which called for special insistence on this old truth. For, when Virchow protests against the introduction into the schools of the "plastidule soul," he attributes to Haeckel a purpose he never has entertained. Haeckel laid special stress upon the introduction into the schools of the *genetic method*; and, among thinking men, there can be no question that this would be an enormous gain as compared with the now dominant authoritative method. In the employment of this genetic method, Haeckel has in view the reform of education which he desires to see brought about, and, in the interest of science, it must be the wish of every one that his scheme may not be an empty dream. But I must go further, and say that, in my opinion, the doctrine of evolution may be introduced into the schools without the slightest hesitation, so long as it is offered, by the teacher, simply as the hypothesis which it is, and which can be very well harmonized with current religious ideas, as we see from the example of Wallace and other very devout Darwinists. Or must we say that pupils, even in our high-schools, should learn nothing about the problems which occupy the minds of all mankind? What harm is it, what damage does it do to the liberty of scientific research, if the pupil (who is sufficiently advanced in age and in his studies) is told how men endeavor to explain the relations between phenomena? Then, if we are to be so extremely scrupulous about excluding all hypotheses from the schools, we must

¹ See Du Bois-Reymond's address, in THE POPULAR SCIENCE MONTHLY for May, 1874.

¹ See this discourse in No. X. of the SUPPLEMENT.

reflect that at the same time we exclude from the school programme a whole series of sciences. Are there not still hypotheses without number in astronomy? Has not the nebular hypothesis of Kant and Laplace for a long time been taught everywhere? Do we hesitate to acquaint pupils in the schools with the principles and the conclusions of geology? In fact, is it not usual to give to them as their first history-lesson a lot of fables which in so far are much worse than scientific hypotheses as they cannot stand scientific criticism? Do we not know that the current accounts of Jewish, Greek, and Roman history are false, and that the pupils have in later years laboriously to disencumber their minds of the lessons learned by them in childhood? In short, is not the human soul itself—though in the school held to be an undisputed fact—an hypothesis, a simple postulate, incapable of exact demonstration? Of the doctrines of religion, which are so zealously taught in our schools, I say nothing, as they are not matters of scientific instruction; but yet one who makes such resistance to the “dogmatic stream which tumultuously makes its way through the fields of the sciences of observation,” and who strives to protect the schools against the same, should first of all labor to exclude this kind of instruction, the *dogmatic* character of which is unquestioned.

I, on the whole, agree with Virchow when he says that it is incumbent on the investigator loyally to declare—1. What is established fact (though from the Kantian point of view this would not come to much); 2. What is an hypothesis of infinite probability—for instance, the earth's revolution round the sun, and the greater part of what we call positive science; 3. What is probable hypothesis, though still needing further confirmation—as, for instance, the hypotheses upon which the Darwinian theory is based; 4. What is simple and entirely undemonstrable hypothesis—for instance, the hypothesis of atoms, of light-ether, of universal gravitation, and the like, which are taught in schools with impunity, albeit some of them, for instance the hypothesis of universal gravitation, are simply a cloak for our ignorance. But these distinctions can only be drawn by the individual himself, since we cannot demand of one who is convinced of the entire correctness of the results of his own researches that he shall represent them as only probable. Hence the line of demarkation postulated by Virchow, and which I myself hold to be desirable, between facts and problems, *never will and never can be drawn by the man of research, but will and*

must in the future, as in the past, continue to be a matter to be settled by the schoolmaster. Only he who stands outside of the domain of research can, by impartial comparison and unprejudiced criticism of the different opinions, form for himself an approximately objective judgment as to whether a proposition is to pass for a doctrine of science or not; the investigator himself cannot do this. Nor will Virchow's address make any change. Every investigator must be absolutely free to teach what he in his inmost scientific convictions holds to be true; and to require him to formulate the positive and the problematic is simply to restrict his scientific liberty. Now, we cannot make any such concession as that to the illustrious Berlin professor. With great truth does Karl Grün observe: “Science either enjoys perfect liberty, or she is not free at all. Setting up hypotheses, and tracing their ultimate consequences, are part and parcel of science, and of the liberty of science.”

I do not class Virchow's strictures with those which I characterized at the opening of these few observations. While the latter, systematically practised, are the utterances of certain parties, and designed to serve certain partisan ends, and hence, as being of a political nature, are utterly void of scientific weight, on the other hand, Virchow's motives were, at bottom, purely scientific. Unfortunately, he let slip a momentous expression, on the strength of which many political partisans have accounted him as one of themselves; and, indeed, they have not failed, out of the professor's utterances at Munich, to straightway make political capital—a thing deeply to be regretted in the interest of science as well as of the orator himself. Inasmuch as Virchow called attention to the fact that socialism already sympathizes with the evolution theory, it is high time for us, in the most solemn and impressive way, to declare that *scientific speculation cannot have anything whatever in common with political movements of any kind, and that they must not be governed by any considerations of their effects upon political questions.* Where is the doctrine that is exempt from misuse? Is it that of the Bible—the very text-book of socialism; or is it the Christian religion, in whose name hecatombs have been sacrificed? Is it medicine or philosophy? Nay, even cellular pathology, as Virchow himself admits, is not safe from misuse and misapplication.

Scientific research aims at the discovery of truth, never inquiring who is to be benefited thereby. The question *Cui prodest?*¹ is fortunate-

¹ Who is benefited?

ly of as little account in science as the other question, *Cui nocet?*¹ Hence whether the evolution doctrine favors the Socialists or the Ultramontanes, the high and dry Conservatives, the Moderates, the Liberals, the Radicals, or any other party, must be a matter of *entire indifference* to the earnest investigator, and must not be permitted for a moment to lead him astray in his researches. *The truth must be established for its own sake*, and for no other purpose. Any other consideration, even though it were urged by a Virchow, must be absolutely rejected.

Ever since science first began there have been heard authoritative voices calling "Halt!" to the restless spirit of speculation, and it were a grave injustice not to recognize the value of such admonitions. They who warn against danger, and they who engage in scientific speculation, are both indispensable for the development of science; but we must ever bear in mind that scientific progress always, almost without an exception,

has come from the labors of those who dared to give expression to thoughts which were as a leaven to the minds of their contemporaries, and who were persecuted for heresy and laid under a ban by the authorities. The most splendid triumphs of science are the fruit of the empiric demonstration of ingenious hypotheses. Even in cases where these hypotheses have proved untenable, they have caused men to think, and that in itself constitutes a new advance of science. We could as little dispense with them as with the leaven in bread. All honor, then, first of all to the men to whom we are indebted for hypotheses which have given a stimulus to research; which, so to speak, constitute a landmark in the history of science; finally, in the *mastering* of which, in the one sense or in the other, a full generation or more has been employed! Honor, again, to those intellectual princes of whom the German proverb is true that, "when kings build, there is work for cartmen!"—*Kosmos*.

CARPENTER, WALLACE, AND SPIRITUALISM.

LETTER FROM MR. WALLACE.

OWING to absence from home I have only just seen Dr. Carpenter's letter in the *Athenæum* of December 22d, to which I now beg leave very briefly to reply.

I must first remark on the extreme inconvenience of Dr. Carpenter's erratic mode of carrying on a discussion. As soon as his lectures on "Mesmerism, Spiritualism, etc.," were published, I wrote a review of them in the *Quarterly Journal of Science* of July last. To this Dr. Carpenter replied in *Fraser's Magazine* of November, promising a fuller reply to certain points in the new edition of his "Lectures," then in the press. As the article in *Fraser* was of a very personal character, I issued a rejoinder in the same periodical the following month. A discussion has also been carried on in *Nature*, and the scene of the contest is now removed to the *Athenæum*, many of whose readers are probably ignorant of its previous phases.

Dr. Carpenter comes before a fresh audience in order to reply to a specific charge of misstatement which I made against him in the *Quarterly*

Journal of Science (July, 1877, p. 398), which charge, as I will proceed to show, he endeavors to evade by a wordy defense, which really amounts to an admission of it. In his "Lectures" (p. 71) is the following passage:

"It was in France that the pretensions of mesmeric clairvoyance were first advanced; and it was by the French Academy of Medicine, in which the mesmeric state had been previously discussed with reference to the performance of surgical operations, that this new and more extraordinary claim was first carefully sifted, in consequence of the offer made in 1837 by M. Burdin (himself a member of that Academy) of a prize of 3,000 francs to any one who should be found capable of reading through opaque substances. The money was deposited in the hands of a notary for a period of two years, afterward extended to three; the announcement was extensively published; numerous cases were offered for examination; every imaginable concession was made to the competitors that was compatible with a thorough testing of the asserted power; and not one was found to stand the trial."

My readers will observe that this is deliberately stated to be the *first* time that clairvoyance

¹ Who is hurt?

was carefully sifted in France; yet it now appears that Dr. Carpenter perfectly well knew of the commission of the same Academy about ten years earlier, which, after five years of most careful and elaborate experiments, gave a unanimous report positively in favor of the reality of clairvoyance.

But Dr. Carpenter would have us believe that he studiously avoided all mention of this report because it had been proved to be wholly founded on imposture or error; and he endeavors to establish this by giving a single hearsay case of a confession of imposture *on another person not even a member of the commission!* I feel sure that the impression conveyed to the readers of Dr. Carpenter's letters would be that the case of alleged imposture by one of the mesmeric patients of MM. Georget and Rostan occurred to members of the commission, and that the case had been examined by them and reported on as genuine. But this impression would be entirely erroneous. The members of the commission, whose names are appended to the report, are as follows: 1. Bourdeois de la Motte (president); 2. Fouquier; 3. Gueneau de Mussy; 4. Guersent; 5. Itard; 6. Leroux; 7. Mare; 8. Thillaye; 9. Husson (reporter). Against the voluminous and interesting details of this report, its carefully-repeated experiments, its cautious deductions, its amazing facts, not one particle of rebutting evidence is adduced. Yet Dr. Carpenter thought himself justified not only in ignoring its existence, but in giving his readers to understand, by an express form of words, that no such inquiry was ever made! This was the accusation I made against him, and the readers of the *Athenæum* can now judge as to the candor and sufficiency of the reply.

I must add a few words on the way in which Dr. Carpenter treats M. Rostan, "one of the ablest medical psychologists of his day." Dr. Carpenter states, as a fact, that, "when a second edition of the 'Dictionnaire de Médecine' came out in 1838, he (M. Rostan) withdrew the article he had contributed to the first;" and then, further on, it is stated that "M. Rostan, by his own confession," had been led away by cunning cheats in the matter of clairvoyance. Now I have always understood that M. Rostan was much annoyed at his article being superseded in the second edition of the Dictionnaire; and, as this is *a priori* probable, I require some direct evidence of Dr. Carpenter's assertion that he voluntarily withdrew it. This is the more necessary because the still more important and damaging statement—that M. Ros-

tan made a "confession" that he had been led away by cunning cheats—is also given as a hearsay report without any reference or authority; and it looks very much as if Dr. Carpenter's logic had deduced the "confession" as an inference from the "withdrawal," no evidence whatever being offered for either of them. If this should really be the case, then the severest things I have said as to Dr. Carpenter's mode of carrying on this discussion will be more than justified.

Throughout my discussion of this subject with Dr. Carpenter I have strictly confined myself to questions of *fact* and of *evidence*, and have maintained that these are of more value than *opinions*, however numerous or weighty. My criticisms have, for the most part, been directed to misrepresentations of facts and suppressions of evidence on the part of my opponent. The readers of the *Athenæum* will now be able to judge, as regards one case, whether that criticism is sound; and for numerous other cases I refer them to my articles in the *Quarterly Journal of Science* and in *Fraser's Magazine*. If they read these, they will, I think, agree with me that the cause of truth will not be advanced by the further continuance of a discussion in which one of the parties perpetually evades or obscures the most important points at issue, and at every step introduces fresh misstatements to be corrected and fresh insinuations to be rebutted, as I have shown that Dr. Carpenter has done in his numerous writings on this subject.

ALFRED R. WALLACE.

DR. CARPENTER'S REJOINDER.

As Mr. Wallace, without invalidating any one of my facts, has now reaffirmed yet more strongly the charge which he brought against me in Mr. Crookes's journal, I beg to be allowed very briefly to restate my defense.

The evidence in favor of clairvoyance (contained in the Academic report of 1830), in which Mr. Wallace not only has himself full faith, but requires me and every one else to have the same, was condemned as untrustworthy by the two contemporary tribunals to which it was submitted—the French Academy of Medicine, and the *rédateurs* of the "Dictionnaire de Médecine." The former, after full investigation by a second and a third commission (1837-'40), deliberately reversed the judgment of its first, as having been obtained by fraud and chicanery; and formally pronounced the evidence for the "higher phenomena" of mesmerism to be "null

and void." The latter, on the same grounds, substituted for the article written by one of their most distinguished contributors for the first edition of their Dictionary another in the precisely opposite sense.

My crime, in Mr. Wallace's eyes, is that I stated that the subject of clairvoyance was "first thoroughly sifted" by those later investigations on which the Academy itself relied; and that I

passed by (1) the earlier report, which was never adopted by the Academy, and was finally rejected by it as worthless; and (2) the article of M. Rostan, which was for the same reason ejected from the Dictionary for which it had been written. I appeal from his judgment to that of the readers of the *Athenæum*.

WILLIAM B. CARPENTER.

—*Athenæum*.

THE LAST OF THE GASES.

THE year 1877 will ever be memorable in the history of scientific progress, its close having been marked by a brilliant series of researches which have ended in an absolute demonstration of the fact that molecular cohesion is a property of all bodies without any exception whatever.

This magnificent work divides itself into two stages, which we shall refer to separately: first, the liquefaction of oxygen; and then, following close upon this, the liquefaction of hydrogen, nitrogen, and atmospheric air.

In the liquefaction of oxygen, which we announced last week as having been accomplished by M. Pietet, of Geneva, we have not only an instance of the long time we may have to wait, and of the great difficulties which have to be overcome, before a theoretical conclusion is changed into a concrete fact—something definite acquired to science; but also another instance of a double discovery, showing that, along all the great lines of thought opened up by modern investigation and modern methods, students of science are marching at least two abreast.

It appears that as early as December 2d M. Cailletet had succeeded in liquefying oxygen and carbonic oxide at a pressure of 300 atmospheres and at a temperature of -29° C. This result was not communicated to the Academy at once, but was consigned to a sealed packet on account of M. Cailletet being then a candidate for a seat in the Section of Mineralogy. Hence, then, the question of priority has been raised, but it is certain that in the future the work will be credited to both, on the ground that the researches of each were absolutely independent, both pursuing the same object, creating methods and instruments of great complexity. We regret, therefore, that M. Jamin, at the sitting of the Academy to which we have referred,

seemed to strain the claims of M. Cailletet by stating that to obtain the gas non-transparent was the same as to obtain it liquefied. We are beginning to know enough of the various states of vapor now not to hazard such an assertion as this. This remark, however, rather anticipates matters; and indeed, as we shall show afterward, M. Cailletet need not himself be very careful of the question of priority—even if it were ever worth caring for except to keep other people honest.

Owing to the double discovery and the curious incident to which we have referred, the meeting of the Academy on the 24th ult. was a very lively one, as not only was the sealed packet and a subsequent communication from M. Cailletet read, but M. Pietet had sent a long letter to M. Dumas giving full details of his arrangements. MM. Dumas, H. St.-Claire-Deville, Jamin, Regnault, and Berthelot, all took part in the discussion, the former admirably putting the work in its proper place by the following quotation from Lavoisier:

"... Considérons un moment ce qui arriverait aux différentes substances qui composent le globe, si la température en était brusquement changée. Supposons, par exemple, que la terre se trouvât transportée tout à coup dans une région beaucoup plus chaude du système solaire, dans une région, par exemple, où la chaleur habituelle serait fort supérieure à celle de l'eau bouillante: bientôt l'eau, tous les liquides susceptibles de se vaporiser à des degrés voisins de l'eau bouillante, et plusieurs substances métalliques même, entreraient en expansion et se transformeraient en fluides aëriiformes, qui deviendraient parties de l'atmosphère.

"Par un effet contraire, si la terre se trouvait tout à coup placée dans des régions très-froides, par exemple de Jupiter et de Saturne, l'eau qui forme aujourd'hui nos fleuves et nos mers, et pro-

blement le plus grand nombre de liquides que nous connaissons, se transformeraient en montagnes solides.

“L’air dans cette supposition, ou du moins une partie des substances aériformes qui le composent, cesserait, sans doute, d’exister dans l’état de fluide invisible, faute d’un degré de chaleur suffisant; il reviendrait donc à l’état de liquidité, et ce changement produirait de nouveaux liquides dont nous n’avons aucune idée.”

When Faraday in the year 1823 (at the age of thirty-one) began the researches indicated in the last paragraph quoted by M. Dumas, and first liquefied chlorine and then several other gases, he had no idea that he had been anticipated, as he had been, by Monge and Clouet, who condensed sulphurous acid before the year 1800, and by Northmore, who liquefied chlorine in 1805. If the great experimenter were among us now, how delighted he would be to see one of the greatest iron-masters of France employing the enormous resources at his disposal at Châtillon-sur-Seine, and a descendant of the Pictet, the firm friend of his great friend De la Rive (who was the first to whom he communicated his liquefaction of chlorine), thus engaged in carrying on the work which he made his own!

The methods employed by MM. Pictet and Cailletet are quite distinct, and are the result of many years’ preparatory study, as testified by M. H. St.-Claire-Deville and M. Regnault. It is difficult to know which to admire most, the scientific perfection of Pictet’s method or the wonderful simplicity of Cailletet’s. It is quite certain that the one employed by the latter will find frequent use in future experiments. We may briefly refer to both these methods.

M. Cailletet’s apparatus has already been briefly alluded to in these columns. It consists essentially of a massive steel cylinder with two openings; through one hydraulic pressure is communicated. A small tube passes through the other, the sides of which are strong enough to withstand a pressure of several hundred atmospheres, and which can be inclosed in a freezing mixture. It opens within the cylinder into a second smaller cylinder serving as a reservoir for the gas to be compressed. The remainder of the space in the large cylinder is occupied by mercury. M. Cailletet’s process consists in compressing a gas into the small tube, and then, by suddenly placing it in communication with the outer air, producing such a degree of cold by the sudden distention of the confined gas that a large portion of it is condensed, a process perfectly analogous to that used to prepare solid carbonic

acid by the rapid evaporation of the liquefied gas. In M. Cailletet’s experiment with oxygen it was brought to a temperature of -29° C. by the employment of sulphurous acid, and a pressure of 300 atmospheres; the gas was still a gas. But when allowed to expand suddenly, which, according to Poisson’s formula, brings it down to 200° below its starting-point, a cloud was at once formed. The same result has since been obtained without the employment of sulphurous acid, by giving the gas time to cool after compression. M. Cailletet has not yet obtained, at all events, so far as we yet know, oxygen in a liquid form, as M. Pictet has done; on being separated from its enormous pressure it has merely put on the appearance of a cloud.

M. Pictet’s arrangements are more elaborate. He uses four vacuum and force pumps, similar to those which were recently exhibited in the Loan Collection of Scientific Apparatus for making ice, driven by an engine of 15-horse power. Two of these are employed in procuring a reduction of temperature in a tube about four feet long containing sulphurous acid. This is done in the following way: The vacuum-pump withdraws the vapor from above the surface of the liquid sulphurous acid in the tube, which, like all the others subsequently to be mentioned, is slightly inclined so as to give the maximum of evaporating surface. The force-pump then compresses this vapor, and sends it into a separate reservoir, where it is again cooled and liquefied; the freshly-formed liquid is allowed to return under control to the tube first referred to, so that a complete circulation is maintained. With the pumps at full work there is a nearly perfect vacuum over the liquid, and the temperature falls to -65° or -70° C.

M. Pictet uses this sulphurous acid as a cold-water jacket, as we shall see. It is used to cool the carbonic acid after compression, as water is used to cool the sulphurous acid after compression.

This is managed as follows: In the tube thus filled with liquid sulphurous acid at a temperature of -60° C. there is another central one of the same length but naturally of smaller diameter. This central tube M. Pictet fills with liquid carbonic acid at a pressure of four or six atmospheres. This is then let into another tube four metres long and four centimetres in diameter. When thus filled the liquid is next reduced to the solid form and a temperature of -140° C., the extraction of heat being effected as before by the pump, which extracts three litres of gas per stroke, and makes 100 strokes a minute.

Now it is the turn of the oxygen.

Just as the tube containing carbonic acid was placed in the tube containing sulphurous acid, so is a tube containing oxygen inserted in the long tube containing the now solidified carbonic acid. This tube is five metres long, fourteen millimetres in exterior diameter, and only four in interior diameter—the glass is very thick. The whole surface of this tube, except the ends which project beyond the ends of the carbonic-acid tube, is surrounded by the frozen carbonic acid.

One end of this tube is connected with a strong shell containing chlorate of potash, the other end is furnished with a stopcock.

When the tube was as cold as its surroundings, heat was applied to the chlorate, and a pressure of 500 atmospheres was registered; this descended to 320. The stopcock was then opened, and a liquid shot out with such violence that none could be secured, though we shall hear of this soon.

Pieces of lighted wood held in this stream spontaneously inflamed with tremendous violence. In this way, then, has oxygen been liquefied at last. But this result has no sooner filled us with surprise than it has been completely eclipsed. On the last day of December, a week after the meeting of the Academy to which we have referred, M. Cailletet performed a series of experiments in the laboratory of the École Normale at Paris, in the presence of Berthelot, Boussingault, St.-Claire-Deville, Mascart, and other leading French chemists and physicists, using the same method as that formerly employed for oxygen, and he then and there liquefied hydrogen, nitrogen, and air!

M. Cailletet first introduced pure nitrogen gas into the apparatus. Under a pressure of 200 atmospheres the tube was opened, and a number of drops of liquid nitrogen were formed. Hydrogen was next experimented with, and this, the lightest and most difficult of all gases, was reduced to the form of a mist at 280 atmospheres. The degree of cold attained by the sudden release of these compressed gases is scarcely conceivable. The physicists present at the experiment estimated it at -300°C .

Although oxygen and nitrogen had both been liquefied, it was deemed of interest to carry out the process with air, and the apparatus was filled with the latter, carefully dried and freed from carbonic acid. The experiment yielded the same result. On opening the tube a stream of *liquid air* issued from it resembling the fine jets forced from our modern perfume-bottles.

These more recent results are all the more surprising as, at an earlier stage, hydrogen, at a pressure of 300 atmospheres, has shown no signs of giving way.

These brilliant and important results, though, as we have said, they give us no new idea on the constitution of matter, open out a magnificent vista for future experiment. First, we shall doubtless be able to study solid oxygen, hydrogen, and air, and if MM. Pictet and Cailletet succeed in this there will then be the history to write of the changes of molecular state, probably accompanied by changes of color, through which these elemental substances pass in their new transformations.

There is a distinct lesson to be learned from the sources whence these startling *tours de force* have originated. The means at the command of both MM. Cailletet and Pictet arise from the industrial requirements of these gentlemen, one for making iron, the other for making ice.

Why, then, in England, the land of practical science, have we not more men like MM. Cailletet and Pictet to utilize for purposes of research the vast means at their disposal, or at all events to allow others to use them?

It is also clear that to cope with modern requirements our laboratories must no longer contain merely an antiquated air-pump, a Leyden jar, and a few bottles, as many of them do. The professor should be in charge of a work instead of an old curiosity shop, and the scale of his operations must be large if he is to march with the times—times which, with the liquefaction of the most refractory gases, mark an epoch in the history of science.—*Nature*.

A RING OF WORLDS.

THREE hundred years ago, when what was called the Copernican Paradox was struggling for existence against the then orthodox Ptolemaic astronomy, the solar system was supposed to consist of eight bodies. The followers of Copernicus believed in a central sun, round which six orbs revolved, while around one of these—our earth—traveled one other orb—making (with the central sun) eight bodies in all. The followers of the old astronomy, including at that time nine-tenths of the astronomers of repute, believed in a central earth, round which traveled seven planets, the sun and moon being two of these, only distinguished from the rest (as planets) by the comparative simplicity of their movements. During last year the number of bodies forming the solar system, without including comets or meteorites, or the multitudinous satellites which compose the ring of Saturn, has been raised to 200—so that for every orb known in the days of Copernicus and his first followers, twenty-five are now recognized by astronomers. Year after year more are becoming known to us. In fact, planets are being discovered so fast, that, after an effort (by dividing the watch upon them among the leading observatories) to keep them well under survey, the task has become regarded as almost hopeless. One or two of the flock are already missing; and it seems not improbable that, before many years have passed, twenty or thirty planets will have to be described as missing, while endless controversies may possibly arise, respecting those newly discovered each year, on the delicate question whether a discovery or a rediscovery has been effected.

It is hardly necessary to say, perhaps, that we refer to that strange ring of small planets which travels between the paths of Mars, the miniature of our earth, and Jupiter, the giant of the solar system, as far surpassing our earth in size as it is surpassed by the sun. In the wide space between these two planets wander thousands of tiny planets. They form a zone of division not only between Mars and Jupiter, thus unlike each other, but between the family of small planets of which our earth is the principal member, and the family of large planets—Jupiter, Saturn, Uranus, and Neptune. It is a strange thought that for ages these bodies have been circling round the sun unknown to men, though

so near to us, compared with the fixed stars, that from the nearest of these the whole ring, far within which, be it remembered, the earth travels, would appear as the merest point in space. Still stranger is the thought that, among the members of this system or ring of worlds utterly invisible to ordinary eyesight, there must be presented at times, if living creatures are there to see, some of the most remarkable celestial scenery visible from any part of the solar system. For the orbits of these bodies interlace in a strangely complex manner. At times, from one or other of the set, several of the rest must be seen at so short a distance as to appear larger and more conspicuous than Jupiter or Venus appears to ourselves, while occasionally an even nearer approach must be made. In fact, in this part of the solar system, and in this part alone, collisions between planets are possible catastrophes; though, fortunately, the motions of these bodies being always in the same direction, they cannot encounter each other full tilt, but can only come into collision by the swifter overtaking the slower. Even of this there is little risk, so small are those planets, and so enormous the ring of space in which they travel.

For many years the idea had been gaining ground that those astronomers who were using their telescopes in the search for small planets, were wasting time which might be better employed. "Of what use," many asked, "can it be, now that we know these bodies may be counted by thousands, to search night after night for hours on the chance of discovering a few each year?" But recently it has been seen that the small planets may give us very useful information. They have, in fact, already told us how much their giant neighbor, Jupiter, would weigh if he could be put in a scale against the earth—or, rather (for that was already known), they have shown us that Jupiter had been rightly weighed in another way. And now it seems likely that we shall learn from this despised family the true measure of the sun's distance, and with that the scale of the solar system, the quantity of matter contained by the sun, and many other matters of great importance in astronomy.

As one of the longest known among the minor planets has already given a very fair answer to

the questions of astronomers on such points, while two others have recently been put under examination, the occasion seems a suitable one for giving a brief account of this ring of worlds, of the manner of their discovery, and of the ideas which have been suggested as to their origin.

If the solar system could be seen at a single view, its appearance at any moment would give no idea of regularity in its construction. The pictures of the solar system in our books present a certain symmetry even when the paths of the planets are shown with their true eccentricity of position (which is, unfortunately, but seldom done). The symmetry is like that of a leaf or flower, not perfect, not geometrical or rigid, but still it is sufficiently striking. But if from a picture of the orbits, presenting this symmetry of appearance, we prick off the positions of the central sun and of the planets in various parts of their paths around him, we can see no symmetry at all in the resulting set of points. The solar system thus shows how there may be real symmetry of arrangement among bodies apparently scattered without law or order. And it shows us also the part which time plays in educing symmetry from apparent disorder. Conceive a being so constituted that the circuit even of the planet Neptune around the sun, though lasting more than a hundred and sixty of our years, would seem to last but a single instant, so that to his vision the planet would be visible during its entire circuit even as a spark swiftly whirled round appears as a circle of light. To such a being the solar system would present a symmetrical and doubtless a most beautiful appearance. At its centre would be the glowing orb of the sun, round which would appear four rings of light, representing the paths of Mercury, Venus, the Earth, and Mars; far outside these again four other rings of light, much brighter and with much wider spaces between them, showing where Jupiter and Saturn, Uranus and Neptune, traverse their wide courses; and between these families will be seen the multitudinous intertwining paths of the small planets, scarcely discernible separately, but forming, as a whole, a faintly-luminous ring between the well-defined sets of bright rings marking the paths of the eight planets. We need not here consider how the beauty of this scene would be enhanced by the rings of light which the moons of the giant planets and of our earth would produce. Let it suffice to note that the symmetry of the solar system, as thus seen, would be altogether marred if the rings of asteroids were removed.

It is not given to man, whose span of life is less than half the orbital period of the outermost planet, to witness, scarcely even to conceive rightly, the scene we have described. But the mathematician can perceive what is necessary to its completeness. Accordingly, the astronomer Kepler, inquiring into the harmonies of the solar system, perceived that one note was wanting; or, returning to our ideal description of the system as it would be seen if centuries were fractions only of seconds, he perceived that the absence of a certain feature impaired the symmetry of the picture. He saw that though the distance separating the path of Mars from that of Jupiter is in reality much less than that which separates the path of Jupiter from that of Saturn, the next planet beyond him, yet there is a certain regularity in the progression of the distances which requires that the space between Mars and Jupiter should not be untenanted, as, according to the astronomy of his day, it was supposed to be. In his youth Kepler had noted the want, and had suggested certain fanciful relations which might be fulfilled by a planet occupying the gap. He had written to Galileo on the subject, who had advised him to base his theories on observed facts only. Later, when unwearied researches for nineteen years had revealed to him the laws of the solar system, Kepler suggested as the relation which connects the distances of the planets that which is now commonly called Bode's law. It may be thus simply expressed: Calling Mercury's distance from the sun 4, the distances of the other planets' orbits from Mercury's orbit are in order as the numbers 3, 6, 12, and so on, doubling as we proceed. According to this law, the distance of Mars from Mercury's orbit should be 12, and the distance of the next planet 24. But there was no known planet at that distance. Jupiter, the planet next beyond Mars, travels at a distance from Mercury's orbit represented on this scale by 48, and Saturn—the most distant known planet—at a distance of 96, the former corresponding exactly, the latter fairly enough, with the law we have indicated. But the planet which, according to the law, should have traveled between Mars and Jupiter at a distance of 24 from Mercury's orbit, or 28 from the sun, either did not exist, or was invisible.

In Kepler's day it was thought by many a sufficient solution of the difficulty to conclude that a planet formerly traveling along this seemingly vacant track had been destroyed on account of the wickedness of its inhabitants. And we are told that there were not wanting preachers who used

the destruction of this hypothetical planet as a warning to evil-doers. If they continued in their sins, they might not only bring destruction on themselves, but on the world, which might burst, as had that other world, and reduce the sun's family by yet another planet.¹

It was not until the discovery of Uranus by Sir W. Herschel, in 1781, that the speculations of Kepler attracted scientific attention. Astronomers had seen the three laws of Kepler interpreted physically by Newton, and had come to regard those relations which admitted of no such interpretation as mere coincidences. But when the empirical law of distances, for which, as it appeared, no reason in Nature could be assigned, was found to be fulfilled by the new planet, astronomers could not but regard the circumstance as somewhat more than a mere coincidence. It is strange to consider that had Neptune instead of Uranus been discovered by Sir W. Herschel, the very reverse would have been inferred. Mercury's orbit, by Bode's law, should be 96, but is really 91; that of Saturn's distance from Uranus should be 192, but is really 188, so that Bode's law is satisfactorily fulfilled by Uranus; but Neptune's distance from Mercury's orbit should be 384, and is really but 296, which cannot in any way be reconciled with the law. Supposing Uranus unknown when Neptune was discovered, the distance of Neptune would have seemed too great by 104 for Saturn's next neighbor (being 296 instead of 192), and too little by 88 for Saturn's next neighbor but one, according to Bode's law of distances. Thus astronomers would have inferred that Bode's law was erroneous (as indeed it is), and would not have thought of looking for a planet between Mars and Jupiter. As, however, by good fortune, Uranus was found first, they inferred (mistakenly) that Bode's law represents a real relation existing, no one could say why, among the planetary orbits, and thence concluded (rightly) that the space between Mars and Jupiter is not vacant.

A society was therefore formed — chiefly through the active exertions of De Zach, of Gotha

¹ We do not learn whether the warning was effective or not; but probably the evil-doers were not more troubled by a danger affecting the whole of the human race than by that which had long been described as hanging over themselves in particular. The logical effect of the warning, one would suppose, must have been to encourage that particular form of godliness which is shown by anxiety about the sins of others. For it was clearly very much to the interest of those who did well to see that the evil-doers did not bring about a catastrophe from which good and bad alike could not fail to suffer.

—to search for the missing planet. It consisted of twenty-four astronomers under the presidency of Schroeter. The zodiac, the highway of the planets, was divided into twenty-four zones, one of which was assigned to each member of this Society for the Detection of a Missing World. The twenty-four commenced their labors with great zeal. When we consider that over the region of the heavens which they were to examine at least a hundred planets, well within the range of their telescopes, were traveling, we may fairly wonder that they discovered nothing. Such, however, was the result of their labors. After they had been at work a considerable time, accident revealed to an astronomer outside their society a body which was regarded for a long time as the missing planet.

Prof. Piazzi, while observing stars for his catalogue, was led to examine very carefully a part of the constellation Taurus, where Wollaston had marked in a star which Piazzi could not find. On the first day of the present century he observed in this part of the heavens a small star, which he suspected of variability, seeing that it appeared where before no star of equal brightness had been mapped. On January 3d he found that the star had disappeared from that place, but another, much like it, lay at a short distance to the west of the place which it had occupied. The actual distance between the two positions was nearly a third of the moon's apparent diameter. On January 24th (our observer was not too impatient, it will be seen) he transmitted to Oriani and Bode, members of the Missing World Detection Society, an account of the movements of this star, which had traveled toward the west till January 11th or 12th, and had then begun to advance. He continued his labors till February 11th, when he was seized with serious illness. Unfortunately, his letters to Oriani and Bode did not reach those astronomers until nearly the end of March, by which time the planet (for such it was) had become invisible, owing to the approach of the sun to the part of the heavens along which the planet was traveling.

But the planet was not lost. The sun passed on his way through the region occupied by the planet, and in September that region was again visible at night. In the mean time the great mathematician Gauss had calculated from Piazzi's observations the real path of the planet. Throughout September, October, November, and December, search was made for the missing star. At length, on the last day of the year 1801, De Zach detected the planet, Olbers independently

effecting the rediscovery on January 1, 1802. Thus, the first night of the present century was distinguished by the discovery of a new planet, and, before the first year of the century had passed, the planet was fairly secured.

Piazzi, the discoverer of the planet, assigned to it the name of the titular goddess of Sicily, where the discovery was made—Ceres.

Ceres was found to be traveling in an orbit corresponding in the most satisfactory manner with Bode's law. According to that law the missing planet's distance from the orbit of Mercury should have been 24; calling Mercury's distance from the sun 4, the actual distance of Ceres is $23\frac{1}{2}$.

Yet astronomers were not satisfied with the new planet. It traveled at the right mean distance from the sun; but, passing over its inferiority to its neighbors, Mars and Jupiter, in size and splendor, it moved in most unplanetary fashion. Instead of traveling nearly in the same plane as the earth, like its neighbors Mars and Jupiter, its path was inclined to that plane in an angle of more than 10° —a thing as yet unheard of among planets. As to its size, Sir W. Herschel, from measurements made with his powerful telescopes, estimated the new planet's diameter at about 160 miles, so that, supposing it of the same density as our earth, its mass is less than $\frac{1}{175000}$ part of hers. Thus, it would take more than 1,560 such planets to make a globe as massive as our moon. And even this probably falls far short of the truth. For our earth owes no small part of her density to the compression produced by the attractive energy of her own substance. The moon, which is less compressed, has much smaller density; in fact, little more than half the earth's. Mars, again, being smaller, and having less attractive energy, has less density than the earth (his density is about $\frac{7}{10}$ of hers).¹ The tiny Ceres would be very much less compressed, and, if made of the same substances, as we may well believe, would probably have a density less than half the moon's, or not very much exceeding that of water. Thus, it would probably take some half-million of worlds like Ceres to make such a globe as our earth, while

from our moon six thousand such worlds as Ceres might be made. It was natural that astronomers should regard with some suspicion a planet falling so far short of every known planet, and even of a mere moon, in size and mass.

But presently a discovery was made which still more markedly separated Ceres from the rest of the planetary family. Olbers, during his search for Ceres, had had occasion to study very closely the arrangement of the groups of small stars scattered along the track which Ceres might be expected to follow. What reason he had for continuing his examination of these groups after Ceres was found does not appear. Possibly he may have had some hope of what actually occurred. Certain it is that in March, 1802, or nearly three months after Ceres had been rediscovered, he was examining a part of the constellation Virgo, close by the spot where he had found Ceres on January 1st, in the same year. While thus at work, he noticed a small star forming with two others, known by him, an equilateral triangle. He felt sure this star had not been there three months before, and his first idea was that it was a variable star. At the end of two hours, however, he perceived that it had moved slightly toward the northwest. On the next evening it had moved still farther toward the northwest. It was, in fact, a planet, and, to the amazement of astronomers, the study of this planet's motion showed that its mean distance from the sun differed very little from that of Ceres. We speak of the amazement of astronomers, because the fact thus discovered was, in reality, the most surprising of any which had been made known to them since the nature of Saturn's ring was discovered by Huygens in 1656. We have become so accustomed of late to the discovery of planets traveling along the region of space between the paths of Mars and Jupiter, that we are apt to forget how strange the circumstance must have appeared to astronomers at the beginning of the present century, that the old views respecting the solar system were erroneous, and that, in addition to the planets traveling singly around the sun, the existence of a ring of planets must be admitted. It is true that the discovery of this second planet (to which the name Pallas was given) did not fully demonstrate this. Still it showed that Ceres was not traveling alone in the region which had so long been supposed untenanted. And as it seemed in some degree to explain the smallness of Ceres, suggesting the idea that possibly the combined mass of bodies traveling in this space might not be great-

¹ Of course, the giant planets Jupiter, Saturn, Uranus, and Neptune, seem to present exceptions to the rule we have here indicated. But there can be no doubt that in their case intense heat expands the planets' substance, while in reality we have no means of forming an opinion respecting their real density, since the surfaces we measure are not the real surfaces, but layers of clouds enwrapping these planets, and lying who shall say how far from the solid surface?

ly inferior to the mass of a primary planet, the notion of a ring of worlds traveling between Mars and Jupiter was presently entertained as according fairly with the facts already discovered.

Olbors himself was fully satisfied that other planets travel in the region between Mars and Jupiter. He was struck by the remarkable features of the orbit of the planet he had discovered. It was inclined more than three times as much as that of Ceres to the plane in which the earth travels, or to that medial plane near which lie the tracks of all the single planets. So greatly is the path of Pallas inclined to this track that, even as seen from the sun, its range on either side gave to the planetary highway a width of 69° , or nearly four times the width of the zodiac (the conventional highway assigned by the ancients to the planets) as determined by the range of Venus, viewed from the earth, on either side of the medial track. The range of Pallas, as seen from the earth, is still greater; so great, indeed, that this planet may actually be seen at times among the polar constellations. Moreover, the path of Pallas is markedly eccentric, insomuch that her greatest distance from the sun exceeds her least in the proportion of about 5 to 3. Olbors was led by these peculiarities to the belief that Ceres and Pallas are the fragments of a planet which formerly traveled between the paths of Mars and Jupiter, but had been shattered to pieces by a tremendous explosion. If our earth, as she travels along her present path, could by some violent internal action be shattered into fragments, the greater number of these would no longer travel in the plane in which lies the earth's present path. Those which chanced to be driven outward in that plane would continue to travel in it, though on a changed path; for their original motion and their imparted motion both lying in that plane, so also of necessity would that motion which would result from the combination of these. But fragments which were driven away at an angle to that plane would no longer travel in it. Hence the great inclination of the path of Ceres and the monstrous inclination of the path of Pallas might be explained by supposing that the former was a fragment which had been driven away at a considerable angle to the ecliptic, while Pallas was a fragment driven away on a path nearly square to that plane.

To show more clearly how Olbors accounted for the peculiar motions of the new planets, suppose our earth to explode on or about March 20th, at noon, Greenwich time. Then the greater part of South America would be driven forward;

it would therefore travel on a course not far from the original track of the earth, but more quickly; our Indian Empire would be driven backward; and though the advancing motion previously possessed by this part of the earth, in common with the rest, would still carry it forward, this motion would be greatly reduced. The central parts of Africa and the Atlantic around Ascension Island and St. Helena would be driven sunward—an impulse which, combined with the previous advancing motion of this region, would cause this part of their new track to cross their former nearly circular track at a sharp angle, passing athwart that track inward. The part opposite to the last-named, that is, in the middle of the Pacific, would be driven directly from the sun; and this impulse, combined with advance, would cause this part of the new track of the scattered fragments from the Pacific to cross the original track at a sharp angle, passing outward. All these regions, and all lying on the zone passing through them, would continue to move in or near the former plane of the earth's motion; some more quickly than before, some more slowly, some passing outward at that portion of their course to return eventually inward till they came to it again, and some passing inward for a while, to return, however, after a complete circuit, to the scene of the catastrophe. But England and other European countries would be impelled partly sunward, partly upward and northward, from the plane of their former motion, and would therefore travel on a track largely inclined to their former course; that is, to the earth's present track. The same would happen, so far as upward motion was concerned, to the United States, and to all the northern parts of Asia. The fragments from all these regions would thenceforward travel on inclined paths crossing their original track ascendingly at the place where the explosion occurred. On the other hand, Australia and New Zealand, South Africa, and the southern parts of South America, would be driven somewhat downward or southward, and the fragments of this zone of the earth would accordingly travel on paths crossing the original track of the earth descendingly at the place of the explosion. The north-polar regions, especially the parts north of the American Continent, would be driven more directly upward by the explosion; while the south-polar regions, especially the parts south of the Indian Ocean, would be driven directly downward; the fragments from these regions then would travel on paths most largely inclined to the original track of the earth.

Regarding the two planets hitherto discovered

as fragments of one which had burst, Olbers perceived that there was a certain region of the heavens where he would have a better chance of discovering other fragments than anywhere else. Every fragment after the explosion would have a path passing through the place where the explosion occurred. For the place of explosion, being the spot from which each fragment started, would of necessity be a point along each fragment's future track. The fragments, be it understood, would not return simultaneously to that spot. Those which had been driven forward (more or less) would have their period of circulation lengthened, those which had been driven backward would have their period shortened; these last then would return to the scene of the outburst sooner than the former, and in point of fact no two would return simultaneously to that place unless, by some utterly improbable chance, they had been hastened or retarded in exactly the same degree. But all would pass through that spot for many centuries after the terrible catastrophe which had scattered them on their various paths. If the region of the heavens toward which that spot lay could be determined, then, the careful observation of that region probably would soon be rewarded by the discovery of other fragments. Moreover, the region exactly opposite to it would be similarly suitable for the search after these small bodies; for though their paths would not all pass through a *point* exactly opposite the scene of the explosion, these paths would all pass through the prolongation of a line drawn through the sun from that place. This is easily seen. Every planet has its own plane of motion, in which plane the sun necessarily lies; if, then, we know any one point of a planet's path, we know that the line joining the sun and that point lies in the plane of the planet's motion, and if extended beyond the sun must cross the planet's track.

Olbers then set himself the task of carefully observing two parts of the heavens, one being the place where the tracks of Ceres and Pallas approached each other nearest, the other being the place directly opposite to this. One point is to be noticed as essential to Olbers's faith in the success of his method of search. In his day it was generally believed that many centuries had not passed since the planets had been set moving on their respective paths. According to this view the catastrophe by which Ceres and Pallas and the fragments yet to be discovered had been sent on their new courses, could not have occurred so long ago that the paths of the fragments had been materially displaced from their original position.

If, on the other hand, millions of years might have elapsed since the catastrophe happened, there would have been little room for hoping that the actual paths of the fragments would have retained any trace of the peculiarity we have described. It was somewhat fortunate for science that Olbers had full faith in the doctrine that the date of the catastrophe could not be more than four or five thousand years before his time, and that therefore he observed the two regions of the heavens indicated by the explosion theory with unwearying assiduity for many months. He also persuaded Harding, of Lilienthal, to pay special attention to these two regions; one near the northern wing of the Virgin, the other in the constellation of the Whale.

At length, on September 4, 1804, the search was rewarded with success; the planet called Juno being discovered by Harding in that part of the Whale which Olbers had indicated. Olbers did not cease from the search, however, but continued it for thirty months after Harding's success, and five years after his own discovery of Pallas. At length, on March 28th, the fifth anniversary of this discovery, Olbers detected Vesta, the only member of the family of asteroids which has ever (we believe) been seen with the naked eye.

For some reason astronomers seem to have been satisfied with this fourth fragment of Olbers's hypothetical planet. The search was not resumed for twenty-three years. Then Hencke, an amateur astronomer of Driessen, in Germany, commenced a search destined to meet with no success until more than fifteen years had elapsed. We shall return presently to the discovery of the fifth asteroid by Hencke. We must first, however, consider the interesting questions raised by astronomers, after the discovery of Vesta, upon the theory of Olbers that the asteroids are fragments of an exploded planet.

Lagrange, in 1814, examined the theory mathematically, inquiring what degree of explosive force would be necessary to detach a fragment of a planet in such sort that it would not return, but travel thereafter on an orbit of its own around the sun. We have not by us the result of his researches except as they are given in Grant's "Physical Astronomy," as follows:

"Applying his results to the earth, Lagrange found that if the velocity exceeded that of a cannon-ball in the proportion of 121 to 1, the fragment would become a comet with a direct motion; but if the velocity rose in the proportion of 156 to 1, the motion of the comet would be retrograde. If the velocity were less than in either of these cases,

the fragment would revolve as a planet in an elliptical orbit."

This statement is not very satisfactory, because the velocity of a cannon-ball, depending considerably on circumstances, is not a definite unit of measurement. The assertion, too, that the fragment would become a comet is open to exception, and nothing is said about the least velocity necessary to free the expelled body from the earth. Probably the velocity of a cannon-ball was taken by Lagrange at about 500 yards per second, that being a fair velocity for a 68-pounder at the date of his paper. A velocity, then, exceeding a cannon-ball in the proportion of 156 to 1, would be about 44 miles a second. Now, for a body expelled from the earth to travel as a retrograde comet, it must be sent backward with a velocity equal to the earth's in her orbit (about $18\frac{1}{2}$ miles per second), increased by the proper velocity for a retrograde comet, about $25\frac{1}{2}$ miles per second, or 44 miles per second in all. This agrees, then, with Lagrange's result. But he seems to have been led from the real subject of inquiry to problems which are only matters of curiosity. The fragmentary planets of Olbers's theory move neither as advancing nor as retrograde comets. Leaving, then, Lagrange's paper, as not very much to the point, if rightly represented by Grant, we note simply that the velocity necessary to expel from the earth a fragment of her mass, in such sort that it would not be drawn back, would amount to about 7 miles per second, or, say, about twenty-five times the velocity of a cannon-ball.

But again, the expulsion of a fragment, and the explosion of an entire planet, are processes very different in their nature. If a fragment were expelled, the entire mass of the earth would recoil with a motion bearing the same kind of relation to that of the fragment which the recoil of a very heavy cannon bears to the motion of the ball. If a cannon were not heavier than the ball, the cannon would be driven back as rapidly as the ball would be expelled, though frictional resistance would bring it sooner to rest. Again, when a shell at rest bursts, the fragments are driven outward on all sides, with much smaller velocities than any one of them would have if the entire charge of powder acted upon it, the rest of the shell being in some way restrained from moving. We see, then, that for a planet to explode into fragments which thereafter should be free to travel independently around the sun, the explosive force must enormously exceed what would be necessary in the case of a single fragment expelled as a projectile is expelled from a gun.

When we consider, further, that the frame of the earth is demonstrably not the hollow shell formerly imagined, but even denser at its core than near its surface; that, moreover, it is not formed of rigid materials, but of materials which under the forces to which they are subject are perfectly plastic and ductile, it seems incredible that under any conditions which appear possible our earth could be shattered by an explosion. Prof. Newcomb, of Washington, in an able paper on this subject, remarks on this objection that, "since the limits of our knowledge are not necessarily the limit of possibility, the objection is not fatal, and it is difficult to say what weight ought to be attached to it;" and, as many of our readers will remember, Sir W. Thomson, one of the greatest mathematicians living, has not thought the arguments against the possible or probable shattering of a planet sufficiently weighty to prevent the theory from being entertained that one world may be peopled from the seeds of life brought to it by the fragments of another which had exploded. Yet it may fairly be said that if the destructive explosion of a planet is possible, it is utterly improbable; and that absolutely nothing is at present known to us which suggests even the bare possibility of such a catastrophe.

Yet the theory that a planet which had been traveling between Mars and Jupiter had burst into fragments, had a much more probable appearance in Olbers's time than it has at present; for the four asteroids first discovered traveled on orbits not differing greatly as to their mean distances, which are as the numbers 236 (Vesta), 267 (Juno), 277 (Ceres and Pallas). When asteroids began to be discovered which traveled nearer to the sun than Vesta, and much farther away than Ceres and Pallas, the explosion theory was shown to be improbable. When, further, the actual paths of these multitudinous worlds came to be examined, the theory was found to be utterly untenable. More recently still a circumstance noted by the ingenious American astronomer, Kirkwood, has pointed to another theory as extremely probable.

The history of the successive discovery of the various members of the asteroidal family, though not without interest, would be little suited to these pages. A few details, however, may be mentioned here as illustrating the general character of the search.

We have seen that Hencke engaged in 1830 in the search for a fifth asteroid. On the evening of December 8th he observed a star of the

ninth magnitude in the constellation Taurus, in a place where he felt sure, from his recollection of the region, that there had previously been no star of that degree of brightness. He communicated the observation to Encke, of Berlin; and on December 14th they rediscovered it in the place to which by that time it had removed. It was found to be an asteroid traveling at a distance almost midway between that of Vesta and that of Ceres. Hencke requested Encke to name the new planet, and that astronomer selected for it the name of Astræa.

On July 1st, Hencke discovered a sixth asteroid, which Gauss named at his request, calling it Hebe. In the same year, and only six weeks later, our English astronomer Hind discovered the asteroid Iris; and on October 18th he discovered another, to which Sir J. Herschel, at his request, assigned a name, selecting (somewhat unsuitably, perhaps, for an October discovery) the name Flora.

Since that date, not a year has passed without the discovery of at least one asteroid, as in 1848, 1849, and 1859. Two were discovered in 1851, 1863, and 1869; three in 1850, 1864, 1865, and 1870; four in 1853, 1855, and 1867; five in 1856, 1860, 1862, and 1871; six in 1854, 1858, 1866, 1873, and 1874; eight in 1852 and 1857; ten in 1861; eleven in 1872; twelve in 1868 and 1876; and seventeen in 1875. During last year six were discovered. The astronomer who has hitherto been most successful in the search for asteroids is Peters, of Clinton, United States (Prof. Peters is a German by birth, however), with twenty-seven; next Luther, of Bilk, with twenty; and third, Watson, of Ann Arbor, Michigan, with twenty. Goldschmidt, a French painter, discovered fourteen; Borelly and our Hind, ten. These six have thus discovered 101 of the 175 asteroids at present known. After them come De Gasparis and Palisa, with nine each; Pogson, of Madras, with seven; Chacornac and Paul Henry, with six each; Prosper Henry and Tempel, with five; and Perrotin, with four, bringing up the total to 149. Of the remaining twenty-three, three were discovered by Ferguson; two by Olbers, Hencke, and Tuttle; and Piazzi, Harding, Graham, Marth, Laurent, Searle, Forster d'Arrest, Tietjen, Stéphan, Coggia, Schulhof, Schiaparelli, and Knorre, have each discovered one.

Some coincidences which would seem curious, but for the great number of asteroids already known, have naturally occurred during the progress of discovery. Thus the asteroid Irene was discovered by De Gasparis, independently, a few

days after Hind had marked it for his own (May 19, 1851). *En revanche*, De Gasparis discovered Psyche on March 19, 1852, while Hind, who had seen the planet on January 18th, but had been prevented by bad weather from reobserving it, satisfied himself on March 18th of its planetary character. While Hind was planning a vigorous search after the planet, news reached him that De Gasparis had discovered it. Goldschmidt, on September 19, 1857, discovered two asteroids, which chanced that night to be within a distance from each other equal to about one-third of the apparent diameter of the moon. No other astronomer has ever had the good fortune to capture two of these wandering bodies on the same night and within the same telescopic field of view. But the planet Alexandra was discovered by Goldschmidt, at Paris, on September 10, 1858, and the planet Pandora by Mr. Searle, of Albany, New York, on the same night, only a few hours later. The asteroid Melete, really discovered on September 9, 1857, was not recognized as a new planet till 1858, having been for a long time mistaken for the asteroid Daphne. The latter had been lost since May, 1856, and Goldschmidt, its discoverer, was looking for it in September, 1857, when he found Melete. When Melete was proved by Schubert's calculations to be a different body, fresh search had to be made for Daphne; but she was not found till August 31, 1862, having been thus lost more than six years.

One feature of M. Goldschmidt's labors in this field of research is worthy of mention. Most of the astronomers who have added to the list of known asteroids were professional observers, employed in well-provided observatories. Goldschmidt was a painter by profession, and the telescopes with which he observed were successively, as he could afford to extend his observational resources, of two inches', $2\frac{3}{4}$ inches', and four inches' aperture only. "None of M. Goldschmidt's telescopes," says Mr. Main, of the Radcliffe Observatory, "were mounted equatorially" (that is, so as to follow any star to which they might be directed by a single motion), "but in the greater number of instances were pointed out of a window which did not command the whole of the sky."

Having now nearly two hundred of these bodies to deal with, we can form a safer opinion, than in Olbers's time, of the theory whether they are fragments of an exploded planet. The answer to this question comes in no doubtful terms. One fact alone suffices to show clearly that they cannot have had a common origin. The least

distances of some of the more remote of these bodies from the sun exceed the greatest distances of some of the nearer. Thus Harmonia, at her greatest distance from the sun, is about 217,000,000 miles from him; Nemansa, 231,000,000; Feronia, 233,000,000, and so on; while Cybele, at her nearest, is 276,000,000 miles from the sun; Doris, 262,000,000; Hygeia, 259,000,000, and so on. So that Cybele, at her nearest to the sun, is farther from him by nearly 80,000,000 miles than Harmonia at her nearest. The two orbits do not even approach each other within this distance, enormous though it is, for the place of Cybele's nearest approach is not *nearly* in the same direction from the sun as the place of Harmonia's greatest recession. The two orbits nowhere approach within a distance less than that which separates our earth from the sun. If the two planets were originally parts of a single one, their orbits after the explosion would have intersected. It is utterly impossible that, if this had been so, subsequent perturbations could have separated the paths by so enormous a distance as 90,000,000 miles at the place even of nearest approach.

But while the discovery of multitudinous members of this ring of worlds has rendered Olbers's theory of the explosion of a single planet between Mars and Jupiter utterly untenable, it has brought to our knowledge a remarkable relation which points very clearly to the real origin of the ring system of planets.

When as yet only half as many asteroids had been discovered as are now known, Prof. Kirkwood, of Bloomington, Indiana, arranging these bodies in the order of their mean distances from the sun, noticed that certain gaps exist, in such sort that no asteroids travel at or nearly at certain mean distances from the sun. And looking more closely into these missing distances, he observed that they correspond to the distance of the giant planet Jupiter in this way, that a planet traveling at any one of these missing distances would have motions synchronizing with those of Jupiter, in the same sense in which the vibrations of one note synchronize with the vibrations of another in harmony with it. For instance, there is a well-marked gap at a distance from the sun exceeding our earth's in the proportion of 5 to 2; now a planet traveling at this distance would make three circuits while Jupiter makes one. There is another gap at a distance somewhat exceeding three and a quarter times the earth's; and a planet at this distance would travel twice round the sun while Jupiter travels once round

him. Still more remarkable, because occurring in the very heart of the ring, is the gap corresponding to the distance of a planet which would travel five times round the sun while Jupiter travels twice round him. There are two gaps, also, where a planet would travel seven times round—1. During two circuits; and, 2. During three circuits, of Jupiter.

Before inquiring into the meaning of this peculiarity, we note that now, when twice as many asteroids have been discovered, the peculiarity is better marked even than when Kirkwood first noticed it. He was justified in saying, as he did in 1868, that the coincidences are not accidental; for the odds were enormously against the observed arrangement, and its accidental occurrence so unlikely as to be practically impossible. But had the arrangement been accidental with the eighty-seven asteroids known to Kirkwood, it could not but have happened that some of the eighty-nine since discovered would have had mean distances corresponding to those gaps or *lacunæ*. This, however, has not only not happened, but the aggregation of asteroids at distances where Kirkwood had already noticed that they were most numerous, has become still more decided.

We are led back, in our inquiry into the significance of this singular relation, to the time when our solar system was gradually forming from its former nebulous condition. Imagine a ring of nebulous fragments, not as yet gathered into a single mass. The process of aggregation would depend in considerable degree on the disturbances to which the fragments were exposed. If they were all moving in concentric orbits, and were not disturbed at all, there would be no collisions, and they would remain as a ring of fragments. It might seem, then, at a first view, that the zone of asteroids was most favorably placed for aggregation into planet form, being under the special perturbing influence of Jupiter, the mightiest of all the planets. But excessive disturbance would be by no means favorable to the formation of a single planet. The nebulous matter must be churned by perturbations, but it must not be scattered by them; and this is what Jupiter's action on the planetoid ring has done. Quantity of matter, again, would be a very important point in the process of aggregation. A region crowded with nebulous fragments would soon teem with aggregations, which would before long gather into a few large masses, which in turn would aggregate into one. But in a region where nebulous matter was very sparsely strewed, aggregations would not readily form, however high-

tily the region might be disturbed. The very activity of the disturbing forces might, in this case, check the process of aggregation. The two bodies which had once come into collision would travel on intersecting orbits, and would therefore before long come into collision, if not perturbed; but if perturbed, their orbits would cease to coalesce; so that the action of a great disturbing planet might prevent a process of aggregation which had already commenced. Now, we know that the quantity of matter in the region where the asteroids travel is less than in any other zone of the solar system. We do not know how many asteroids there are, but we do know how much they all weigh; at least, we know that altogether their weight is not more than a fourth of our earth's, and is probably a great deal less. And the zone over which they range is very much larger than the zone over which our earth may be regarded as bearing sway. Their zone being thus poverty-stricken, and Jupiter's mighty mass in their neighborhood perturbing them too actively to allow of their aggregation, they remain as a ring of fragments.

And now let the signs of Jupiter's influence in this respect be noticed. He would perturb all these fragments pretty equally in a single revolution of his. But those whose periods synchronized with his own would be more seriously perturbed. For the disturbance produced in one set of revolutions which brought any asteroid and Jupiter back to the position they had before those revolutions began, would be renewed in the next similar set, and in the next, and so on, until one of two things happened. Either the asteroid would be thrown entirely out of that periodic motion which had brought it thus under Jupiter's effectively disturbing influence, *or*, being set traveling on a markedly eccentric path, it would be brought into collision with some of the neighboring asteroids, and would cease to have separate existence, or at least move thenceforward on a changed orbit. Thus those asteroids having a period synchronizing with that of Jupiter would be gradually eliminated, and we should find gaps in the ring of worlds precisely where gaps actually exist.

There can be no reasonable doubt that these marked gaps were produced in the manner here described. Their existence can indeed be explained in no other way, and can be so satisfactorily explained in this way that assurance is made doubly sure.

But now consider the significance of this result. Imagine the asteroidal ring as it now ex-

ists to be redistributed, the gaps being filled up. The process we have described would immediately come into operation. But many millions of years would be required before it could eliminate even a few among the asteroids having those synchronous periods which expose them to accumulating perturbations. Only one of the two processes above described would really be effective. Mere change of period would be oscillatory. We have an instance of the kind in the motions of Jupiter and Saturn, which very nearly synchronize, Saturn going almost exactly twice round the sun while Jupiter goes five times round. But, though for a long period of time accumulating perturbations lengthen Saturn's period (and shorten Jupiter's), after a while the time comes when these changes are reversed; then Saturn's period begins to shorten (and Jupiter's to lengthen). The changes carry these periods on either side of their mean value, just as the swinging of a pendulum carries it on either side of its mean position. So it would be with an asteroid mightily perturbed by Jupiter: its period would oscillate more widely, but still it would oscillate; and during the middle of the oscillation (just as a pendulum at the middle of its swing is in its mean position) the asteroid would have that synchronous period which, as we have seen, none of the asteroids in point of fact possess. We must look, then, to collisions to cause the gaps in the ring of worlds. But how rare must such collisions be among minute bodies like the asteroids, even though they be hundreds of thousands in number, occupying a domain in space so vast as that which belongs to this system! The width of the ring greatly exceeds the earth's distance from the sun, amounting in fact to more than 120,000,000 miles. Its innermost edge is more than 200,000,000 miles from the sun. It is not a flat ring, but shaped like an anchor-ring (or a wedding-ring), and is as thick as it is wide—insomuch that a cross-section of the ring would be a mighty circle, more than 120,000,000 miles in diameter. Amid this enormous space 1,000,000 asteroids, each five hundred miles in diameter (and none of the asteroids are so large, while the number even of those exceeding one hundred miles in diameter scarcely amounts to a hundred), would be as widely scattered as 1,000,000 grains of sand would be in such a space as the interior of St. Peter's, at Rome. Take a cubical block of sandstone, one inch in length, breadth, and thickness, crumble it into finest sand-dust, and imagine this dust scattered in the interior of that great

peculiarities of the Saturnian ring system would one day be found to afford "a key to the law of development under which the solar system has reached its present development." The same may now confidently be said respecting the ring of worlds traveling between the orbits of Mars and Jupiter. It has already enabled us to weigh the giant Jupiter afresh; it has given excellent measures, and promises to give yet better meas-

ures, of the dimensions of the solar system; and we venture to predict that before long this zone of worlds will have placed beyond shadow of doubt or question the general theory of the development of our solar system of which Laplace's nebular hypothesis presents only a few details, or rather suggests only a few possibilities.

—*Cornhill Magazine.*

TAME BEARS IN SWEDEN.

By JOHN WAGER.

IT is well known that the bear, by a course of severe discipline, can be taught to carry a long pole in his paws or a pert monkey upon his back, to dance to the music of pipe and drum, and to perform tricks which the solemn gravity of his demeanor, his clumsy motions, and shaggy hide, render the more amusingly grotesque. He may also be seen, in the den of a menagerie, to leap through a comparatively small ring encircled with flame, associated, during the performance only, with leopards and a hyena; though the uncouthness and reluctance with which he accomplishes the feat, contrasted with the graceful and ready spring of the leopards, is enough to make the hyena laugh; while, of all the performers, he has evidently the most intractable temper, and is least trusted by the spangled damsel who presides with the whip.

Yet, when young, the bear is not altogether devoid of amiable qualities, as the following narrative will prove. The account was communicated to the present writer in 1867, by a Swedish acquaintance residing at Mora, in Dalecarlia, the bear being then living, and the property of a gentleman at Siknäs, in Venjan, an adjoining parish, having been taken when about three weeks old, from the adjacent forest, in February, 1865. Being fed with warm milk, young Bruin thrived satisfactorily, and, when large enough to enjoy liberty, he usually sojourned in the yard with the bear-dog "Jeppe," playing and springing about his companion like a cat. He was also much attached to his master, delighting to accompany him, not only to the forest, where he often clambered up trees, but also into the house, where removing chairs and tables from one room into another appeared to be his favorite occupa-

tion. Strangers who visited Siknäs always received his attentions; but as these were somewhat brusque, and expressed in a surly tone, they tended rather to repel than attract.

To Swedish punch (a luscious compound of arrack and sugar) he was extremely partial, and partook of it, whenever invited, out of a glass, like a well-bred gentleman, but afterward showing his loutish and lumpish nature in a drunken fit, concluding with heavy sleep and loud snores.

One day, while Bruin was yet of tender years, a kitten came into the yard and immediately drew his surprised attention upon herself; but young Puss, not admiring his looks, first cast upon him an angry glance, and then sprang up and fixed her claws in his head, exciting such alarm that he trotted off in a nervous perspiration, and ensconced himself in an out-house. Subsequently he always fled at the sight of this cat, though she was the only one of which he showed fear.

Bruin took a daily bath in the river, which flows within a stone's-throw of the house; swimming across and back again. He then trotted to an ice-cellar, the roof of which was easily accessible and covered with deal boards, one of which projected considerably beyond the rest; toward the end of this he used to creep warily, to enjoy the swinging motion that resulted. It was a mode of recreation of which he frequently availed himself.

Whenever he could intrude into the kitchen he bemeaned himself like an officious and meddlesome husband, disordering affairs, greatly to the vexation of the domestics, to whose castigations with a stout knob-stick he payed little regard. One day he laid hold of a coffee-pan that stood on the hearth, and was conveying it in his

paws to the yard, when the hot contents, overflowing on his bosom, provoked him to cast it on the ground and flatten it with a stroke of his paw. He would also, when opportunity occurred, smuggle himself into the larder (a detached building), looking round first to see that he was not observed, then bring out some article, especially a cheese, which he found convenient to carry; but on one occasion he made free with a tub of *clouted* milk and cream, handling it, however, so awkwardly that the ropy tenacious contents streamed down the front of his erected corpus, and, as in the case of the coffee-pan, brought vengeance on the tub. After fruitless endeavors, with tongue and claws, to clear the viscous mass from his best fur coat, he betook himself to the river, and then solaced himself with a swing.

This partiality for swinging or rocking rendered him an undesirable companion in a boat; yet he constantly followed his owner to the river-side, and, if not admitted as a passenger, would swim after the boat, grunting like a hog. During one river-excursion which he had been allowed to share he enjoyed as usual his rocking, till the boat, gliding down the river, entered a stormy rapid, when he became quite agitated with fear, trembling in every limb, and holding on each side of the boat so long as it remained in the weltering force. When indulged with a ride by land, he would sometimes leap on the shafts of the vehicle, and, placing a hind-leg on each, rest his fore-paws on the horse's back.

As he grew older it was found necessary to impose some check upon his movements, and for this purpose a chain, with a log at the end of it, was attached to a collar round his neck. Such badge of servitude and interference with the liberty of a free-born bear was not to be borne. At first he tried to strike off the log with his paws; then he dragged it to the river, but was vastly irritated to find that, after every attempt to sink it, the audacious log came to the surface again. Finally he dug a hole, put the log into it, and re-

placed the earth, stamping or pressing it down; then, apparently satisfied with his work, he attempted to move off, but found himself in a worse fix than before; however, after sundry curvets and angry jerks, the chain broke, and he regained his freedom, leaving his incumbrance in the grave.

In concluding his ursine anecdotes my Swedish friend remarked: "These are but a few of Bruin's traits and droll tricks, which must be seen to be fully enjoyed. At present he lies quietly in his winter lair, but imagine his humor when he leaves it in spring; he is then no agreeable companion, especially for the kitchen-maids, toward whom, and the fair sex in general, he shows the greatest disregard."

Poor Bruin! he must indeed have got up on the wrong side of the bed, for he became so unbearably troublesome and subject to such angry moods, that, as I afterward learned, at the early age of about three years he was doomed to death and executed accordingly.

Another young bear, captured in the winter of 1869, was kept for about two years at Ekshärads, in Wermland; but as it grew older it became dangerously ferocious, and consequently was also shot. A tame bear, kept at Snö-an, had accidentally one Saturday evening got locked up in the smithy, and, not liking to remain in a workshop on a Sunday, attempted to escape through an opening in the roof. But to reach this Bruin had to clamber upon a lever, which, under the pressure of his weight, opened the sluice-gate, and, turning the water upon the wheel, set the great hammer to work. Evidently annoyed by its persistent motion and noise, he appears to have grasped the hammer in his paws with intent to stop it; but the contest proved beyond his strength, for the neighbors, hearing loud roars, hastened to the smithy and found him lying upon the anvil, having received a death-blow before their arrival.

—*Science Gossip.*

EQUALITY.¹

By MATTHEW ARNOLD.

THERE is a maxim which we all know, which occurs in our copy-books, which occurs in that solemn and beautiful formulary against which the Nonconformist genius is just now so angrily chafing—the burial-service. The maxim is this: “Evil communications corrupt good manners.” It is taken from one of the chapters of the Epistles to the Corinthians; but originally it is a line of poetry, of Greek poetry. *Quid Athenis et Hierosolymis?* asks a Father; what have Athens and Jerusalem to do with one another? Well, at any rate, the Jerusalemite Paul, exhorting his converts, enforces what he is saying by a verse of Athenian comedy, a verse, probably, from the great master of that comedy, a man unsurpassed for fine and just observation of human life, Menander. *Φθέρονσιν ἤθη χρῆσθ' ὁμιλίαι κακάι*—“Evil communications corrupt good manners.”

In that collection of single, sententious lines, printed at the end of Menander's fragments, where we now find the maxim quoted by St. Paul, there is another striking maxim, not alien certainly to the language of the Christian religion, but which has not passed into our copy-books: “Choose equality and flee greed.” The same profound observer, who laid down the maxim so universally accepted by us that it has become commonplace, the maxim that evil communications corrupt good manners, laid down too, as a no less sure result of the accurate study of human life, this other maxim also: “Choose equality and flee greed”—*Ἰσότητα δ'αἰροῦ καὶ πλεονεξίαν φύγε*.

Pleonexia, or greed, the wishing and trying for the bigger share, we know under the name of covetousness. We understand by covetousness something different from what *pleonexia* really means: we understand by it the longing for other people's goods; and covetousness, so understood, it is a commonplace of morals and of religion with us that we should shun. As to the duty of pursuing equality, there is no such consent among us. Indeed, the consent is the other way, the consent is against equality. Equality before the law we all take as a matter of course; that is not the equality which we mean when we talk of equality. When we talk of equality we understand social equality; and for equality in this

Frenchified sense of the term almost everybody in England has a hard word. About four years ago Lord Beaconsfield held it up to reprobation in a speech to the students at Glasgow—a speech so interesting, that being asked soon afterward to hold a discourse at Glasgow, I said that if one spoke there at all at that time, it would be impossible to speak on any other subject than equality. However, it is a great way to Glasgow, and I never yet have been able to go and speak there. But the testimonies against equality have been steadily accumulating from the date of Lord Beaconsfield's Glasgow speech down to the present hour, when Sir Erskine May winds up his new and important “History of Democracy” by saying: “France has aimed at social equality. The fearful troubles through which she has passed have checked her prosperity, demoralized her society, and arrested the intellectual growth of her people.” Mr. Froude is more his own master than I am, and he has been able to go to Edinburgh and to speak there upon equality. Mr. Froude told his hearers that equality splits a nation into “a multitude of disconnected units,” that “the masses require leaders whom they can trust,” and that “the natural leaders in a healthy country are the gentry.” And only just before “The History of Democracy” came out, we had that exciting passage of arms between Mr. Lowe and Mr. Gladstone, where equality, poor thing, received blows from them both. Mr. Lowe declared that “no concession should be made to the cry for equality, unless it appears that the state is menaced with more danger by its refusal than by its admission. No such case exists now or ever has existed in this country.” And Mr. Gladstone replied that equality was so utterly unattractive to the people of this country, inequality was so dear to their hearts, that to talk of concessions being made to the cry for equality was absurd. “There is no broad political idea,” says Mr. Gladstone, quite truly, “which has entered less into the formation of the political system of this country than the love of equality.” And he adds: “It is not the love of equality which has carried into every corner of the country the distinct, undeniable popular preference, wherever other things are equal, for a man who is a lord over a man who is not. The love of

¹ Address delivered at the Royal Institution.

freedom itself is hardly stronger in England than the love of aristocracy." Mr. Gladstone goes on to quote a saying of Sir William Molesworth, that with our people the love of aristocracy "is a religion." And he concludes in his copious and eloquent way: "Call this love of inequality by what name you please—the complement of the love of freedom, or its negative pole, or the shadow which the love of freedom casts, or the reverberation of its voice in the halls of the constitution—it is an active, living, and life-giving power, which forms an inseparable essential element in our political habits of mind, and asserts itself at every step in the processes of our system."

And yet, on the other side, we have a consummate critic of life like Menander, delivering, as if there were no doubt at all about the matter, the maxim, "Choose equality!" An Englishman with any curiosity must surely be inclined to ask himself how such a maxim can ever have got established, and taken rank along with "Evil communications corrupt good manners." Moreover, we see that among the French, who have suffered so grievously, as we hear, from choosing equality, the most gifted spirits continue to believe passionately in it nevertheless. "The human ideal, as well as the social ideal, is," says George Sand, "to achieve equality." She calls equality "the goal of man and the law of the future." She asserts that France is the most civilized of nations, and that its preëminence in civilization it owes to equality.

But Menander lived a long while ago, and George Sand was an enthusiast. Perhaps their differing from us about equality need not trouble us much. France, too, counts for but one nation, as England counts for one, also. Equality may be a religion with the people of France, as inequality, we are told, is a religion with the people of England. But what do other nations seem to think about the matter? Now this is most certainly not a lecture on law and the rules of bequest. But it is evident that in the societies of Europe, with a constitution of property such as that which the feudal middle age left them with—a constitution of property full of inequality—the state of the law of bequest shows us how far each society wishes the inequality to continue. The families in possession of great estates will not break them up if they can help it. The owners will do all they can, by entail and settlement, to prevent their successors from breaking them up. They will preserve inequality. Freedom of bequest, then, the power of making entails and

settlements, is sure, in an old European country like ours, to maintain inequality. And with us, who have the religion of inequality, the power of entailing and settling, and of willing property as one likes, exists, as is well known, in singular fullness—greater fullness than in any country of the Continent. The proposal of a measure such as the Real Estates Intestacy Bill is, in a country like ours, perfectly puerile. A European country like ours, wishing not to preserve inequality but to abate it, can only do so by interfering with the freedom of bequest. This is what Turgot, the wisest of French statesmen, pronounced before the Revolution to be necessary, and what was done in France at the great Revolution. The Code Napoléon, the actual law of France, forbids entails altogether, and leaves a man free to dispose of but one-fourth of his property, of whatever kind, if he have three children or more, of one-third if he have two children, of one-half if he have but one child. Only in the rare case, therefore, of a man's having but one child, can that child take the whole of his father's property. If there are two children, two-thirds of the property must be equally divided between them; if there are more than two, three-fourths. In this way has France, desiring equality, sought to bring equality about.

Now the interesting point for us is, I say, to know how far other European communities, left in the same situation with us and France, having immense inequalities of class and property created for them by the middle age, have dealt with these inequalities by means of the law of bequest. Do they leave bequest free, as we do? then, like us, they are for inequality. Do they interfere with the freedom of bequest, as France does? then, like France, they are for equality. And we shall be most interested, surely, by what the most civilized European communities do in this matter—communities such as those of Germany, Italy, Belgium, Holland, Switzerland. And among those communities we are most concerned, I think, with such as, in the conditions of freedom and of self-government which they demand for their life, are most like ourselves. Germany, for instance, we shall less regard, because the conditions which the Germans seem to accept for their life are so unlike what we demand for ours; there is so much personal government there, so much *junkerism*, militarism, officialism; the community is so much more trained to submission than we could bear, so much more used to be, as the popular phrase is, sat upon. Countries where the community has more a will of its own, or can more show it, are

the most important for our present purpose—such countries as Belgium, Holland, Italy, Switzerland. Well, Belgium adopts purely and simply, as to bequest and inheritance, the provisions of the Code Napoléon. Holland adopts them purely and simply. Italy has adopted them substantially. Switzerland is a republic, where the general feeling against inequality is strong, and where it might seem less necessary, therefore, to guard against inequality by interfering with the power of bequest. Each canton has its own law of bequest. In Geneva, Vaud, and Zurich—perhaps the three most distinguished cantons—it is identical with that of France. In Berne, one-third is the fixed proportion which a man is free to dispose of by will; the rest of his property must go among his children equally. In all the other cantons there are regulations of a like kind. Germany, I was saying, will interest us less than these freer countries. In Germany—though there is not the English freedom of bequest, but the rule of the Roman law prevails, the rule obliging the parent to assign a certain portion to each child—in Germany entails and settlements in favor of an eldest son are generally permitted. But there is a remarkable exception. The Rhine countries, which in the early part of this century were under French rule, and which then received the Code Napoléon, these countries refused to part with it when they were restored to Germany; and to this day Rhenish Prussia, Rhenish Hesse, and Baden, have the French law of bequest, forbidding entails, and dividing property in the way we have seen.

The United States of America have the English liberty of bequest. But the United States are, like Switzerland, a republic, with the republican sentiment for equality. Theirs is, besides, a new society; it did not inherit the system of classes and of property which feudalism formed in Europe. The class by which they were settled was not a class with feudal habits and ideas. It is notorious that to hold great landed estates and to entail them upon an eldest son, is neither the practice nor the desire of any class in America. I remember hearing it said to an American in England, "But, after all, you have the same freedom of bequest and inheritance as we have, and if a man to-morrow chose in your country to entail a great landed estate rigorously, what could you do?" The American answered, "Set aside the will on the ground of insanity."

You see we are in a manner taking the votes for and against equality. We ought not to leave out our own colonies. In general they are, of

course, like the United States of America, new societies. They have the English liberty of bequest. But they have no feudal past, and were not settled by a class with feudal habits and ideas. Nevertheless it happens that there have arisen, in Australia, exceedingly large estates, and that the proprietors seek to keep them together. And what have we seen happen lately? An act has been passed which in effect inflicts a fine upon every proprietor who holds a landed estate of more than a certain value. The measure has been severely blamed in England; to Mr. Lowe such a "concession to the cry for equality" appears, as we might expect, pregnant with warnings. At present I neither praise it nor blame it; I simply take it as one of the votes for equality. And is it not a singular thing, I ask you, that while we have the religion of inequality, and can hardly bear to hear equality spoken of, there should be, among the nations of Europe which have politically most in common with us, and in the United States of America, and in our own colonies, this diseased appetite, as we must think it, for equality? Perhaps Lord Beaconsfield may not have turned your minds to this subject as he turned mine, and what Menander or George Sand happen to have said may not interest you much; yet surely, when you think of it, when you see what a practical revolt against inequality there is among so many people not so very unlike to ourselves, you must feel some curiosity to sift the matter a little further, and may be not ill-disposed to follow me while I try to do so.

I have received a letter from Clerkenwell, in which the writer reproaches me for lecturing about equality at this which he calls "the most aristocratic and exclusive place out." I am here because your secretary invited me. But I am glad to treat the subject of equality before such an audience as this. Some of you may remember that I have roughly divided our English society into Barbarians, Philistines, Populace, each of them with their prepossessions, and loving to hear what gratifies them. But I remarked, at the same time, that scattered throughout all these three classes were a certain number of generous and humane souls, lovers of man's perfection, detached from the prepossessions of the class to which they might naturally belong, and desirous that he who speaks to them should, as Plato says, not try to please his fellow-servants, but his true and legitimate masters, the heavenly gods. I feel sure that, among the members and frequenters of an institution like this, such humane souls are apt to congregate in numbers.

Even from the reproach which my Clerkenwell friend brings against you of being too aristocratic, I derive some comfort. Only I give to the term *aristocratic* a rather wide extension. An accomplished American, much known and much esteemed in this country, the late Mr. Charles Sumner, says that what particularly struck him in England was the large class of gentlemen as distinct from the nobility, and the abundance among them of serious knowledge, high accomplishment, and refined taste—taste fastidious perhaps, says Mr. Sumner, to excess, but erring on virtue's side. And he goes on: "I do not know that there is much difference between the manners and social observances of the highest classes of England and those of the corresponding classes of France and Germany; but in the rank immediately below the highest—as among the professions, or military men, or literary men—there you will find that the Englishmen have the advantage. They are better educated and better bred, more careful in their personal habits and in social conventions, more refined." Mr. Sumner's remark is just and important; this large class of gentlemen in the professions, the services, literature, politics—and a good contingent is now added from business also—this large class, not of the nobility but with the accomplishments and tastes of an upper class, is something peculiar to England. Of this class I may probably assume that my present audience is in large measure composed. It is aristocratic in this sense, that it has the tastes of a cultivated class, a certain high standard of civilization. Well, it is in its effects upon *civilization* that equality interests me. And I speak to an audience with a high standard of civilization. If I say, certain things in certain classes do not come up to a high standard of civilization, I need not prove how and why they do not; you will feel whether they do or not. If they do not, I need not prove that this is a bad thing, that a high standard of civilization is desirable; you will instinctively feel that it is. Instead of calling this "the most aristocratic and exclusive place out," I conceive of it as a *civilized* place; and in speaking about civilization half one's labor is saved when one speaks about it among those who are civilized.

Politics are forbidden here; but equality is not a question of English politics. The abstract right to equality may, indeed, be a question of speculative politics. French equality appeals to this abstract natural right as its support. It goes back to a state of Nature where all were equal, and supposes that "the poor consented,"

as Rousseau says, "to the existence of rich people," reserving always a natural right to return to the state of Nature. It supposes that a child has a natural right to his equal share in his father's goods. The principle of abstract right, says Mr. Lowe, has never been admitted in England, and is false. I so entirely agree with him, that I run no risk of offending by discussing equality upon the basis of this principle. So far as I can sound human consciousness, I cannot, as I have often said, perceive that man is really conscious of any abstract natural rights at all. The natural right to have work found for one to do, the natural right to have food found for one to eat, rights sometimes so confidently and so indignantly asserted, seem to me quite baseless. It cannot be too often repeated—peasants and workmen have no natural rights, not one. Only we ought instantly to add, that kings and nobles have none either. If it is the sound English doctrine that all rights are created by law and are based on expediency, and are alterable as the public advantage may require, certainly that orthodox doctrine is mine. Property is created and maintained by law. It would disappear in that state of private war and scramble which legal society supersedes. Legal society creates, for the common good, the right of property, and for the common good that right is by legal society limitable. That property should exist, and that it should be held with a sense of security and with a power of disposal, may be taken, by us here at any rate, as a settled matter of expediency. With these conditions a good deal of inequality is inevitable. But that the power of disposal should be practically *unlimited*, that the inequality should be *enormous*, or that the degree of inequality admitted at one time should be admitted *always*—this is by no means so certain. The right of bequest was in early times, as Sir Henry Maine and Mr. Mill have pointed out, seldom recognized. In later times it has been limited in many countries in the way that we have seen; even in England itself it is not formally quite unlimited. The question is one of expediency. It is assumed, I grant, with great unanimity among us, that our signal inequality of classes and property is expedient for our civilization and welfare. But this assumption, of which the distinguished personages who adopt it seem so sure that they think it needless to produce grounds for it, is just what we have to examine.

Now, there is a sentence of Sir Erskine May, whom I have already quoted, which will bring us straight to the very point that I wish to raise.

Sir Erskine May, after saying, as you have heard, that France has pursued social equality, and has come to fearful troubles, demoralization, and intellectual stoppage, by doing so, continues thus: "Yet is she high, if not the first, in the scale of civilized nations." Why, here is a curious thing, surely! A nation pursues social equality, supposed to be an utterly false and baneful ideal; it arrives, as might have been expected, at fearful misery and deterioration by doing so; and yet, at the same time, it is high, if not the first, in the scale of civilized nations. What do we mean by *civilized*? Sir Erskine May does not seem to have asked himself the question. So we will try to answer it for ourselves. Civilization is the humanization of man in society. To be humanized is to comply with the true law of our human nature: *servare modum, finemque tenere, Naturamque sequi*, says Lucan; "to keep our measure, and to hold fast our end, and to follow Nature." To be humanized is to make progress toward this, our true and full humanity. And to be civilized is to make progress toward this in civil society; in that civil society "without which," says Burke, "man could not by any possibility arrive at the perfection of which his nature is capable, nor even make a remote and faint approach to it." To be the most civilized of nations, therefore, is to be the nation which comes nearest to human perfection, in the state which that perfection essentially demands. And a nation which has been brought by the pursuit of social equality to moral deterioration, intellectual stoppage, and fearful troubles, is perhaps the nation which has come nearest to human perfection in that state which such perfection essentially demands! M. Michelet himself, who would deny the demoralization and the stoppage, and call the fearful troubles a sublime expiation for the sins of the whole world, could hardly say more for France than this. Certainly Sir Erskine May never intended to say so much. But into what a difficulty has he somehow run himself, and what a good action would it be to extricate him from it! Let us see whether the performance of that good action may not also be a way of clearing our minds as to the uses of equality.

When we talk of man's advance toward his full humanity, we think of an advance, not along one line only, but several. Certain races and nations, as we know, are on certain lines preëminent and representative. The Hebrew nation was preëminent on one great line. "What nation," it was justly said by their lawgiver, "hath statutes and judgments so righteous as the law

which I set before you this day? Keep therefore and do them; for this is your wisdom and your understanding in the sight of the nations which shall hear all these statutes and say, Surely this great nation is a wise and understanding people!" The Hellenic race was preëminent on other lines. Isocrates could say of Athens: "Our city has left the rest of the world so far behind in philosophy and eloquence, that those educated by Athens have become the teachers of the rest of mankind; and so well has she done her part, that the name of Greeks seems no longer to stand for a race, but to stand for intelligence itself, and they who share in our culture are called Greeks even before those who are merely of our own blood." The power of intellect and science, the power of beauty, the power of social life and manners—these are what Greece so felt, and fixed, and may stand for. They are great elements in our humanization. The power of conduct is another great element; and this was so felt and fixed by Israel that we can never with justice refuse to allow Israel, in spite of all his shortcomings, to stand for it.

So you see that in being humanized we have to move along several lines, and that on certain lines certain nations find their strength, and take a lead. We may elucidate the thing yet further. Nations now existing may be said to feel, or to have felt, the power of this or that element in our humanization so signally that they are characterized by it. No one who knows this country would deny that it is characterized, in a remarkable degree, by a sense of the power of conduct. Our feeling for religion is one part of this; our industry is another. What foreigners so much remark in us—our public spirit, our love, amid all our liberty, for public order and for stability—are parts of it, too. The power of beauty was so felt by the Italians that their art revived, as we know, the almost lost idea of beauty, and the serious and successful pursuit of it. Cardinal Antonelli, speaking to me about the education of the common people in Rome, said that they were illiterate, indeed, but whoever mingled with them at any public show, and heard them pass judgment on the beauty or ugliness of what came before them—"è brutto," "è bello"—would find that their judgment agreed admirably, in general, with just what the most cultivated people would say. Even at the present time, then, the Italians are preëminent in feeling the power of beauty. The power of knowledge, in the same way, is eminently an influence with the Germans. This by no means implies, as is sometimes supposed, a high and fine general culture.

What it implies is a strong sense of the necessity of knowing *scientifically*, as the expression is, the things which have to be known by us—of knowing them systematically, by the regular and right process, and in the only real way. And this sense the Germans especially have. Finally, there is the power of social life and manners. And even the Athenians themselves, perhaps, have hardly felt this power so much as the French.

Voltaire, in a famous passage, where he extols the age of Louis XIV., and ranks it with the chief epochs in the civilization of our race, has to specify the gift bestowed on us by the age of Louis XIV., as the age of Pericles, for instance, bestowed on us its art and literature, and the Italian Renaissance its revival of art and literature. And Voltaire shows all his acuteness in fixing on the gift to name. It is not the sort of gift which we expect to see named. The great gift of the age of Louis XIV. to the world, says Voltaire, was this: *l'esprit de société*—the spirit of society, the social spirit. And another French writer, looking for the good points in the old French nobility, says that this, at any rate, is to be said in their favor: they established a high and charming ideal of social intercourse and manners, for a nation formed to profit by such an ideal, and which has profited by it ever since. And in America, perhaps, we see the disadvantages of having social equality before there has been any such high standard of social life and manners formed. We are not disposed in England, most of us, to attach all this importance to social intercourse and manners. Yet Burke says, "There ought to be a system of manners in every nation which a well-formed mind would be disposed to relish." And the power of social life and manners is truly, as we have seen, one of the great elements in our humanization. Unless we have cultivated it we are incomplete. The impulse for cultivating it is not, indeed, a moral impulse. It is by no means identical with the moral impulse to help our neighbor and to do him good. Yet, in many ways, it works to a like end. It brings men together, makes them feel the need of one another, be considerate of one another, understand one another. But, above all things, it is a promoter of equality. It is by the humanity of their manners that men are made equal. "A man thinks to show himself my equal," says Goethe, "by being *grob*—that is to say, coarse and rude; he does not show himself my equal, he shows himself *grob*." But a community having humane manners is a community of equals, and, in such a community, great social inequalities have really no meaning, while

they are, at the same time, a menace and an embarrassment to perfect ease of social intercourse. A community with the spirit of society is eminently, therefore, a community with the spirit of equality. A nation with a genius for society, like the French or the Athenians, is irresistibly drawn toward equality. From the first moment when the French people, with its congenital sense for the power of social intercourse and manners, came into existence, it was on its road to equality. When it had once got a high standard of social manners abundantly established, and, at the same time, the natural, material necessity for the feudal inequality of classes and property pressed upon it no longer, the French people introduced equality and made the French Revolution. It was not the spirit of philanthropy which mainly caused that Revolution, neither was it the spirit of envy; it was the spirit of society.

The well-being of the many comes out more and more distinctly, as time goes on, as the object we must pursue. An individual or a class, concentrating their efforts upon their own well-being exclusively, do but beget troubles both for others and for themselves also. No individual life can be truly prosperous, passed, as Obermann says, in the midst of men who suffer—*passée au milieu des générations qui souffrent*. To the noble soul, it cannot be happy; to the ignoble, it cannot be secure. Socialistic and communistic schemes have generally, however, a fatal defect; they are content with too low and material a standard of well-being. That instinct of perfection, which is the master-power in humanity, always rebels at this, and frustrates the work. Many are to be made partakers of well-being, true; but the ideal of well-being is not to be, on that account, lowered and coarsened. M. de Lavéleye, the political economist, who is a Belgian and a Protestant, and whose testimony, therefore, we may the more readily take about France, says that France, being the country of Europe where the soil is more divided than anywhere except in Switzerland and Norway, is at the same time the country where material well-being is most widely spread, where wealth has of late years increased most, and where population is least outrunning the limits which, for the comfort and progress of the working-classes themselves, seem necessary. This may go for a good deal. It supplies an answer to what Sir Erskine May says about the bad effects of equality upon French prosperity. But I will quote to you, from Mr. Hamerton, what goes, I think, for yet more. Mr. Hamerton is an excellent observer and reporter, and has lived for

many years in France. He says of the French peasantry that they are exceedingly ignorant. So they are. But he adds: "They are at the same time full of intelligence; their manners are excellent, they have delicate perceptions, they have tact, they have a certain refinement which a brutalized peasantry could not possibly have. If you talk to one of them at his own home, or in his field, he will enter into conversation with you quite easily, and sustain his part in a perfectly becoming way, with a pleasant combination of dignity and quiet humor. The interval between him and a Kentish laborer is enormous." This is indeed worth your attention. Of course, all mankind are, as Mr. Gladstone says, of our own flesh and blood. But you know how often it happens in England that a cultivated person, a person of the sort that Mr. Charles Sumner describes, talking to one of the lower class, or even of the middle class, feels, and cannot but feel, that there is somehow a wall of partition between himself and the other, that they seem to belong to two different worlds. Thoughts, feelings, perception, susceptibilities, language, manners—everything—are different. Whereas, with a French peasant, the most cultivated man may find himself in sympathy, feel that he is talking to an equal. This is an experience which has been made a thousand times, and which may be made again any day. And it may be carried beyond the range of mere conversation, it may be extended to things like pleasures, recreations, eating and drinking, and so on. In general the pleasures, recreations, eating and drinking of English people, when once you get below that class which Mr. Charles Sumner calls the class of gentlemen, are to one of that class unpalatable and impossible. In France there is not this incompatibility. The gentleman feels himself in a world, not alien or repulsive, but a world where people make the same sort of demands upon life, in things of this sort, which he himself does. In all these respects France is the country where the people, as distinguished from a wealthy, refined class, most lives what we call a humane life, the life of civilized man. Of course, fastidious persons can and do pick holes in it. There is just now, in France, a *noblesse* newly revived, full of pretension, full of airs and graces and disdains; but its sphere is narrow, and out of its own sphere no one cares very much for it. There is a general equality in a humane kind of life. This is the secret of the passionate attachment with which France inspires all Frenchmen, in spite of her fearful troubles, her checked prosperity, her disconnected units,

and the rest of it. There is so much of the goodness and agreeableness of life there, and for so many. It is the secret of her having been able to attach so ardently to her the German and Protestant people of Alsace, while we have been so little able to attach the Celtic and Catholic people of Ireland. France brings the Alsatians into a social system so full of the goodness and agreeableness of life; we offer to the Irish no such attraction. It is the secret, finally, of the prevalence which we have remarked in other Continental countries of a legislation tending, like that of France, to social equality. The social system which equality creates in France is, in the eyes of others, such a giver of the goodness and agreeableness of life, that they seek to get the goodness by getting the equality.

Yet France has had her fearful troubles, as Sir Erskine May justly says. She suffers, too, he adds, from demoralization and intellectual stoppage. Let us admit, if he likes, this to be true also. His error is, that he attributes all this to equality. Equality, as we have seen, has brought France to a really admirable and enviable pitch of humanization in one important line. And this, the work of equality, is so much a good in Sir Erskine May's eyes, that he has mistaken it for the whole of which it is a part, frankly identifies it with civilization, and is inclined to pronounce France the most civilized of nations. But we have seen how much goes to full humanization, to true civilization, besides the power of social life and manners. There is the power of conduct, the power of intellect and knowledge, the power of beauty. The power of conduct is the greatest of all. And without in the least wishing to preach, I must observe, as a mere matter of natural fact and experience, that for the power of conduct France has never had anything like the same sense which she has had for the power of social life and manners. Michelet, himself a Frenchman, gives us the reason why the Reformation did not succeed in France. It did not succeed, he says, because *la France ne voulait pas de réforme morale*—moral reform France would not have, and the Reformation was above all a moral movement. The sense in France for the power of conduct has not greatly deepened, I think, since. The sense for the power of intellect and knowledge has not been adequate either. The sense for beauty has not been adequate. Intelligence and beauty have been, in general, but so far reached as they can be and are reached by men who, of the elements of perfect humanization, lay thorough hold upon one

only—the power of social intercourse and manners. I speak of France in general; she has had, and she has, individuals who stand out and who form exceptions. Well, then, if a nation laying no true hold upon the powers of beauty and knowledge, and a most failing and feeble hold upon the power of conduct, comes to demoralization and intellectual stoppage and fearful troubles, we need not be inordinately surprised. What we should rather marvel at is the healing and bountiful operation of Nature, whereby the laying firm hold on one real element in our humanization has had for France results so beneficent.

And thus, when Sir Erskine May gets bewildered between France's equality and fearful troubles on the one hand, and the civilization of France on the other, let us suggest to him that perhaps he is bewildered by his data because he combines them ill. France has not exemplary disaster and ruin as the fruits of equality, and at the same time, and independently of this, an exemplary civilization. She has a large measure of happiness and success as the fruits of equality, and she has a very large measure of dangers and troubles as the fruits of something else.

We have more to do, however, than to help Sir Erskine May out of his scrape about France. We have to see whether the considerations which we have been employing may not be of use to us about England.

We shall not have much difficulty in admitting whatever good is to be said of ourselves, and we will try not to be unfair by excluding all that is not so favorable. Indeed, our less favorable side is the one which we should be the most anxious to note, in order that we may mend it. But we will begin with the good. Our people has energy and honesty as its good characteristics. We have a strong sense for the chief power in the life and progress of man—the power of conduct. So far we speak of the English people as a whole. Then we have a rich, refined, and splendid aristocracy. And we have, according to Mr. Charles Sumner's acute and true remark, a class of gentlemen, not of the nobility, but well-bred, cultivated, and refined, larger than is to be found in any other country. For these last we have Mr. Sumner's testimony. As to the splendor of our aristocracy, all the world is agreed. Then we have a middle class and a lower class; and they, after all, are the immense bulk of the nation.

Let us see how the civilization of these classes

appears to a Frenchman, who has witnessed, in his own country, the considerable humanization of these classes by equality. To such an observer our middle class divides itself into a serious portion, and a gay or rowdy portion; both are a marvel to him. With the gay or rowdy portion we need not much concern ourselves; we shall figure it to our minds sufficiently if we conceive it as the source of that war-song produced in these recent days of excitement:

"We don't want to fight, but, by jingo, if we do,

We've got the ships, we've got the men, and we've got the money too."

We may also partly judge its standard of life, and the needs of its nature, by the modern English theatre, perhaps the most contemptible in Europe. But the real strength of the English middle class is in its serious portion. And of this a Frenchman, who was here some little time ago as the correspondent, I think, of the *Siècle* newspaper, and whose letters were afterward published in a volume, writes as follows. He had been attending some of the Moody and Sankey meetings, and he says: "To understand the success of Messrs. Moody and Sankey, one must be familiar with English manners, one must know the mind-deadening influence of a narrow Biblism, one must have experienced the sense of acute *ennui* which the aspect and the frequentation of this great division of English society produce in others, the want of elasticity, and the chronic *ennui* which characterize this class itself, petrified in a narrow Protestantism and in a perpetual reading of the Bible." You know the French—a little more Biblism, one may take leave to say, would do them no harm. But an audience like this—and here, as I said, is the advantage of an audience like this—will have no difficulty in admitting the amount of truth which there is in the Frenchman's picture. It is the picture of a class which, driven by its sense for the power of conduct, in the beginning of the seventeenth century, entered—as I have more than once said, and as I may more than once have occasion in future to say—*entered the prison of Puritanism, and had the key turned upon its spirit there for two hundred years*. They did not know, good and earnest people as they were, that to the building up of human life there belong all those other powers also—the power of intellect and knowledge, the power of beauty, the power of social life and manners. And something, by what they became, they gained, and the whole nation with them; they deepened and fixed for this nation the sense of conduct. But they created a type

of life and manners, of which they themselves indeed are slow to recognize the faults, but which is fatally condemned by its hideousness, its immense *ennui*, and against which the instinct of self-preservation in humanity rebels.

Partisans fight against facts in vain. Mr. Goldwin Smith, a writer of eloquence and power, although too prone to acerbity, is a partisan of the Puritans, and of the Nonconformists, who are the special inheritors of the Puritan tradition. He angrily resents the imputation upon that Puritan type of life, on which the life of our serious middle class has been formed, that it was doomed to hideousness, to immense *ennui*. He protests that it had beauty, amenity, accomplishment. Let us go to facts. Charles I., who, with all his faults, had the just idea that art and letters are great civilizers, made, as you know, a famous collection of pictures—our first National Gallery. It was, I suppose, the best collection at that time north of the Alps. It contained nine Raphaels, eleven Correggios, twenty-eight Titians. What became of that collection? The journals of the House of Commons will tell you. There you may see the Puritan Parliament disposing of this Whitehall, or York House, collection, as follows: "Ordered, that all such pictures and statues there as are without any superstition, shall be forthwith sold. . . . Ordered, that all such pictures there as have the representation of the Second Person in Trinity upon them, shall be forthwith burned. Ordered, that all such pictures there as have the representation of the Virgin Mary upon them, shall be forthwith burned." There we have the weak side of our parliamentary government, and our serious middle class. We are incapable of sending Mr. Gladstone to be tried at the Old Bailey because he proclaims his antipathy to Lord Beaconsfield; a majority in our House of Commons is incapable of hailing, with frantic laughter and applause, a string of indecent jests against Christianity and its founder; but we are not, or were not, incapable of producing a Parliament which burns or sells the masterpieces of Italian art. And one may surely say of such a Puritan Parliament, and of those who determine its line for it, that they had not the spirit of beauty.

What shall we say of amenity? Milton was born a humanist, but the Puritan temper, as we know, mastered him. There is nothing more unlovely and unamiable than Milton, the Puritan disputant. Some one answers his "Doctrine and Discipline of Divorce." "I mean not," rejoins Milton, "to dispute philosophy with this pork, who never read any." However, he does reply to

him, and throughout the reply Milton's great joke is, that his adversary, who was anonymous, is a serving-man. "Finally, he winds up his text with much doubt and trepidation; for, it may be, his trenchers were not scraped, and that which never yet afforded corn of favor to his noddle—the salt-cellar—was not rubbed; and, therefore, in this haste, easily granting that his answers fall foul upon each other, and praying you would not think he writes as a prophet, but as a man, he runs to the black jack, fills his flagon, spreads the table, and serves up dinner." There you have the same spirit of urbanity and amenity, as much of it and as little, as generally informs the religious controversies of our Puritan middle class to this day.

But Mr. Goldwin Smith insists, and picks out his own exemplar of the Puritan type of life and manners, and even here let us follow him. He picks out the most favorable specimen he can find, Colonel Hutchinson, whose well-known memoirs, written by his widow, we have all read with interest. "Lucy Hutchinson," says Mr. Goldwin Smith, "is painting what she thought a perfect Puritan would be; and her picture presents to us not a coarse, crop-eared, and snuffling fanatic, but a highly-accomplished, refined, gallant, and most *amiable*, though religious and seriously-minded gentleman." Let us, I say, in this example of Mr. Goldwin Smith's own choosing, lay our finger upon the points where this type deflects from the truly humane ideal. Mrs. Hutchinson relates a story which gives us a good notion of what the amiable and accomplished social intercourse, even of a picked Puritan family, was. Her husband was Governor of Nottingham. He had occasion, she says, "to go and break up a private meeting in the cannoneer's chamber;" and in the cannoneer's chamber "were found some notes concerning pædobaptism, which, being brought into the governor's lodgings, his wife having perused them and compared them with the Scriptures, found not what to say against the truths they asserted concerning the misapplication of that ordinance to infants." Soon afterward she expects her confinement, and communicates the cannoneer's doubts about pædobaptism to her husband. The fatal cannoneer makes a breach in him too. "Then he bought and read all the eminent treatises on both sides, which, at that time, came thick from the presses, and still was cleared in the error of the pædobaptists." Finally, Mrs. Hutchinson is confined. Then the governor "invited all the ministers to dinner, and propounded his doubt, and the ground thereof,

to them. None of them could defend their practice with any satisfactory reason, but the tradition of the Church from the primitive times, and their main buckler of federal holiness, which Tombs and Deane had excellently overthrown. He and his wife then, professing themselves unsatisfied, desired their opinions." With the opinions I will not trouble you, but hasten to the result—"Whereupon that infant was not baptized."

No doubt, to a large division of English society at this very day, that sort of dinner and discussion, and, indeed, the whole manner of life and conversation here suggested by Mrs. Hutchinson's narrative, will seem both natural and amiable, and such as to meet the needs of man both as a religious and as a social creature. You know the conversation which reigns in thousands of middle-class families at this hour about nunneries, tectotalism, the confessional, eternal punishment, ritualism, disestablishment. It goes wherever the class goes which is moulded on the Puritan type of life. In the long winter evenings of Toronto, Mr. Goldwin Smith has had, probably, abundant experience of it. What is its enemy? The instinct of self-preservation in humanity. Men make crude types and try to impose them, but to no purpose. "*L'homme s'agite, Dieu le mène*," says Bossuet. "There are many devices in a man's heart; nevertheless, the counsel of the Eternal, that shall stand." Those who offer us the Puritan type of life, offer us a religion not true, the claims of intellect and knowledge not satisfied, the claim of beauty not satisfied, the claim of manners not satisfied. In its strong sense for conduct that life touches truth; but its other imperfections hinder it from employing even this sense aright. The type mastered our nation for a time. Then came the reaction. The nation said: "This type, at any rate, is amiss; we are not going to be all like *that*." The type retired into our middle class, and fortified itself there. It seeks to endure, to emerge, to deny its own imperfections, to impose itself again; impossible! If we continue to live we must outgrow it. The very class in which it is rooted, our middle class, will have to acknowledge the type's inadequacy; will have to acknowledge the hideousness, the immense *ennui* of the life which this type has created; will have to transform itself thoroughly. It will have to admit the large part of truth which there is in the criticisms of our Frenchman, whom we have too long forgotten.

After our middle class, he turns his attention to our lower class. And of the lower and larger portion of this—the portion not bordering on

the middle class and sharing its faults—he says: "I consider this multitude to be absolutely devoid, not only of political principles, but even of the most simple notions of good and evil. Certainly, it does not appeal, this mob, to the principles of '89, which you English make game of; it does not insist on the rights of man; what it wants is beer, gin, and *fun*."¹

That is a description of what Mr. Bright would call the residuum, only our author seems to think the residuum a very large body. And its condition strikes him with amazement and horror. And surely well it may. Let us recall Mr. Hamerton's account of the most illiterate class in France; what an amount of civilization they have, notwithstanding! And this is always to be understood, in hearing or reading a Frenchman's praise of England. He envies our liberty, our public spirit, our trade, our stability. But there is always reserve in his mind. He never means for a moment that he would like to change with us. Life seems to him so much better a thing in France for so many more people, that, in spite of the fearful troubles of France, it is far best to be a Frenchman. A Frenchman might agree with Mr. Cobden, that life is good in England for those people who have at least £5,000 a year. But the civilization of that immense majority who have not £5,000 a year, or £500, or even £100, of our middle and lower class, seems to him too deplorable.

And now, what has this condition of our middle and lower class to tell us about equality? How is it, must we not ask, how is it that, being without fearful troubles, having, as a nation, a deep sense for conduct, having signal energy and honesty, having a splendid aristocracy, having an exceptionally large class of gentlemen, we are yet so little civilized? How is it that our middle and lower class, in spite of the individuals among them who are raised by happy gifts of Nature to a more humane life, in spite of the seriousness of the middle class, in spite of the general honesty and power of true work, *verus labor*, which prevail throughout the lower, do yet present, as a whole, the characters which we have seen?

And, really, it seems as if the current of our discourse carried us of itself to but one conclusion. It seems as if we could not avoid concluding that, just as France owes her fearful troubles to other things and her civilizedness to equality, so we owe our immunity from fearful troubles to other things, and our uncivilizedness to inequality. "Knowledge is easy," says the wise man,

¹ So in the original.

"to him that understandeth;" easy, he means, to him who will use his mind simply and rationally, and not to make him think he can know what he cannot, or to maintain, *per fas et nefas*, a false thesis with which he fancies his interests to be bound up. And to him who will use his mind as the wise man recommends, surely it is easy to see that our shortcomings in civilization are due to our inequality—or, in other words, that the inequality of classes and property, which came to us from the middle age, and which we maintain because we have the religion of inequality, that this constitution of things, I say, has the natural and necessary effect, under present circumstances, of materializing our upper class, vulgarizing our middle class, and brutalizing our lower class. And this is to fail in civilization.

For, only just look how the facts combine themselves. I have said little as yet about our aristocratic class, except that it is splendid. Yet these, "our often very unhappy brethren," as Burke calls them, are by no means matter for nothing but ecstasy. Our charity ought certainly, as he says, to extend "a due and anxious sensation of pity to the distresses of the miserable great." Burke's extremely strong language about their miseries and defects I will not quote. For my part, I am always disposed to marvel that human beings, in a position so false, should be so good as these are. Their reason for existing was to serve as a number of centres in a world disintegrated after the ruin of the Roman Empire, and slowly reconstituting itself. Numerous centres of material force were needed, and these a feudal aristocracy supplied. Their large and hereditary estates served this public end. The owners had a positive function, for which their estates were essential. In our modern world the function is gone; and the great estates, with an infinitely multiplied power of ministering to mere pleasure and indulgence, remain. The energy and honesty of our race does not leave itself without witness, and in no class are there more conspicuous examples of individuals raised by happy gifts of Nature far above their fellows and their circumstances. But on the whole, with no necessary function to fulfill, never conversant with life as it really is, tempted, flattered, and spoiled from childhood to old age, our aristocratic class is inevitably materialized, and the more so the more the development of industry and ingenuity augments the means of luxury. Every one can see how bad is the action of such an aristocracy upon the class of newly-enriched people, whose great danger is a materialistic ideal, just because it is

the ideal they can easiest comprehend. The effect on society at large, and on national progress, is what we must regard. Turn even to that sphere which aristocracies think specially their own, and where they have under other circumstances been really effective—the sphere of politics. When there is need for any large forecast of the course of human affairs, for an acquaintance with the ideas which in the end sway mankind, and for an estimate of their power, aristocracies are out of their element, and materialist aristocracies most of all. In the immense spiritual movement of our day, the English aristocracy, as I have said, always reminds me of Pilate confronting the phenomenon of Christianity. Nor can a materialized class have a serious and fruitful sense for the power of beauty. They may imagine themselves in pursuit of beauty; but how often, alas, does the pursuit come to little more than dabbling a little in what they are pleased to call art, and making a great deal of what they are pleased to call love! For the power of manners, on the other hand, an aristocratic class, whether materialized or not, will always from its circumstances have a strong sense. And although for this power of social life and manners, so important to civilization, our race has no special natural turn, in our aristocracy this power emerges, and marks them. When the day of general humanization comes, they will have fixed the standard of manners. The English simplicity, too, makes the best of the English aristocracy more frank and natural than the best of the like class anywhere else, and even the worst of them it makes free from the incredible fatuities and absurdities of the worst. Then the sense of conduct they share with their countrymen at large. In no class has it such trials to undergo; in none is it more often and more grievously overborne. But really the right comment on this is the comment of Pepys upon the evil courses of Charles II. and the Duke of York, and the court of that day: "At all which I am sorry; but it is the effect of idleness, and having nothing else to employ their great spirits upon."

Heaven forbid that I should speak in dispraise of that unique and most English class which Mr. Charles Sumner extols—the large class of gentlemen, not of the landed class or the nobility, but cultivated and refined. They are a seemly product of the energy and of the power to rise in our race. Without, in general, rank and splendor, and wealth and luxury to polish them, they have made their own the high standard of life and manners of an aristocratic and refined class. Not

having all the dissipations and distractions of this class, they are much more seriously alive to the power of intellect and knowledge, to the power of beauty. The sense of conduct, too, meets with fewer temptations. To some extent, however, their contiguity to the aristocratic class materializes them, as it does the class of newly-enriched people. The most palpable action is on the young, and on their standard of life and enjoyment. But in general, for this whole class, established facts, the materialism they see regnant, too much block their mental horizon, and limit the possibilities of things to them. They are deficient in openness and flexibility of mind, in free play of ideas, in faith and ardor. Civilized they are, but they are not much of a civilizing force; they are somehow bounded and ineffective.

So on the middle class they produce singularly little effect. What the middle class sees is that splendid piece of materialism, the aristocratic class, with a wealth and luxury utterly out of their reach, with a standard of social life and manners, the offspring of that wealth and luxury seeming utterly out of their reach also; and thus they are thrown back upon themselves—upon a defective type of religion, a narrow range of intellect and knowledge, a stunted sense of beauty, a low standard of manners. And the lower class see before them the aristocratic class, and its civilization, such as it is, even infinitely more out of their reach than out of that of the middle class; while the life of the middle class, with its unlovely types of religion, thought, beauty, and manners, has naturally, in general, no great attractions for them either; and so they too are thrown back upon themselves; upon their beer, their gin, and their *fun*. Now, then, you will understand what I meant by saying that our inequality materializes our upper class, vulgarizes our middle, brutalizes our lower. And the greater the inequality the more marked is its bad action upon the middle and lower classes. In Scotland the landed aristocracy fills the scene, as is well known, still more than in England; the other classes are more squeezed back and effaced, and the social civilization of the lower middle class, and of the poorest class, in Scotland, is an example of the consequences. Compared with the same class even in England, the Scottish lower middle class is most visibly, to vary Mr. Charles Sumner's phrase, *less well-bred, less careful in personal habits and in social conventions, less refined*. Let any one who doubts it go, after issuing from the aristocratic solitudes which possess Loch Lomond, let him go and observe the

shopkeepers and the middle class in Dumbarton, and Greenock, and Gourock, and the places along the mouth of the Clyde. And for the poorest class, who that has seen it can ever forget the hardly human horror, the abjection and uncivilizedness of Glasgow?

What a strange religion, then, is our religion of inequality! Romance is good in its way, but ours is not even a romantic religion. No doubt our aristocracy is an object of strong public interest. The *Times* itself bestows a leading article, by way of epithalamium, on the Duke of Norfolk's marriage. And those journals of a new type, full of talent, and which interest me particularly because they seem as if they were written by the young lion of our youth—the young lion grown mellow and, as the French say, *viveur*, arrived at his full and ripe knowledge of the world, and minded to enjoy the smooth evening of his days—those journals, in the main a sort of social gazette of the aristocracy, are apparently not read by that class only which they most concern, but are read with avidity by other classes also. And the common people, too, have undoubtedly, as Mr. Gladstone says, a wonderful preference for a lord. Yet our aristocracy, from the action upon it of the Wars of the Roses, the Tudors, and the political necessities of George III., is for the imagination a singularly modern and uninteresting one. Its splendor of station, wealth, show, and luxury, is then what the other classes really admire in it; and this is not an elevating admiration. So that when Mr. Gladstone invites us to call our love of inequality “the complement of the love of freedom or its negative pole, or the shadow which the love of freedom casts, or the reverberation of its voice in the halls of the constitution,” we must surely answer that all this mystical eloquence is not in the least necessary to explain so simple a matter; that our love of inequality is really the vulgarity in us, and the brutality, admiring and worshiping the splendid materiality.

Our present social organization, however, will and must endure until our middle class is provided with some better ideal of life than it has now. That organization has been an appointed stage in our growth; it has been of good use, and has enabled us to do great things. But the use is at an end, and the stage is over. Ask yourselves if you do not often feel in yourselves a sense that, in spite of the strenuous efforts for good of so many excellent persons among us, we begin somehow to flounder and to beat the air; that we seem to be finding ourselves stopped on this line

of advance and on that, and to be threatened with a standstill. It is that we are trying to live on with a social organization of which the day is over. Certainly equality will never of itself alone give us a perfect civilization. But, with such inequality as ours, a perfect civilization is impossible. To that conclusion, facts, and the stream itself of this discourse, do seem, I think, to carry us irresistibly. We arrive at it because they so choose, not because we so choose. Our tendencies are all the other way. We are most of us politicians, and in one of two camps, the Liberal or the Conservative; and Liberals tend to accept the middle class as it is and to praise the nonconformists, while the Conservatives tend to accept the upper class as it is, and to praise the aristocracy. And yet here we are at the conclusion, that one of the great obstacles to our civilization is British nonconformity, and the other, British aristocracy!—and this while we are yet forced to recognize excellent special qualities, as well as the general English energy and honesty, and a number of emergent humane individuals, in both of them. Clearly such a conclusion can be none of our own seeking. Then, again, to remedy our inequality, there must be a change in the law of bequest, as in France; and the faults and inconveniences of the French law of bequest are obvious. It tends to over-divide property; it is unequal in operation, and can be eluded by people limiting their families; it makes the children, however ill they choose to behave, independent of the parent. To be sure, Mr. Mill and others have shown that a

law of bequest, fixing the maximum, whether of land or money, which any one individual may take by bequest or inheritance, but in other respects leaving the testator quite free, has none of the inconveniences of the French law, and is in every way preferable. But evidently these are not questions of practical politics. Imagine Lord Hartington going down to Glasgow, and meeting his Scotch Liberals there, and saying to them: "You are ill at ease, and you are calling for change, and very justly. But the cause of your being ill at ease is not what you suppose. The cause of your being ill at ease is the profound imperfectness of your social civilization. Your social civilization is indeed such as I forbear to characterize. But the remedy is not disestablishment. The remedy is social equality. Let me direct your attention to a reform in the law of bequest and entail." One can hardly speak of such a thing without laughing. No, the matter is one for the thoughts of those who think. It is a thing to be turned over in the minds of those who, on the one hand, have the spirit of scientific inquirers, bent on seeing things as they really are; and, on the other hand, the spirit of friends of the humane life, lovers of perfection. To your thoughts I commit it. And, perhaps, the more you think of it, the more you will be persuaded that Menander showed his wisdom quite as much when he said, "*Choose equality*," as when he assured us that "*evil communications corrupt good manners*."

—*Fortnightly Review*.

HELL AND THE DIVINE VERACITY.

Ὡς μή 'στι δρῶντι τάρβος, ὅσδ' ἔπος φοβεῖ.—Sophocles, O. T. 296.

By LIONEL A. TOLLEMACHE.

"SUPPOSE," says Mr. Mill, "that certain unknown attributes are ascribed to the Deity in a religion the external evidences of which are so conclusive to my mind as effectually to convince me that it comes from God. Unless I believe God to possess the same moral attributes which I find, in however inferior a degree, in a good man, what ground of assurance have I of God's veracity?" In other words, if God's justice and mercy are not as our justice and mercy, what guarantee have we that his truth is as our truth? And, conversely, are not orthodox reasoners, who start with the assumption that God's truth is as our

truth, likewise bound to assume that his justice and mercy are as our justice and mercy? We propose to discuss this question at some length; for it seems to suggest the most easily stated and, so to say, handiest reply to the familiar platitude that the only legitimate exercise of reason in these matters is to convince us of the reality of the Christian miracles, and that, being once convinced, we ought straightway to accept any doctrines, however seemingly immoral, which the recorders of those miracles have preached.

This subject has lately been brought under my notice by Father Oxenham's work on "Catho-

lie Eschatology and Universalism." In that work the doctrine of eternal punishment is upheld; and it is not thought blasphemous to represent God as the author of hell. Yet the same work, referring to some one who has suggested that the accounts of eternal punishment in the Gospels may have been exaggerated for a moral end, pronounces that suggestion to be "little short of blasphemous." In short, God is too good to deceive, but not too good to condemn. Now, if Mr. Oxenham were alone in maintaining this paradox, I should not be at the pains to controvert it; for, differing from him *toto celo* (*totaque*, let me add, *gehenna*), I feel that between him and me, except on some minor topics, there is no common ground for argument.

But, unfortunately, there are many Protestants and even nibblers at liberalism who hold vaguely, and perhaps unwittingly, what this able writer has stated clearly and forcibly. It is mainly with these, and wholly for their sake, that my present discussion is set on foot. In fact, my article is a plea for that generally valuable, yet generally unvalued, body, the Neochristians—those transformed and regenerate Ishmaels whose hand is against no man, though every man's hand is against them. And the motive of this plea is an earnest desire that the religious reform which is inevitable should be kept as far as possible within the Christian lines. Still, a measure of reform which is to avail against revolution, has often to be somewhat drastic; and the first advice which should be offered to our Neochristian friends is, that they should at once give up the old foundation, for which their modest structure is unfitted, and on which pandemonium may so easily be built. But, before entering on their defense, a word of personal explanation is required. Mr. Mill certainly held that a Being who could create hell would be, strictly speaking, not a God, but the very reverse. Yet, in the chapter by him from which I have quoted, the popular language is repeatedly adopted for the sake of clearness; and to the supposed author of hell, the name "God" is applied. In the present article that example will be followed. It will also be found convenient to assume, unless when the contrary is specified, that the Church is right in pronouncing certain writings to be genuine and certain marvels to be historical. But it must be understood that I am not bound by these assumptions. It should, moreover, be explained that, zealous though I am on behalf of the Neochristians, I in no wise commit myself to either of the recognized forms of Neochristianity, either to

Mr. Tennyson's Christianity without hell, or to Mr. Arnold's Christianity without God. My position will be rendered yet clearer by my adding that I expect the various orthodox sects, with their chronic civil war, to continue in a state of heedlessness not wholly unlike that which the gospel attributes to the antediluvian world: they will preach, they will write, they will cavil, they will give in to cavils, till science comes and destroys them all. Wherefore, of the Catholic and the orthodox Protestant it may be said, as of Lausus and Pallas, that neither is destined to overwhelm the other, but that *moz illos sua fata manent majore sub hoste*.

Doubtless, to satisfy Mr. Oxenham personally, the foregoing explanation was not needed; for he clearly thinks me an honest (if somewhat ravenous) wolf in wolf's clothing, and has even singled me out as the representative of the common enemy into whose hand timid or treacherous friends (seemingly Broad Churchmen) are playing. It is possible that the simplest way of opening our inquiry will be to quote and expand from a former article a passage from which he has made an extract. "The wiser among us," I said, "are seeking to drop hell out of the Bible as quietly, and about as logically, as we already contrive to disregard the plain texts forbidding Christians to go to law, and Christian women to plait their hair,"¹ or, it might have been added, to be unveiled in church; bidding all Christians work miracles on pain of damnation;² bidding them choose psalms and spiritual songs as a vent for their mirth; forbidding them to jest;³ to take judicial oaths; to hope for exemption from "persecution"⁴ (in the plain sense which the early Christians attached to that word); to receive interest for loans, or even to receive back the principal;⁵ to be rich, or to ask rich people to dinner;⁶ to receive an unorthodox person into their house, or even to wish him "God speed." That this last prohibition was meant literally is proved by the tradition about St. John and Cerinthus; and I have heard an Evangelical divine, only too plausibly, adduce the passage to prove the sinfulness of entertaining Catholics. That some of the other texts I have referred to were not meant literally, is commonly and conveniently assumed. Personally, I

¹ *Fortnightly Review*, January, 1876, p. 125.

² Mark xvi. 16-18.

³ Ephesians v. 4. Cf. Matthew xii. 26.

⁴ 2 Timothy iii. 12.

⁵ Luke vi. 34, 35. These and the other texts against usury were taken literally, until the needs of civilization refuted them.

⁶ Luke xiv. 12, 13.

could never take this view—not even in my orthodox boyhood, when such texts made life a burden to me; so that my judgment was then vehemently biased not against, but in favor of, the traditional interpretation of them. That the literal meaning of each of those passages is the true one, still seems to me probable. At any rate, it is certain that, taken collectively, they breathe an ascetic spirit which is in glaring contrast to the smooth and polished Christianity of our day. A popular preacher, complaining of rationalists that they had no moral standard, once said to me, "When I am in doubt, I refer to my Bible:" almost as if his Bible was unlike other Bibles; certainly as if the Bible was a lucid encyclopædia of doctrine and morals. Nor did my friend herein go far beyond what is held by most orthodox Protestants. They have forged a vast shield of texts, which they use to their own satisfaction against Romanists (*Ingentem clipeum informant, unum omnia contra Tela Latinorum*); and therewith they hope to quench the fiery darts of the combined wicked—of Romanists and rationalists together. Our object, on the other hand, has been to show that the Bible is not such a handbook as they suppose; and that, in fact, if the way of doctrinal transgressors is hard, that of Bibliolaters is not easy. And if, consciously or unconsciously, orthodox Christians exercise the right of dropping inconvenient texts out of the Bible, they should not be wroth with their liberal brethren who do likewise; for the game, in very truth, is one at which two can play. Here, then, is our point. If the Bible contains plain commands which we have a right to disobey, may it not contain plain assertions which we have a right to disbelieve?¹ Thus the Neochristian would be in no lack of orthodox precedents, if he contended that the statements about hell were Oriental hyperboles; or that they were an extra deterrent mercifully given to the Jews in their low state of piety, or rather of culture and civilization—an adaptation to the hardness of their hearts, or perhaps to the softness of their brains; or that they were a needful concession to a prevailing superstition: for the Bible was written *a Judeis, ad Judeos, apud Judeos*;

and superstition, like nature, *non nisi parendo vincitur*. Perhaps, indeed, it will be objected that our analogy between disobeying Divine commands and disbelieving Divine assertions does not hold. Let us, then, give an example of each kind. It is plainly declared that the observance of the Sabbath—an observance binding in regard to the day, the obligations, and the penalties—was to be perpetual, and forever.¹ And this perpetual ordinance, originally imposed on Israel, extends to all who have adopted Israel's law.² It is also affirmed that the house, kingdom, and throne of David should be established forever. Compare these two statements with the statement that hell is to be perpetual. If, by a prophetic license, *perpetual* means *transitory* in regard to the Sabbath and the house of David, why not in regard to hell? Or (what is much the same thing), if we may give a non-natural interpretation to two of these propositions,³ why not to the third?

Impartial readers will probably think that I have already made out my case; but, as the subject is very important, and as the prejudice about it is inveterate, I will carry the inquiry somewhat deeper. To reasonings like the above it is commonly objected that (according to the Bible) God can neither lie nor repent. Now, it is obvious that this objection is at once refuted by the fact that it proves the biblical veracity from the Bible, making the Bible arbiter in its own cause. But I will let this pass, as I wish as far as possible to meet orthodoxy on its own ground: *ἐκ τοῦ στόματος σου κρινῶ σε*. The Bible, then, asserts that God neither lies nor repents. But, in the very same chapter,⁴ God is described as

¹ Exodus xxxi. 16, 17.

² Matthew v. 18. Cf. Matthew xxiv. 20.

³ Thus, it is commonly maintained that the throne of David spiritually survives in Christianity. To test this interpretation, let us put a parallel case, which we can consider impartially. One was told at school that Virgil's *Imperium sine fine dei* is a signal instance of an uninspired prophecy failing. Yet it might be at least as plausibly urged that the Roman dominion survives in the papacy, as that the Davidic throne survives in Christianity. But to any such pitiful misinterpretation of Virgil's words a sufficient answer would be that, before the Roman Empire ceased, no one dreamed of so explaining the poet's meaning. Even so we may ask, Did the Jews, before the time of Nebuchadnezzar, dream of spiritually *evaporating* the plain prediction about David?

⁴ 1 Samuel xv. 11, 29. In this singular chapter a still more startling contrast occurs: Samuel (verse 22) expresses the noble sentiment that "to obey is better than sacrifice;" yet, at that very moment, he was meditating the most hideous of all sacrifices—a human sacrifice (verse 23).

¹ Sir J. Fitzjames Stephen says ("Liberty, Equality, and Fraternity," p. 315) that some Scriptural commands are "understood by those who believe in the supernatural authority of Christ as a pathetic overstatement of duties, . . . peculiarly liable to be neglected." Every argument that can be used to justify such a "pathetic overstatement" of duties will serve to justify a pathetic overstatement of the penalties whereby those duties were enforced.

repenting; hence it might be argued that the biblical statement on this head, so far from proving that there are no biblical misstatements, adds to their list one misstatement the more. But this difficulty also I will not press. An orthodox person would probably meet it by saying that the Divine word, like Nature, half reveals and half conceals the soul within; we can see God only through a glass darkly, or rather through a pseudoscope — *immortalia mortali sermone notamus*; hence there is no inconsistency in supposing that God does not really repent, but that to our finite reason he can only be revealed as repenting. Well, let this explanation stand, only let us observe that in the Hebrew verse—that *rime de penses*, as M. Renan calls it—lying and repenting are coupled together. The Divine incapacity of misrepresentation is announced in the same breath, and placed in the same category, with the Divine incapacity of repentance. And yet, humanly speaking, God *does* repent. Is it, then, impious to inquire whether, humanly speaking, God may not misrepresent? Nay, further, according to the only notion that we can form of repentance, a repentant man must either err when he repents, or have erred in doing that for which he repents. Surely this reasoning *mutatis mutandis* applies to a repentant Deity. Perhaps an illustration will best set forth our meaning. We are told that God repented of the good work of creating man. Therefore, his beneficent decrees do not resemble the laws of the Medes and Persians. Why, then, must we assume that his maleficent decrees resemble those laws? If it repented God of creation, may it not repent him of the intention of damnation?

But it is not only out of the Bible that eternal punishment is defended. The burden of proof is attempted to be thrown on the assailants of that doctrine. The doctrine, it is said, is rendered antecedently probable by the analogy of Nature. In Nature the wages of sin accumulate till death; a sinful act never ceases injuriously to affect the sinner; but whatever occurs in Nature must be permitted, if not ordained, by God; and the presumption is that his supernatural government bears some analogy to his natural; and, therefore, that the punishment of sin, which has no end in this world, will likewise have no end in the next. Now, this reasoning, which is substantially that of Butler, could not be fully examined without discussing the argument of the first chapter of the analogy, and even the fundamental assumption on which the analogy rests. This is not the place for such a discussion; so I

will merely remark that natural forces are in themselves neither moral nor immoral, but *outside morality*; but, when they are personified and judged by a moral standard, they are found to be recklessly immoral. Hence, if we start with the assumption that the course of Nature is in harmony with God's direct and deliberate action, we may go on to defend the foulest superstition that ever cursed mankind. If whatever exists (including Nero's government¹) is "ordained of God," theft and adultery must be so ordained. If, then, God's natural procedure is a sample of his supernatural, what right have Christians to condemn the actions attributed to Jupiter, which were, humanly speaking, immoral? Nor is it only civilized Jupiters, ancient or modern, that may claim the benefit of such a plea. The plea is equally applicable to those "puny godlings of inferior race"² whom savages worship, nay, even to Bhowanee, the goddess of murder. Hence, when Shelley indignantly denied that

"The God of Nature and benevolence had given
A special sanction to the trade of blood,"

his indignation was partly reasonable, partly not. That the god of benevolence should have sanctioned such a trade is, of course, impossible; but that the god of Nature, the ordainer of all the abominations that occur in Nature, should have done so, is in no wise impossible, but just what we might have expected. Nor, again, are we left to conjecture as to the employment of the analogical aid to faith in support of religious systems which we now justly condemn. On the contrary, we know that, when pagan orthodoxy was giving way, such pagans as Plutarch and some of Lucian's interlocutors propped it up with arguments not unlike those wherewith the disciples of Butler now prop up Christian orthodoxy. So that, after all, Butler's and Mansel's sanctuary is a too catholic Pantheon—a veritable "shrine of all saints and temple of all gods"—where mutually destructive theologies seek a common refuge. It is, however, with such attributes as those of Hermes Dolios, that we are specially concerned. If it was God who hardened Pharaoh's heart, we may assume that it is often, if not always, God who hardens the liar's heart; in every such case *Deus fallit per alium*; analogy, therefore, points to the presumption that sometimes *Deus fallit per se*. But this is not all. That the sun travels from east to west, that the earth is approximately a flat surface, that the blue sky is a solid vault

¹ Romans xlii. 1.

² Dryden's "Persius."

(στερέωμα)—these are delusions which the plan of universe has done its very best to foster, which are common to primitive races, and which primitive writers, inspired as well as uninspired, have emphatically shared. In the face of these delusions, will the paradox that the course of Nature is a representation, however imperfect, of the Deity, a not inglorious "mirror where the Almighty's form glasses itself in" moral tempests, be seriously maintained? If so, we are driven to the monstrous conclusion that there are qualities in the First Cause little akin to those of Nathanael. And hence would arise the analogical presumption that, in revelation, God, according to St. Paul's happy euphemism, "calletth those things that be not as though they were."

Xenophanes blames Homer for attributing to the gods—

ὅσσα παρ' ἀνθρώποισιν ὄνείδεα καὶ ψόγος ἐστίν . . .
κλέπτειν μοιχέυειν τε καὶ ἀλλήλους ἀπατεῦναι.

In this strikingly modern passage two things may be noted. First, divine deceit is not put in a class by itself; it is merely ranked with other forms of divine guilt. Secondly, the various forms of divine guilt are pronounced to be such, only on the assumption that the gods are bound by human morality; the acts are condemned because they would be deemed wrong and disgraceful among men. Now, it must be owned that to create millions of sentient beings, foreknowing that most of them were doomed to eternal tortures, compared with which the perpetual extraction of a sensitive tooth would be hailed as a relief!—such an act is unlike those which are thought praiseworthy among men. Are we not, then, bound to blame this act when imputed to God? For, in truth, there are two standards, and only two, whereby acts so imputed can be judged: there is the standard of human morality, and there is the immoral standard of natural analogy. Almost always, in weighing Christian and non-Christian theologies, we play fast and loose with these two standards. Will it be said that Christianity is in itself superior to the best non-Christian theology? It is; but we vastly exaggerate the superiority by applying to the different theologies

¹ I give this realistic comparison in order to bring home to my readers what the popular doctrine is. People who talk glibly about *glad tidings* should read (in Wall's "History of Infant Baptism") Augustine's and Fulgentius's expressions about the fate of unbaptized (including still-born) infants. It is, however, satisfactory to know that, although Augustine (once at least) explicitly declared that all unbaptized children would be damned, yet he trusted that "this fire would be to them the most moderate of all" (Wall).

different tables of weights and measures. The divergence between these tables far exceeds what is commonly supposed. Weighed in the balance of natural analogy, *no* historic gods are found wanting; weighed in the balance of human morality, *all*. The like may be said of the comparison between damning and deceiving. If God is wholly beyond the pale of human morality, we cannot guess whether he ought to damn or not to damn—to deceive or not to deceive. If, however, he is within that pale, we may conclude that (if omnipotent) he ought neither to damn nor to deceive; but that the guilt of deceiving is as dust in the balance when compared with the guilt of damning. I say "if omnipotent," for the following reason: That a good spirit of limited powers might, in extreme cases, have to deceive his creatures, is just conceivable. In those extreme cases we might agree with Æschylus, that ἀπάτης δικάιως οὐκ ἀποστατεῖ θεός. But that such a spirit should be one

"Wha, as it pleases best hissell,
Sends ane to heaven, and ten to hell,
A' for his glory,"

is utterly inconceivable and revolting. The orthodox, however, take a view the opposite of ours; they virtually assume that the text, "Let God be true, but every man a liar," is itself true in a more literal sense than the text, "God is love." Indeed, to their *apothecosis* of veracity may be due some of the exaggerated commonplaces that are current as to the absolute universality of the duty of truth-telling. I remember, when a boy, being told that it was sinful in Napoleon to encourage the Guard at Waterloo with the misstatement that their comrades, having crushed Blücher, were in sight coming to help them. Yet it certainly seemed that to tell the Guard a lie for which, if it had succeeded, they would have been grateful, was, at worst, what Sophocles would have called ὅσια πανουργεῖν, and Shakespeare would have called "a virtuous sin;" and that, at all events—in judging of that long crime, Napoleon's career—to single out this peccadillo for reprobation showed a want of moral perspective. But what should I have answered if my teacher had gone on to ask whether it was not uncharitable to suspect a man like Napoleon of telling such a lie? My answer would, or should, have been in words of Ædipus. When Ædipus had adjured the unknown murderer of Laius to give himself up, the chorus was so sanguine as to suggest that further efforts at detection would be needless; without doubt, the criminal, on hearing the imprecation, would make haste to confess his guilt.

Whereunto the king rejoined, "Not he who dared the deed will shrink at words." We have prefixed this reply as motto to our article; for it happily exposes the delusion which prevails about the Divine morality. Whoever, in conceiving of that morality, strains at the gnat of even beneficent misrepresentation, while he swallows the camel of eternal punishment, should bind the motto about his neck, and write it on the table of his heart. But our popular teachers are deaf to such advice. They scorn to depict God as an idealized Edward III., pardoning those whom he had doomed to destruction; but they scruple not to depict him as a Torquemada *in excelsis*.

But, after all, it is superfluous to show that, assuming orthodoxy, Divine deceptions may occur: orthodoxy herself practically admits that they *have* occurred. How does she account for the scientific statements in the Bible, which are, to say the least, calculated to mislead? She affirms that those statements were needful accommodations: which being interpreted is, that God, to teach a great truth, had to teach a little error. But there are graver forms of Divine deception to which the Bible directly bears witness. Lucian justly complains that Zeus, in the "Iliad," "deceived Agamemnon by sending him a lying dream, so as to cause the death of many Greeks." In exactly the same way, Jehovah, in the book of Kings, deceived Ahab by sending him a lying spirit, so as to cause the death of many Hebrews (*Deus fallit per alium*). At another time, he "gave them also statutes that were not good, and judgments whereby they should not live;" and "if the prophet be deceived when he hath spoken a thing, I the Lord have deceived that prophet" (*Deus fallit per se*).¹

Nor is it only in the Old Testament that such deceptions are mentioned: they are attested also in the New.² I am careful to notice this latter testimony, inasmuch as it is on the earliest Christian traditions and sentiments—those recorded in the Synoptical writings and the Apocalypse—that the case for eternal torture chiefly rests. St. Paul, on the other hand, inclined toward Universalism:³ and it does not lie with the Church to neglect his authority; for ecclesiastical Christianity is based far more on the Pauline Epistles and the Fourth Gospel than on the genuine sayings of Jesus. But St. Paul himself would have been the first to disclaim any such preëminence, and to admit that the servant is less than his

Lord. *Numquid Paulus crucifixus est pro vobis? Aut in nomine Pauli baptizati estis?* It is, therefore, with especial interest that we inquire whether a strong case for eternal torture can be made out of the language of the Synoptical records. To me their expressions seem very strong: inasmuch that, when Mr. Oxenham holds up their damnatory phraseology and virtually asks with Hubert de Burgh: "Can you not read it? Is it not fair writ?" I most reluctantly echo Prince Arthur's answer:

"Too fairly, Hubert, for so foul effect."

Not only is this concession in itself painful: it also involves a painful inquiry. For it behooves us to prove, not merely that there are errors in the Bible—thus much all rational Christians now admit—but that there are errors even in the words ascribed to the Master. Yet, in this thankless demonstration, it is a comfort to feel that we are only affirming a principle which all Neochristians practically assume, and which is indeed the corner-stone of their system; for it is certain that what may be termed the non-populousness and the non-eternity of hell are staked on the fallibility of Christ. From this point of view, then, all Christians, even those who *believe* our conclusions to be false, ought to *wish* them to be true. If a great physician told us that we were going to die of a lingering and loathsome disease, we should wish—he would expect us to wish, and would himself wish—that he might be mistaken; and so, when the Object of our deepest reverence has proclaimed sad tidings of great sorrow which are unto all people, common humanity bids us hope that even he was liable to error.

Before proceeding further, I must guard against a misconception. Some readers may be estranged from this inquiry, through supposing that I am about to assail the doctrine of the Incarnation. Such, however, is not my intention; for, having a clear case before me, I mean to avoid all disputable matter. I will, therefore, remark that those who deny the infallibility of Christ do not *necessarily* deny his Divinity; they need only subject that Divinity to limitations which, in theory, are hardly greater than those to which it is subjected already. To make my meaning clear, I will first observe that in different ages the word God has been held to connote very different sets of attributes. Thus, Mr. Oxenham assumes that God is infallible; and, as we have seen, he thinks it blasphemous to suggest that the Incarnate God could deceive. Xenophanes, on the other hand, deemed it blas-

¹ Compare Deuteronomy xiii. 3; Jeremiah xx. 7.

² 2 Thessalonians ii. 11.

³ Romans xi. 32.

phemous to suppose that God could be incarnate at all;¹ whereas Hesiod saw nothing amiss in saying that the heavenly Muses are skilled to tell many lies.² But it is not only in pagan authors that such representations as this last are to be found. The Bible, we have shown, speaks of God as deceiving. In another place God declares himself to be fallible, and even provides against the contingency of his having been misinformed.³ Either this divine statement is true, or it is not. If it is, *cadit questio*: if it is not, the speaker is convicted of misrepresentation in this case, and capable of it in others. Of course it may be contended that God is infallible in himself, but that, when speaking *down* to our faculties, he has to depict himself as fallible. I do not mean to contest this explanation; for, in conceding that God *as revealed to us* is fallible, it concedes all that my argument requires.

A different class of objectors may urge that God did not declare himself to be fallible, but was misrepresented by the author of Genesis. This solution, however, only throws the difficulty further back; for the founders of Christianity asserted, or rather assumed, the divine authority of the Pentateuch;⁴ so that, if the author of Genesis was mistaken, they were mistaken also. And this brings us to a remark about verbal inspiration. St. Paul believed in the verbal inspiration of the Old Testament.⁵ Nor can there be any reasonable doubt that Jesus held the same view. Also, he promised his disciples that his teaching should be supernaturally brought to their remembrance; and that, when taken before judges, they should be verbally inspired.⁶ These and similar passages serve to explain the desperate efforts that were made to defend verbal inspiration. In a work whose perfect accuracy is divinely guaranteed, even a minute error in fact involves a grave error in doctrine; for it proves that inspiration did not know its own limits. Extremes in theology sometimes meet; and I am glad to find that the views here enunciated may

be confirmed by a quotation from Dr. Wordsworth. After rightly premising that the promise of verbal inspiration must be regarded as extending to St. Stephen, he goes on to comment on allegations that the proto-martyr's speech contains errors: "The allegations in question, when reduced to their plain meaning, involve the assumption that the Holy Ghost speaking by St. Stephen (who was 'full of the Holy Spirit') forgot what he himself had written in the book of Genesis, and that his memory is to be refreshed by biblical commentators of the nineteenth century." This trenchant logic may be fitly coupled with Cowper's sneer at geologists, who

". . . drill and bore
The solid earth, and from the strata there
Extract a register, by which we learn
That He who made it, and revealed its date
To Moses, was mistaken in its age!"

One has only to confront Dr. Wordsworth's logic with Alford's correct statement that St. Stephen's speech contains "at least two demonstrable historical inaccuracies;" and to confront Cowper's sneer with the first principles of modern geology; and one perceives what an edged tool every such *reductio ad anti-Christianum* is. But what concerns us is, to note that, as we have said, rational Christians nowadays admit that the Scriptures contain mistakes. Whence it follows that the founders, who believed that the Scriptures (or large portions of them) were free from mistakes, were in that very belief themselves mistaken.

Moreover, the fallibility of Christ may be distinctly inferred from the Gospels. He is represented "as growing" (and therefore as at one time deficient) "in wisdom." He sought theological instruction from the Jewish doctors. Unless this instruction was a mere farce, he was, then, if not fallible, at least inferior in knowledge to his fallible teachers. Also, in mature manhood, he knew not the day or the hour of his coming.¹ Hence his knowledge on some subjects

¹ Mark xiii. 32. This and similar passages are explained away by some Catholics. Thus the pope (quoted by Mr. Gladstone) has pronounced that Christ's increase in wisdom was "only apparent;" wherunto a Neochristian might respond that future punishment will be "only apparent." So, again, the *Dublin Review* (September, 1865) says that "the Church imperatively requires her children to understand Mark xiii. 32 in some very unobvious sense." If the Church may take this liberty with plain texts in the New Testament, the Scribes and Pharisees (who sat in Moses's seat) must have had a like authority over plain texts in the Old Testament. Why, then, were the Jews blamed for giving a "very unobvious sense" to the fifth commandment (Mark vii. 9-13)?

¹ ὁμοίως ἀσεβοῦσιν οἱ γενέσθαι φάσκοντες τοὺς θεοὺς τοῖς ἀποθανεῖν λέγουσιν.

² ἔμεν ψεύδεια πολλὰ λέγειν.

³ Genesis xviii. 21. In 1 Kings xxii 30-22, God is represented as at a loss for an expedient and as seeking counsel—in the art of deception.

⁴ See Mark xii. 26. It is clear that the general state of opinion—the suppressed major premise, as we may call it—which is involved in the assumption that the divine words spoken in the burning bush were genuine, will cover the assumption that the Divine words confessing fallibility were genuine.

⁵ Galatians iii. 16.

⁶ Mark xiii. 11.

was imperfect. And from imperfect knowledge to fallibility the step is a slight one; for, when a Being has imperfect knowledge, how can we be sure that his knowledge is perfect as to the limits of its own imperfection? But, as regards the fallibility of Christ, we are not left to mere conjecture. He "marveled at the centurion's faith." Now, it is obvious that an infallible being could not marvel. When we say that a man marvels, we imply that his expectation fell short of the reality, and was therefore erroneous. And thus, when we are told that Jesus marveled at the centurion's faith, we infer that his previous estimate of that faith had been unduly low. Again, a being conscious of infallibility would be free from doubt and misgiving. Yet, Jesus was uncertain respecting his death; and, when dying, he feared that God had forsaken him.¹ In case this demonstration (for such it is) should be painful to any reader, I would fain offer a word of comfort. The great Catholic Commentary of Cornelius à Lapide states that "*esto Christus non creverit sapientia et gratia habituali, crevit tamen actuali et practica.*" This reasoning is just as applicable to Christ's infallibility as to his youthful deficiency in knowledge; and hence a liberal Christian who clings to the belief in his Lord's Divinity may plausibly urge that the Saviour (as was inevitable) held some errors of his time, but that in respect of those errors it was only his "actual and practical wisdom," not his "habitual wisdom," that failed him.

Having thus sought to disarm prejudice, we can more freely comment on a few out of the many erroneous statements reported in the Gospel—statements that may, as it were, keep in countenance the reported statements about hell; and, in making the selection, we will mainly confine our view to errors that have been practically acknowledged by Christians of note. We will begin with an example that perplexed Mr. Maurice. The Master is said to have prophesied that he would "be three days and three nights in the heart of the earth." Now, the interval from Friday evening to Sunday morning is only one day and two nights. Hence, in the prophecy as reported by St. Matthew, there is as open a breach with arithmetic as in the three fourteens in the same Evangelist's genealogy; and, we may add, as in his strange narrative (evolved out of a misunderstood prophecy) concerning the ass and the colt, on both of which (*αἰῶν*) Jesus rode to Jerusalem.² Again, Jesus

said that David ate the shewbread "in the high-priesthood of Abiathar:"¹ the event really occurred in the high-priesthood of Ahimelech. Once more: an excellent religious journal has courageously proposed "to explain, once for all, that the theological and historical library popularly called the 'Bible' contains some errors."² Now, the "error" that is chiefly referred to occurs in the Fourth Commandment. Did God give the Ten Commandments or did he not? If he did, the "error" was a Divine one, and the thunders on Sinai were so many seals to that error. If he did not, the Master, who clearly believed the Decalogue to be from God, was himself in error on a fundamental point. The gravity of such an error may be best shown by an illustration. In the parable of Dives and Lazarus—that *tremendous parable*, as Charles Austin called it, which implies that all who receive their good things on earth, all whom a Jew of the Christian era would have counted rich, will be tormented³—greater value is attached to the testimony of Moses and the prophets than to that of one risen from the dead.⁴ Now, if one of the by-standers had suggested that one risen from the dead would appeal directly to the senses, whereas the passages in Moses and the prophets (even assuming those passages to be genuine and rightly interpreted) might figure among the errors in the theological and historical library popularly called the Bible—if one of the by-standers, say the virtuous and enlightened St. Thomas, had suggested this, would not the remonstrance, "Be not faithless, but believing," have been the very mildest that

ass is supposed. St. Matthew and the fourth Evangelist quote Zechariah ix. 9 differently, so as to make it support their differing accounts. The Fourth Gospel elsewhere furnishes a striking example of a myth *deposited* from a misunderstood text (xix. 23, 24).

¹ Mark ii. 26. I adopt Alford's translation, as the difficulty is slurred over in the authorized version. Alford comments on the instructive fact that a good and learned divine has persuaded himself that this text "rather suggests that he (Abiathar) was *not* the high-priest then: "*nonum Atlanta vocavit, Æthiopem cygnum.*" As for me, I forbear to waste words on the ingenious disingenuousness of harmonists: for I cannot even understand the notion that it is honest to apply to the Bible a mode of interpretation which would be dishonest if applied to any other book; and that orthodoxy, like Sigismund, is *supra grammaticam*.

² *Spectator*, August 28, 1875, p. 1091.

³ Luke xvi. 25.

⁴ In like manner, the writer calling himself St. Peter attributes greater probative force to the enigmatic prophecies of the Old Testament than to the evidence of St. Peter's own eyes and ears (2 Peter i. 18, 19). This tendency of the early Christian mind is suggestive.

¹ Matthew xxvi. 39; xxvii. 46.

² By the other three Evangelists the supernumerary

would have been addressed to him? Again, not only did Jesus accept the entire narrative of the Pentateuch, but on the details of that narrative he founded important rules of conduct. In treating of the right of divorce, he appealed to the institution that was "from the beginning;" primitive institutions he assumed to be ideally the best. His reasoning suggests two reflections: 1. Whatever the primitive form of marriage was, strict monogamy it was not. 2. The question as to primitive marriage, though indirectly full of instruction, has no direct bearing on conduct. As soon as science shall have determined whether primitive societies were endogamous or exogamous, modern communities will not be constrained to adapt their marriage laws to the primitive model: any more than those of us who believe slavery and cannibalism to have been primitive institutions are therewithal bound to become slaveholders and cannibals.

These illustrations are given in no captious spirit, but in order to show how hollow is the truce that has been patched up between orthodoxy and modern research. Especially hollow is the truce between orthodoxy and biblical criticism. For example: Jesus ascribed the 110th Psalm to David;¹ and the context shows that, in so ascribing it, he was not adapting himself to conventional phraseology, but that he thought that it was verily and indeed spoken by David. On the other hand, the "Four Friends" deny that it was by David; indeed, it was manifestly spoken not *by*, but *to* a Hebrew ruler.² The "Four Friends," who write in a thoroughly Christian spirit, forbear to point the moral of their statement; but they can hardly have been ignorant that, in making the statement at all, they were charging their Master with error. It is yet more obvious that their interpretation of the contemptuous apostrophe, "Ye are gods," is at variance with the amazing interpretation reported in the Fourth Gospel. Indeed, according to modern criticism, hardly one of the texts quoted from the Old Testament is rightly interpreted in the New. "Of prophecies in the sense of *prognostication*," says Coleridge, "I utterly deny that there is any instance delivered by one of the illustrious Diadoche whom the Jewish Church comprised in the name *Prophets*—and I shall regard *Cyrus* as an exception, when I believe the

137th Psalm to have been composed by David." In effect, this remarkable passage denies that the so-called Hebrew prophecies were predictions. On the other hand, Jesus believed them to be, not merely predictions, but predictions so plain that the Jewish nation was held guilty for not discerning their fulfillment. Thus, on so vital a question as prophecy, the opinion of the chief Christian philosopher of our century was diametrically opposed to the opinion of Christ. Other Christian writers follow Coleridge's lead. For instance: the Master is alleged to have foretold that a prophecy of Daniel was about to be fulfilled in the fall of Jerusalem, which was to be "immediately" followed by the end of the world.¹ Yet, not only has a certain interval already elapsed between the destruction of Jerusalem and that of the world, but we learn, even from Christian authorities, that the passage attributed to Daniel had no reference to the sack of Jerusalem by Titus—that it was not by Daniel—that it was not a prophecy, but a forgery. Hence, the book of Daniel furnishes a crucial test of rationalism. Laodicean liberals sometimes boast that they have given up their orthodoxy concerning the Old Testament, but that their orthodoxy concerning the New remains unimpaired. Now, if there is a point whereon rational critics from Porphyry to Zeller are agreed, it is that the prophecy in Daniel is unauthentic. If there is a point which lukewarm liberals are loath to give up, it is that every word of Christ came from God. To what, then, does their theory amount? Even to this shocking result: that God professed to have inspired the pseudo-Daniel, and thus became accessory after the fact. A similar mode of reasoning applies yet more directly to the theory of "inspired personation," a theory which seems to find favor with the accomplished divine who has written the article Bible in the "Encyclopædia Britannica," and who has justly been described in a religious journal as the most orthodox of biblical critics. That theory practically is, that the author of Deuteronomy, who was not Moses, was inspired to say that he was Moses (*Dio per mendacium gratificari*). Yet, peradventure, for this theory something may be said. We have seen that, on the orthodox hypothesis, St. Stephen's speech was verbally inspired. Yet, when professing to give the very words of Amos, he quietly substituted Babylon for Damascus; in fact, he manipulated the prophecy, so as to make it seem to have been fulfilled

¹ Matthew xxii. 43, 44: compare Acts ii. 34, 35.

² I say "ruler" (not "king"), since there is a great difference of opinion as to when this psalm was written. The "Four Friends" place it during the monarchy; while our best biblical critic, Dr. Davidson, is inclined to relegate it to the time of the Maccabees.

¹ Matthew xxiv. 15, 29.

by the captivity.¹ It follows, then, that he was verbally inspired to misquote. If St. Stephen was inspired to misquote, why may not the Deuteronomist have been inspired to misreport?

But this is not all. A distinguished living clergyman told me that he considered the strongest passage in the Bible to be one where God, by the mouth of Jeremiah, disowned the entire ceremonial law.² The explanation of this passage probably is, that Jeremiah, like Ezekiel, felt that the Mosaic law contained statutes which, according to the moral standard of his own age, "were not good;" but that, whereas Ezekiel concluded that those unworthy statutes were given by God penally, Jeremiah more rationally concluded that they were not given by God at all. At any rate, Jeremiah's statement is incompatible with the divine authorship of the Pentateuch. How, then, is it to be reconciled with Christ's observance of the Passover, and his injunction to "offer the gift that Moses commanded?" I refrain from pressing this difficulty. Enough has been said to explain why it is that, on the approach of sound criticism, the orthodox landmarks, which but lately seemed so steadfast, are one by one being removed.

A Greek sage once laid down three rather sweeping propositions: 1. Nothing exists. 2. If anything exists, it may not be known. 3. If anything exists and may be known, the knowledge may not be communicated. Now, if in these propositions for "thing" be substituted "good argument against orthodoxy," they will be found to correspond with three objections commonly urged against inquiries like the present. With the first class of objectors—those who deny the existence of plausible arguments for rationalism—we have already dealt. There remain the other two sets of objectors. There are those who maintain that such plausible arguments exist indeed, but exist only to try our faith; the fruit of this tree of knowledge should be eschewed on pain of death. And there are those who complain that, in imparting to them this fruit, we have made them unhappy, and have driven them, as it were, out of paradise: we have taken away their Lord, and they know not where we have laid him. This last objection

shall be discussed first, and very briefly. That the popular creed is in itself not a happy one, we have shown. Indeed, the application of the name "Gospel" to a system containing such doctrines as the imputation of Adam's guilt—"th' enormous faith of many" damned "for one"—may be called the *πρῶτον ψεῖδος* of orthodoxy: insomuch that it is the Christian Universalists who are on *the side of the angels*; and this time it is the popular theology which, in representing itself as having received from the angels the glaring misnomer of good tidings of great joy, suggests what is little short of blasphemous. Still, although that theology is in itself a very Kakangel, there is no doubt that by many the *κακάγγελτος ἄχη* is unfelt. Our "sister while she prays" is generally able to enjoy "her early heaven, her happy views," and blissfully to ignore her early hell and most depressing views. And this is a reason against heedlessly airing modern opinions in general conversation, when one's hearer is almost at one's mercy. But it is not a reason against putting forth those opinions in writings, which no one is compelled to read. Moreover, the orthodox, who practise self-deception as to the unsound portions of their creed, will find their task daily more difficult, and therefore more demoralizing. As was said in a former article, "the bracing intellectual air that we now breathe will bring the latent diseases of our religion out;" and perchance, if we limit overmuch the action of that bracing air, it will work unmixed harm—it will have time to bring the diseases out, but not time to cure them. It is on this account that too mild a treatment of those diseases may be perilous to the entire body of Christian sentiment and practice—not merely to the letter that killeth, but to the spirit that giveth life: if thine hand or thy foot offend thee, says the Scripture, cut it off. And thus, when we exhorted Christians manfully to renounce the devil and all his angels, and to drop hell out of the Bible, we acted under a conservative impulse: for we doubted whether to Christianity itself the presence of those nether flames, if they are suffered to go on smouldering, will be wholly free from risk. *Behold, how great a matter a little fire kindleth!*

The other objection is, in effect, that "man is not made to question, but adore:" it is *safer* to accept undoubtingly whatever our Bible or Church tells us of God, even if the evidence for those statements be inconclusive; nay, had the evidence been conclusive, where would be the room for our faith? Of this faith unfaithful we

¹ Acts vii. 43. This practice was after the manner of the age. In Isaiah ix. 12, the LXX. did not scruple to render "Philistines" by "Ἕλληνες," their object being, according to a high authority, to make the prophecy refer to the Ptolemies and Seleucide. (See Mackay's "Progress of the Intellect.")

² Jeremiah vii. 22.

might summarily dispose, by observing that its possessors are liable to Coleridge's censure—they prefer Christianity to truth. But it will serve our purpose to meet these objections on their own ground, and to fight them with their own weapons. Is it, then, quite certain that a good Being, who on one or more occasions affirmed himself to have ordained Tophet, would wish his affirmation to be always believed? The answer to this question may be sought in human analogies. Malcolm, in order to test the fidelity of Macduff, charged himself with grievous faults. It was with hearty satisfaction that Macduff at length discovered that Malcolm had been deceiving him. Nor can we doubt that, when the discovery was made, his satisfaction was shared by Malcolm himself; for the latter would prefer that his friend should regard him as an occasional liar, rather than as a perpetual villain.¹ A yet closer parallel may be drawn from classical mythology. Mr. Symonds has well observed that an enlightened pagan would feel about the cannibal repasts attributed to his gods much as an enlightened Christian feels about eternal punishment. This parallel (Mr. Symonds's critics notwithstanding) holds perfectly; for the analogical device which is used to defend, and the allegorical device which is used to explain away, the belief in a divine torture-house, may just as readily be applied to the belief in divine cannibalism. It is, therefore, worth while to consider the sort of language which devout but enlightened pagans—pagan Broad Churchmen, in fact—held concerning this unsavory dogma of pagan orthodoxy. In a passage translated and justly praised by Bacon, Plutarch observes: "Surely, I had rather a great deal men should say there was no such man at all as Plutarch, than that they should say that there was one Plutarch that would eat his children as soon as they were born; as the poets speak of Saturn;" the gods, he infers, have a similar preference, and hate superstition worse than atheism. This principle is fruitful of consequences. Let us suppose that Plutarch

would have accepted them: in that case, if Kronos or Zeus could have been shown to have pleaded guilty to revolting cruelty, Plutarch would have judged it right to disbelieve the divine confession. And he might fairly have hoped that such a judgment would find an echo amid the peaks of Olympus; for would not the Olympian father more bitterly resent the charge of murdering his own children than that of, humanly speaking, either deceiving or being deceived (*κρείττον δ' ἐλέσθαι ψεύδος, ἢ ἀληθὲς κακόν*)? Nay, further, Zeus was the father "of men" as well as "of gods," the father whose "offspring we are;"¹ and the foregoing argument would as clearly apply to his treatment of his human, as to his treatment of his divine, children. Wherefore Plutarch might have thought it not merely unscientific, but irreligious, to doubt that—

"As for the dog, the furies, and their snakes,
The gloomy caverns, and the burning lakes,
And all the vain infernal trumpery,
They neither are, nor were, nor e'er can be."²

In other words, he might have clung to his belief in the divine mercy, even though the divine mercy had to be upheld at the cost of lesser divine attributes; even though, with the voracity of Tartarus, he gave up the veracity of Zeus.

Another Neopagan has dealt with divine cannibalism in a manner whereon Neochristians would do well to meditate. To Pindar it seemed hardly credible that the gods should have eaten up Pelops. He granted, indeed, that very strange things sometimes happened; and he thought that, in this particular case, the final decision might be reserved for posterity; but, provisionally, he deemed it safer to reject the story. It is remarkable that here the poet uses the same sort of prudential weapons that orthodox Christians use; but he uses it on the opposite side—he employs it in defense, not of faith, but of skepticism. And this should show us what a two-edged weapon it is. Pindar, indeed, probably regarded the gods as having been misrepresented, not as misrepresenting themselves. But we have shown that, for practical purposes, these two forms of misrepresentation differ less than at first sight appears; and, indeed, that the distinction between gods who misreport themselves, and gods who are misreported by verbally inspired reporters, is a distinction without a difference. But Pindar haply did not regard the misreporters as verbally inspired. If so, his view exactly foreshadowed that of the Neochristians; and the state of mind common to both bears so closely on our inquiry that we propose to

¹ Perhaps a similar lesson may be gathered from the Gospels. We may be sure that the father whose son refused to go into the vineyard, but afterward repented and went, was better pleased than if the son had kept his word and not gone—had been more truthful, but less obedient. The moral of Jephthah's story is less satisfactory; and the frantic efforts that are nowadays made to explain away this simple narrative—to make believe that Jephthah broke his vow and did not commit murder—are among the many proofs that the religious instinct of modern times is in some respects healthier than that of the Old, and seemingly of the New, Testament (Hebrews xi. 32).

¹ Menander. ² Lucretius translated by Dryden.

consider it further, and for that purpose to resort yet once again to a classical illustration. The Kymæans being commanded by an oracle to deliver up a suppliant, one of their citizens, Aristodikus, suspected that the divine words had been tampered with,¹ and consulted the oracle himself. The god, however, gave the same answer as before. Thereupon Aristodikus bethought him of a device: he robbed the nests of the sacred birds that were in the precincts of the temple. Presently he heard a voice from the sanctuary, saying, "Wretch, how dare you strip the temple of my suppliants?" "O king!" replied he, nothing abashed, "you, indeed, protect your suppliants; and do you bid the Kymæans deliver up theirs?"² "Yea, verily," said the god, "that for such impiety ye may perish speedily; and may never again ask the oracle about giving up suppliants." Thus, then, was Aristodikus rewarded for disregarding an injunction strikingly analogous to Jehovah's "statutes that were not good." His bearing in face of such an injunction differed from that of Abraham and Hosea,³ just as Hellenism differed from Hebraism. It is, therefore, important that his precise moral attitude should be noted. He first cherished the hope that the wicked command was not from God; and, afterward, when convinced that it *was* from God, he still held that God was less dishonored by its breach than by its observance; for it seemed less incredible that, for some inscrutable reason, God should have deceived his worshipers, than that he should have sanctioned what was unjust and cruel.

Aristodikus, in so judging, was a model of pious discrimination. He deserves our respect, both for regarding the divine untruthfulness as one of the solutions of the problem that lay before him, and also for regarding it as an unsatis-

factory solution—a solution not to be adopted till a happier one had failed. And, in thus expressing our concurrence with his estimate of divine deceptions, we have shown what we think of Mr. Oxenham's estimate. It is in a certain sense true that the belief in such deceptions is "little short of blasphemous." But this is a one-sided truth, unless supplemented by the more obvious and momentous truth that the belief in hell is, in the words of the first of living bishops, "blasphemous and revolting." Orthodoxy, therefore, is in a strait between two blasphemies; and of those blasphemies she should choose the less.

Briefly, then, we concede to Suarez and Prof. Huxley that "*incredibile est, Deum illis verbis ad populum fuisse locutum quibus deciperetur.*" But we guard this concession by adding, "*Incredibilis est, Deum illis pœnis in populum esse usurum quibus crucietur.*" We should hate, not the belief in divine untruthfulness less, but the belief in divine cruelty more. Only, in holding our brief for Neochristianity, we assumed that it was between these two beliefs that the alternative lay. And, starting with this assumption, we maintained that those who *hang* the belief in hell on the divine veracity represent the chain of evidence for hell as stronger than its weakest link; or, to employ a yet bolder metaphor, they make the burning lake rise above its own level. To prove this has been the design of our article. We have been endeavoring to show the universal application of a plain rule of human jurisprudence, by establishing a proposition which may be called a counterpart, if not a corollary, of Hume's famous proposition about miracles. Our proposition is: That no person (whether in heaven or on earth) should stand convicted, on his own testimony, of an immoral or unlikely act, unless it be less antecedently unlikely that he should do the act than that his testimony should be false; "and" (to apply Hume's very words) "even in that case there is a mutual destruction of arguments, and the superior only gives us an assurance suitable to that degree of force which remains after deducting the inferior."

—*Fortnightly Review.*

¹ δοκέων τοὺς θεοπρόπους οὐ λέγειν ἀληθῆως. Herodotus. i., 158.

² These words are closely parallel to passages in the Gospel: Matthew vi. 14, 15; xviii. 33. Observe that in all such passages the identity of the divine and the human morality is assumed.

³ Genesis xxii.; Hosea i. 2.

SPONTANEOUS GENERATION: A LAST WORD.

BY PROFESSOR TYNDALL.

THE results of some years of labor, on my part, in connection with the subject of spontaneous generation are set forth in the two memoirs published in the "Philosophical Transactions of the Royal Society" for 1876 and 1877. But by conversation and correspondence with various physicians and surgeons of eminence I was made aware that the further exposition and elucidation of two or three leading points was desirable, and to this task I addressed myself in the January number of this review. This has drawn forth in the February number a "reply," in which it is intimated that my article deals in "denunciation." Of that the reader will judge for himself, my desire being that demonstration, rather than denunciation, should form the staple of the article. I am also spoken of as commenting in terms of severe reprobation on the writer's temerity in differing from M. Pasteur. On this point I take the opportunity of remarking that had the "temerity" referred to been the outcome of true courage, and fidelity to scientific conviction, I should have been the first to applaud the writer's dissent from Pasteur, Huxley, and the other able men with whom he has come into collision; but I could not applaud the turning of a momentous discussion into a mere dialectic wrangle, nor could I approve of the systematic abandonment of that courtesy of language which befits the neophyte in the presence of the master. Science, as a moral agent, is affected by the spirit in which it is pursued, and the man who, at the entrance of his career, discharges from his mind all reverence for those whose reputations have been established by the successful disciplines of laborious lives, is not likely to win applause from me.

To justice, however, my respondent is entitled, and I begin these remarks by an act of justice toward him. He complains that I speak of the vital resistance of the seeds of *Medicago* as if he had not been aware of the fact, and points out, to use his own words, that "the facts newly discovered by Prof. Tyndall, which were to invalidate my views, were, with others, nearly five years ago, referred to by me." I turn to vol. i., page 314, of his "Beginnings of Life," and there, it must be admitted, is a reference to Pouchet's experiment. The observation referred to aston-

ished Pouchet himself. At first he would not believe the statements of those who informed him that the seeds of *Medicago* could resist four hours' boiling. "Ce fait extraordinaire était tellement en opposition avec ce que professent les physiologistes les plus éminents de notre époque, que je n'y pouvais croire." Spallanzani had distinctly declared that vegetable seeds were destroyed by boiling water, those with the hardest integuments not excepted. But Pouchet made the experiment for himself, and in twenty different repetitions of it found that some of the seeds germinated after four hours' boiling. "Les semences," he says, "de ce *medicago* du Brésil résistaient à une ébullition de quatre heures de durée. Où cela s'arrête-t-il? Je n'en sais rien, n'ayant pas expérimenté au delà."

This observation, which excited great attention at the time, which afterward formed the subject of discussions in the Academy, and which certainly is the most important observation of the kind ever made, is briefly spoken of in a footnote on the page above referred to. I had read the note and forgotten it, my lapse of memory being confirmed by the fact that in my respondent's later volume, "Evolution, or the Origin of Life," where he treats very fully of "the destructive influence of heat upon living matter," the observation of Pouchet is not, to my knowledge, once mentioned.

My respondent refers to Mr. Moseley in the *Academy*, and to Prof. Huxley at Liverpool, as enunciating views which were afterward "abundantly refuted" both in this country and on the Continent. Notwithstanding such refutation, "Prof. Tyndall," continues my respondent—

"three years later—that is, early in 1876—attempted to deny that such experimental results as mine could be legitimately obtained, and sought to convince the Royal Society and a crowded audience at the Royal Institution that I had fallen into error, and that no such results could be obtained by a skilled experimentalist like himself. In evidence of this he brought forward a 'cloud of witnesses,' all of which, if rightly interpreted, gave very different testimony from that which Prof. Tyndall imagined. But while he at first strenuously denied my facts, he is now only able to demur to my interpretation."

What the "different testimony" here spoken of is I do not know, but I do know that the "cloud of witnesses" confront this writer now, as they did in 1876. Save by such intimations as the above, which seem to point to a reserve of wisdom in the writer's private mind, he has never, to my knowledge, attempted to shake their evidence. The birth of the "witnesses" was on this wise: At a meeting of the Pathological Society, especially convened for the discussion of the "germ-theory" of contagious disease, my respondent thus addressed his medical colleagues:

"With the view of settling these questions, therefore, we may carefully prepare an infusion from some animal tissue, be it muscle, kidney, or liver; we may place it in a flask, whose neck is drawn out and narrowed in the blowpipe-flame; we may boil the fluid, seal the vessel during ebullition, and await the result, as I have often done. After a variable time, the previously-heated fluid within the hermetically-sealed flask swarms more or less plentifully with bacteria and allied organisms."

The speaker had already informed his audience that he was discussing "a question lying at the root of the most fatal class of diseases to which the human race is liable." Special care, I thought, was needed in the performance of experiments which lay at the basis of a subject of this importance. I was not sure that the speaker had observed this care. I therefore took him at his word, prepared infusions of animal tissues, comprising mutton, beef, fowl, wild-duck, partridge, plover, pheasant, snipe, rabbit, hare, bad-dock, mullet, codfish, sole, and other substances. I placed them in flasks, "with necks narrowed and drawn out in the blowpipe-flame." I boiled the fluids, sealed the vessels during ebullition, and awaited the result. These are the "witnesses" of whose evidence my respondent possesses an "interpretation" known, as far as I am aware, only to himself. The fact, as known to me and others, is that the witnesses contradicted his assertion. He had affirmed that they would swarm with bacteria and allied organisms. They distinctly refused to do so. This thing was not done in a corner. One hundred and thirty such flasks were submitted to the scrutiny of the Royal Society in January, 1876, while thirty of them were critically examined by the biological secretary of the Society, Prof. Huxley. In one flask, and in one only, a small mycelium was discovered, and it, as Prof. Huxley remarked at the time, afforded a "dramatic confirmation" of the overwhelming evidence otherwise adduced. In this

flask, and in it only, a small orifice was discovered, through which the infusion could be projected, and by which the germinal matter of the air had had access to the flask.

My respondent next deals with Liebig's doctrine of fermentation, regarding which, after some preliminary remarks, he says: "If, then, as Liebig contended, organic matter in a state of decay is capable of acting as a ferment, and of initiating the common fermentations and putrefactions, there surely can be no error in quoting him in support of such views." Certainly not. Whether organic matter in a state of decay possess the power ascribed to it or not, the writer was perfectly justified in quoting Liebig; but his justification ceases when by a twist of logic he seeks to make Liebig's views answerable for his own. He goes on to say: "And if it has also been shown that the appearance and increase of the lowest living particles are always correlative of these processes, Liebig's view, if it is true at all, must be true for the whole of the processes which are essentially included under the term fermentation."

Such logic is best met by the direct and simple statement of the truth. Matter in decay was, in Liebig's view, matter in a state of molecular disturbance. His vision was concentrated on groups of atoms, or molecules—not on organisms. He pictured, in perfect consistency with his theoretic sight, the propagation of the disturbance of these groups to other groups of unstable constitution. These he figured as shaken asunder by the motion of their agitated neighbors; the visible concomitant of this molecular breaking up being what we call fermentation. Liebig's idea of a ferment had nothing whatever to do with the doctrine of spontaneous generation. He gave that doctrine no countenance; he derived from it no aid; and the attempt of the heterogenist to strengthen his position by amalgamation with Liebig is an attempt to mix together wholly immiscible things. My respondent quotes not only one, but two celebrated German chemists in his favor. I ventured, a few days ago, to place the foregoing extract from the "reply" before a third distinguished German chemist, who is intimately acquainted with Liebig's views. He had two alternative hypotheses to account for it. The first need not be mentioned; the second ascribed the reasoning of the extract to "mere confusion of mind."

My respondent continues:

"The heterogenist, therefore, has perfectly good ground for demanding proofs of error from the germ-theorist, rather than more or less pos-

sible guesses based solely on the germ-theorists' way of thinking, before he abandons Liebig's fertile idea, supported by Gerhardt and others, that the mere organic matter of the air can engender fermentative changes in suitable fluids, leading though it may, among other phenomena, to a new birth of living particles. This, too, the reader will observe, is a very different notion concerning the origin of such new living particles from that which Prof. Tyndall persists in attributing to me, viz., the absurd idea that mere dead particles from the air are themselves 'miraculously kindled into living things.' "

It is to be hoped that the reader will be able to observe the difference to which his attention is here directed. For my own part I am grateful for the explanation, such as it is, which, in view of the writer's previous utterances, was by no means unnecessary. It does not, it is true, quite abolish the "miracle," but it changes the form thereof. It is not, we now learn, the dead atmospheric particles *themselves* that are kindled into life; it is, on the contrary, the dead particles of the liquid that are kindled into life by the dead particles of the air. The former, we are told, is an "absurd idea," while the latter, I suppose, is thought a sweetly reasonable one. Thus, the discord persistently raised by me is finally resolved. The "reader," if I might claim his attention for a moment, will observe the frictionless way in which this "new birth of living particles" in the liquid, begotten, be it remembered, by the dead particles of the air, glides in as a small corollary to Liebig's "fertile idea." There are people among us who, it is alleged, can produce effects, before which the discoveries of Newton pale. There are men of science who would sell all that they have, and give the proceeds to the poor, for a glimpse of phenomena which are mere trifles to the "spiritualist." In like manner, while no discovery of the age would bear comparison with this "new birth of living particles," it is a mere commonplace occurrence to our fortunate heterogenist.

My respondent scatters through his article words and phrases which he intends to have an effect, if not a meaning. He labels proofs as "assumptions," ocular demonstrations as "possible guesses," and propositions backed by all the knowledge of Nature which we possess as the outcome of arbitrary prejudice. He speaks of my "setting the seal upon Nature's possibilities" when I am merely setting it upon his own illicit wanderings. Indeed, he plainly shows himself to be unacquainted with the real basis of scientific inference. Let us consider a special

case, over which he has loudly sounded the argumentative timbrel. In my January article I refer to Pouchet, fairly, I trust, appreciating his learning and his strength, but quoting his own words to indicate the leaning of his mind when he began his researches on heterogeny. My respondent retorts that I show "an even more obvious bias in the contrary direction;" and, to make his point good, he publishes a mutilated paragraph from one of my letters. The full text of the paragraph I here restore:

"Dr. Bastian says that two interpretations of my facts are equally admissible. He is again wrong; there is but one interpretation possible. An interpretation which violates all antecedent knowledge is undeserving of the name. All our experience of the method of Nature goes to show that, if a sown particle sprout into a plant, the particle is proved thereby to be the seed of that plant. The inference that a particle which, when sown, produces a thistle is the seed of the thistle, is not surer than the inference that the particles described in the *Times* as rising in clouds from shaken hay embrace the seeds of bacteria; while, to infer that the thistle is the offspring, not of a living seed, but of dead, unrelated organic matter, is not more repugnant to right reason than the so-called second interpretation of Dr. Bastian, which ascribes such definite organisms as hay-bacillus to dead dust."

This, I submit, is reasoning of a perfectly sound and wholesome kind. My respondent, however, italicizes one obnoxious line of the paragraph, omits some others, and deduces from the whole that I have set my presumptuous seal upon the "possibilities of Nature," and done other foolish things. I think it will not be difficult to make this matter plain to the readers of the *Nineteenth Century*. The smallest organisms which the microscope has hitherto revealed are grouped together under the common name of bacteria. They differ from each other both in size and shape, some being globular, some staff-like (whence the name), some having the form of fine filaments, some mobile, and some still. In the staff-like bacteria, the usual mode of propagation and multiplication is bisection. The "staff" is nipped at its centre, the nip deepens, and finally the bacterium is divided into two halves, which lengthen and are bisected in their turn. According to a calculation of Dr. Burdon-Sanderson, this process enables 17,000,000 individuals to proceed in twenty-four hours from a single ancestor. In the case, however, of certain large bacteria, which, because they are large, have been more thoroughly examined than the others, the rods or filaments are observed to

resolve themselves into spores. This resolution, as proved by Cohn and Koch, is conspicuously illustrated by the *Bacillus subtilis* of hay, and the *Bacillus anthracis* of splenic fever. Both these organisms propagate themselves by spores which may be rendered as plain to the eye of the microscopist as peas in a pod.¹

This premised, let the reader place before his mind one of the sealed chambers described in the January number of this review; let him figure its series of test-tubes, charged with infusions which, exposed to optically pure air, have remained sweet and clear for six months in a warm room. Let the reader now suppose the door of the sealed chamber to be opened, and a bunch of dry hay to be shaken in the moteless air of the chamber. A beam sent through that air now shows it to be laden with dust. Forty-eight hours after this dust has been let loose, the infusions are found to have a fatty, corrugated scum upon their surfaces, it may be with a clear or it may be with a turbid liquid underneath. When this scum is examined, it is found to consist of countless multitudes of the hay-bacillus matted together. What are we to conclude? Whence have these organisms come? I say there is but one interpretation possible, and this is the particularly obnoxious phrase that my respondent has italicized as marking my scientific bigotry and narrowness of view. The interpretation is that the organisms have come from the germs of *Bacillus subtilis*, which have been shaken from the hay. In giving this interpretation, and in asserting it to be the only one, I am not, I submit, arbitrarily setting my seal upon the possibilities of Nature, but loyally and dutifully following her teachings as an obedient son. But, my respondent might urge, you forget the other interpretation, that I made so clear to the reader at page 267 of my "reply"—the interpretation, namely, that the dust of the hay is dead organic matter in a state of motor decay. This dead dust falls into the infusions, and, although it does not commit the "absurdity" of becoming "itself" alive, it does go through the perfectly reasonable process of making the dead infusions alive. The value of logic leading to this issue has been duly appraised by our highest scientific authorities; its survival among the general public cannot, I think, be long.

"What present warrant," asks my respondent,

"is there for supposing that a naked, or almost naked, speck of protoplasm can withstand four, six, or eight hours' boiling?" To which he adds, "I can only answer none." Regarding naked specks of protoplasm I make no assertion. I know nothing about them save as the creatures of my respondent's fancy put into words. But I do affirm, not as a "supposition," nor an "assumption," nor a "probable guess," nor, to use a more strenuous stigma of my respondent, "a wild hypothesis," but as a matter of the most undoubted fact, that the spores of the hay-bacillus, when thoroughly desiccated by age, have, in special cases, withstood the ordeal mentioned. And I further affirm that these obdurate germs, under the guidance of the knowledge that they *are* germs, can be destroyed by five minutes' boiling, or even less. This needs explanation. The finished bacterium, as the reader of my January article knows, perishes at a temperature far below that of boiling water, and it is fair to assume that the nearer the germ is to its final sensitive condition the more readily will it succumb to heat. Seeds soften before and during germination. This premised, the simple description of the following process will suffice to make its meaning understood:

An infusion infected with the most powerfully resistant germs, but otherwise protected against the floating matters of the air, is gradually raised to its boiling-point. Such germs as have reached the soft and plastic state immediately preceding their development into bacteria are thus destroyed. The infusion is then put aside in a warm room for ten or twelve hours. If for twenty-four, we might have the liquid charged with well-developed bacteria. To anticipate this, at the end of ten or twelve hours we raise the infusion a second time to the boiling temperature, which, as before, destroys all germs then approaching their point of final development. The infusion is again put aside for ten or twelve hours, and the process of heating is repeated. We thus kill the germs in the order of their resistance, and finally kill the last of them. No infusion can withstand this process if it be repeated a sufficient number of times. Artichoke, cucumber, and turnip infusions, which had proved specially obstinate when infected with the germs of desiccated hay, were completely broken down by this method of discontinuous heating, three minutes being found sufficient to accomplish what three hundred minutes' continuous boiling failed to accomplish. I applied the method, moreover, to infusions of various kinds of hay, including those most tenacious of life. Not one

¹ A few days ago I had an opportunity of seeing matted together and dotted with spores some magnificent examples of *Bacillus anthracis*, which had been cultivated by Mr. Ewart, of University College.

of them bore the ordeal. These results were clearly foreseen before they were realized, so that the germ-theory fulfills the test of every true theory, that test being the power of prevision.

When my respondent speaks of "naked or almost naked specks of protoplasm," he draws, as I have intimated, upon his own imagination, not upon the objective truth of Nature. His words seem the words of knowledge, but his knowledge is really *nil*. He concedes the possibility of a "thin covering." Such a covering may, however, exercise a powerful protective influence. A thin pellicle of India-rubber, for example, surrounding a pea, keeps it hard in boiling water for a time sufficient to reduce an uncovered pea to a pulp. The pellicle prevents imbibition, diffusion, and the consequent disintegration. A greasy or oily surface, or even the layer of air which clings to certain bodies, would act to some extent in a similar way. "The singular resistance of green vegetables to sterilization," says Dr. William Roberts, "appears to be due to some peculiarity of the surface, perhaps their smooth, glistening epidermis which prevented complete wetting of their surfaces." I pointed out in 1876 that the process by which an atmospheric germ is wetted would be an interesting subject of investigation. A dry microscope covering-glass may be caused to float on water for a year. A sewing-needle may be similarly kept floating, though its specific gravity is nearly eight times that of water. Were it not for some specific relation between the matter of the germ and that of the liquid into which it falls, wetting would be simply impossible. Antecedent to all development there must be an interchange of matter between the germ and its environment; and this interchange must obviously depend upon the relation of the germ to its encompassing liquid. Anything that hinders this interchange retards the destruction of the germ in boiling water. In 1877 I add the following remark:

"It is not difficult to see that the surface of a seed or germ may be so affected by desiccation and other causes as practically to prevent contact between it and the surrounding liquid. The body of a germ, moreover, may be so indurated by time and dryness as to resist powerfully the insinuation of water between its constituent molecules. It would be difficult to cause such a germ to imbibe the moisture necessary to produce the swelling and softening which precede its destruction in a liquid of high temperature."

However this may be—whatever be the state of the surface, or of the body, of the spores of

Bacillus subtilis, they do as a matter of certainty resist, under some circumstances, exposure for hours to the heat of boiling water. No theoretic skepticism can successfully stand in the way of this fact, established as it has been by hundreds, if not thousands, of rigidly-conducted experiments.

My respondent calls his article a "reply." It is the reply which antecedent knowledge would have led me to expect; but it is not, I submit, the reply which the English public, including the medical profession of England, had a right to expect. It is a reply upon side issues which do not touch the core of the question at all. Let me point out something which demanded a reply, but to which none has been given. Reference has been already made to my "cloud of witnesses," for the interpretation of whose testimony my respondent seemed to intimate that he possessed a private key. The true inference from that testimony is that it refutes my respondent. But were it not that I wished to follow his instructions formally and scrupulously, and thus deprive him of all opportunity of cavil or complaint, the refutation was unnecessary. The evidence already recorded against him in the industrial arts was simply overwhelming. Not by hundreds, nor by thousands, but by millions, the witnesses might be counted which contradict him. For, what are most of our preserved meats and vegetables but the results of experiments in which his instructions have been carried out and his statements disproved? Animal and vegetable tissues are placed in tin vessels, each with a small hole in its lid. The tins are boiled, steam issues through the hole, and, after some minutes' boiling, the tin is hermetically sealed. This is to all intents and purposes the process described by my respondent before the Pathological Society. Every sound tin thus prepared is therefore a witness against him. I am aware that he has met what he is pleased to call Mr. Huxley's "empty generalities" by stating that the tins of a certain establishment which he visited were boiled for an hour and a half, and, after sealing, were subjected to a temperature of 253° for half an hour. But this is not the universal practice, and millions of tins have been prepared without this subsequent superheating. It is idle, moreover, to lay any stress upon this point; for the substances after having been superheated remain putrescible, though they do not putrefy, or show the slightest tendency or power to generate life.

To meet this crushing demonstration, my re-

spondent invented the theory referred to in my January article, according to which sound tins do, in the first instance, ferment, the associated organisms committing suicide by the pressure of the gases developed by their own vital actions. This is the very first point to which his "reply," if he meant it to be a real one, ought to have been directed. Why did he, when dealing with a question described by himself as "lying at the root of the most fatal class of diseases to which the human race is liable," commit the levity of enunciating so easily tested a theory without having carefully verified it experimentally? Why, after its character has been exposed, does he still leave his medical brethren in the dark regarding his views by neglecting to confess his error, and to retract it? The reply that we have a right to demand of him ought to direct itself to such points as this.

In my January article I also refer to sixty flasks prepared in the Royal Institution, and transported in warm July weather to the Alps. On their arrival fifty-four of these flasks were found transparent and void of life. Six of them were charged with organisms, and these particular six were found on examination to have had their fragile sealed ends broken off. Here is a question for my respondent which he does not attempt to answer. I described accurately the way in which the flasks were charged and sealed, and gave him, moreover, a representative drawing of one of them. He does not offer a word of explanation of the sterility of the fifty-four flasks, prepared according to his own prescription, and which ought, according to his prediction, to have "swarmed with bacteria and allied organisms." With reference to his pressure-theory, which he has also applied to explain Gruithuisen's experiments, he was, moreover, informed that animal and vegetable infusions had been subjected by me to mechanical pressures far more than sufficient to produce the bactericidal effects which his theory ascribes to pressure, and that bacteria nevertheless grew and multiplied to countless swarms under such pressure, but he has not a word of answer to the fact, or of acknowledgment of what it involves. He had claimed a power for the "actinic rays" as aiding in the development of organisms. By observations conducted in the powerful sunlight of the Alps, and at the temperatures which my respondent declared to be most efficient, the alleged power was proved to be a delusion. I pointed out the fundamental mistake contained in his communication to the Royal Society, where an observation made with a

mineral solution is unwarrantably extended to an organic infusion, a demonstration of the *de novo* generation of living organisms being founded on this illegitimate process; but the "reply" does not contain an allusion, much less an answer, to my counter-demonstration. He passes without notice my remarks about positive and negative results, his "misunderstanding" of which, to use the words of Dr. William Roberts, "makes him blind to the overwhelming eogency of the case against him." In reply to one of his arguments, I ask: "Why, when your sterilized organic infusion is exposed to optically pure air, should this generation of life *de novo* utterly cease? Why should I be able to preserve my turnip-juice side by side with your saline solution for three hundred and sixty-five days of the year in free connection with the general atmosphere, on the sole condition that the portion of that atmosphere in contact with the juice shall be visibly free from floating dust, while three days' exposure to that dust fills it with bacteria?" There is no answer. These are but a fraction, and by no means the weightiest fraction, of the points urged upon his attention, but which he systematically avoids. He expands, with a "wonderful effluence of words," on *Medicago* and such like things. He deflects the discussion from the question of spontaneous generation to the totally different question whether the bacterial matter of the air exists there as germs or as finished organisms. But he leaves absolutely untouched the main facts and the most conclusive arguments of my article.

As to any bias, or prejudice, or foregone conclusion, that may beset me in this matter, I have only to remind the reader that few persons at the present day have more distinctly avowed belief in the "potency of matter," and that few have paid more dearly for the avowal, than myself. The criticism of high-minded scholars and cultivated gentlemen, as well as the vituperation of individuals who have not yet reached that "place in Nature" where gentlemanly feeling comes into play, have been liberally bestowed upon me. In a letter recently received from my excellent friend Mr. Oliver Wendell Holmes, he justly remarks that I should probably have been well satisfied had my inquiries in relation to the present question justified Pouchet instead of Pasteur. With the views, indeed, which I entertain upon this subject, it specially behooves me to take care that no theoretic leaning shall taint my judgment of experimental evidence. I have always kept apart the speculative and the proved. Before Virchow laid down his canons I had reduced them to prac-

tie. My sole care has been that the potency of truth should be vindicated; and no denier of the potency of matter could labor more strenuously than I have done to demonstrate its impotence as regards spontaneous generation. While expressing, therefore, unshaken "belief" in that form of "materialism" to which I have already given utterance, I here affirm that no shred of trustworthy experimental testimony exists to prove that life, in our day, has ever appeared independently of antecedent life.

The present condition of this question is such that no medical man, seeking clearly to realize and effectually to remove the causes of epidemic disease, need have his mind troubled by a doubt as to the derivation of those organisms to which modern physiology, with ever-increasing empha-

sis, assigns such momentous functions. Clearly assured that they are not spontaneously generated, his efforts will be directed to the discovery and the destruction of the germinal matter from which they spring. Here, as I have stated in another place, the intelligent coöperation of the public with the physician is absolutely essential to success. For their sakes I have spared no pains to render my demonstrations so clear that no amount of verbal "effluence" will be able to obscure them. This accomplished, the controversy comes to a natural end. Neither honor to the individual nor usefulness to the public is likely to accrue from its continuance, and life is too serious to be spent in hunting down in detail the Protean errors of Dr. Bastian.

—*Nineteenth Century.*

THE DEFINITION OF LIFE.¹

By CLAUDE BERNARD.

I.

SINCE the earliest days of antiquity, famous philosophers or physicians have viewed those phenomena which pass through their phases in living beings as resulting from the action of some higher and immaterial principle upon passive and yielding matter. This is the conception of Pythagoras, Plato, Aristotle, and Hippocrates, the received belief, at a later time, among the philosophers and learned mystics of the middle ages, held by Paracelsus and Van Helmont, and by the scholastic doctors. In the course of the eighteenth century this idea reached its highest point of acceptance and control in that eminent physician, Stahl, who added to its distinctness of form by the conception of *animism*. The spirituality of life found its extravagant expression in animism. Stahl was the resolute and most positive supporter of those conceptions which had prevailed since Aristotle's time. It may be said, too, that he was their last representative; the modern mind refused to welcome a doctrine that had grown into too glaring an opposition to science.

On the other hand, in contradiction to the ideas just noted, even before physics and chemistry had gained an organized form, before the

phenomena of dead matter were understood, we perceive that, in anticipation of the facts, the movement of philosophy tended toward the attempt at proving the identity of phenomena in inorganic substance with those of living bodies. This notion is the basis of atomism, as held by Democritus and Epicurus. The atomists admit no governing intelligence; for them the world from everlasting moves of its own force. They conceive of one kind of matter only, the elements of which possess, by means of their forms, the property of entering into combinations in endless diversity, through their mutual connections, and of composing inorganic and lifeless bodies, as well as organized living and feeling beings like animals, or rational and volitional ones such as man.

The latter hypothesis thus assumed, at its origin, an exclusively materialistic shape; but it must be noted as singular that those philosophers most profoundly convinced of the spirituality of the soul, as Descartes and Leibnitz, for instance, did not hesitate to adopt a view of a very similar kind which accounted for all those manifestations of life in action which are presented to the senses by the operation of unintelligent forces. The ground of this seeming contradiction is to be found in the almost absolute severance between the body and the soul which they insisted on.

¹ Translated from the *Revue des Deux Mondes*, by A. R. Macdonough.

Descartes gives a metaphysical definition of the soul and a physical definition of life. The soul is that higher principle which makes itself known by thought; life is merely a higher result from mechanical laws. The human body is a machine, made up of springs, levers, pipes, filters, sieves, and squeezers. This machine is made only for itself; the soul unites with it only for the contemplation of whatever takes place in the body as a mere spectator, but it takes no part whatever in the discharge of vital functions. The ideas entertained by Leibnitz, as regards their physiological character, are closely analogous to those of Descartes. He, too, like Descartes, severs the soul from the body, and, though he admits a harmony preëstablished between them by divine power, he denies that they have any sort of reciprocal influence. "The body"—these are his words—"goes on in its development mechanically, and the laws of mechanics are never transgressed in its natural motions; everything takes place in souls as though there were no body, and in the body everything takes place as though there were no soul."

Stahl's conceptions of the nature of vital phenomena and the relations between soul and body were totally unlike these. In considering the action of life, he throws aside all explanations which would apply alike to such action and to the mechanical, physical, and chemical phenomena of inert matter. An eminent chemist himself, he assails with great power and peculiar authority the extravagances of the chemist-doctors, or iatro-chemists, men like Sylvius de Le Boë, Willis, and others, who resolved all the phenomena of life into chemical action, fermentations, alkalinities, acidities, and effervescences. He goes further than to maintain that chemical forces are different from the forces that rule the manifestations of life, and even asserts that the former are hostile to the latter, and that they tend to the destruction instead of the preservation of the living body. We must have, as Stahl teaches, a vital force that protects the body against the action of external chemical forces which press incessantly toward its attack and destruction; life is the triumph of such vital forces over the others. Stahl was led by these ideas to his theory of *vitalism*; but he did not stop at that stage: it was but a first step in the path that led him at last to animism. This vital force, he says, struggling without rest against physical forces, acts intelligently, upon a definite plan, for the preservation of the organism. But if vital force is intelligent, why make any distinction between it and the rational soul? Basil Va-

lentin and Paracelsus, his disciple, had imagined the existence in infinite number of immaterial intelligent principles, the *archææ*, which governed the phenomena in the living body. Van Helmont, the most famous representative of these *archæic* teachings, who joined a genius for experiment to an imagination wholly ungoverned in its starts and sallies, dreamed out a whole hierarchy of these immaterial principles. Highest of all was placed the rational and immortal soul, undistinguished from God; next the sentient and mortal soul, using as its agent another chief of the *archææ*, which in its turn controlled a multitude of subordinate *archææ*, styled the *blas*. Stahl, following Van Helmont a century later, and carrying on his ideas, reduces all these notions of intelligent principles, governing or *archæic* spirits, to some simplicity. He acknowledges but one soul, the soul immortal, charged also with the control of the body. He regards the soul as the very principle of life. Life is one of the soul's modes of action, it is the soul's *vivific act*. The immortal soul, an intelligent and rational force, rules directly the matter of the body, sets it at work, guides it to its end. It is this soul which not merely commands our voluntary acts, but which, moreover, sets the heart beating, sends the blood on its course, lifts the lungs in breathing, makes the glands secrete. If the union of these phenomena is disturbed, if disease occurs, it is because the soul has failed to discharge its functions, or has not succeeded in effectual resistance to external causes of destruction. A doctrine like this contained singular contradictions, since the influence of a rational soul upon vital processes seems to imply conscious direction, while the simplest observation teaches us that all the functions of nutrition, circulation, digestion, secretions, etc., are unconscious and involuntary, as if, to borrow the phrase of a physiological philosopher, Nature had chosen, out of caution, to withdraw these important processes from the control of a capricious and ignorant will. So that the animism of Stahl was stamped by an extravagance that induced his successors, if not to give it up, at least to subject it to very grave modifications.

Descartes's ideas, and those of Stahl, left a deep impression on science, and set two currents in motion, which have continued flowing even to our own day. Descartes laid down first principles, and applied mechanical laws to the action of that machine, the human body. His pupils gave breadth and precision to mechanical explanations of the various vital phenomena. Among

the most famous of these iatro-mechanicians must be named, in the first rank, Borelli; and, next, Pitcairn, Hales, Keil, and Boerhaave particularly, whose influence prevailed strongly. On its side, iatro-chemistry, which is but another face of the doctrine of Descartes, pursued its course, and had become definitely established, when modern chemistry appeared. Descartes and Leibnitz had laid it down as a principle that the laws of mechanics are everywhere the same; that there is no such thing as two mechanics, one for inert bodies, another for living bodies. At the close of the last century, Lavoisier and Laplace added the demonstration that there are not two chemistries either, one for inert bodies and another for living bodies. They proved, by course of experiment, that respiration and the production of heat take place in the bodies of men and of animals, through phenomena of combustion precisely similar to those that occur in the calcination of metals.

Nearly at the same time, Borden, Barthez, and Grimaud, were famous in the school of Montpellier. They were Stahl's successors, yet they retained only the first part of their master's teaching, vitalism, and rejected its second portion, animism. In contradiction to Stahl, they conceive that the principle of life is distinct from the soul, but they agree with him in acknowledging a vital force, a ruling vital principle, a unity such that it explains the harmony in the manifestations of life, and one that acts apart from the laws of mechanics, physics, and chemistry.

Still, vitalism underwent gradual modifications of its form; the *doctrine of vital properties* marked an important epoch in the history of physiology. In place of the metaphysical notions which had prevailed up to that time, we have here a physiological idea which endeavors to explain manifestations of life by the properties themselves of the substance of the tissues or organs. As long ago as at the end of the seventeenth century, Glisson had pointed out *irritability* as the immediate cause of movement in living fibre. Borden, Grimaud, and Barthez, caught a more or less uncertain glimpse of the same idea. Haller connected his name with the discovery of that mode of motion, by bringing to our knowledge his memorable experiments on the irritability and sensibility of the different parts of the body. It is, however, not before the beginning of this century that Xavier Bichat, by a sudden flash of genius, perceived that the solution of vital phenomena must be sought for not in an immaterial principle of a higher order, but, on the contrary, in the properties of matter, in the depths of which these phe-

nomena have their rise and course. Doubtless Bichat did not define the vital properties, but gave them uncertain and obscure characteristics. His genius, as is often the case, consists not in having discovered the facts, but in having understood their meaning, by being the first to announce that general, luminous, and fertile idea, that in physiology, as in physics, phenomena must be connected with properties as with their cause. "The relations of properties, as causes, to phenomena as effects," he says, in the preface to his "General Anatomy," "form an axiom almost too familiar to need repetition at this day, in physics and chemistry; if my book establishes a similar axiom in the physiological sciences, it will have gained its end." Then he adds, in continuation: "There are in Nature two classes of beings, two classes of properties, two classes of sciences. Beings are organic or inorganic, properties are vital or non-vital, sciences are physical or physiological."

Here, and at the outset, it is of consequence to understand Bichat's idea thoroughly. It might be supposed that he means to side with the physicists and chemists, because he agrees with them in placing the causes of phenomena in the properties of matter; but the result is the opposite one, and Bichat abandons and separates himself from them in as thorough a way as possible. In truth, the object pursued at all times by the iatro-mechanicians, physicists, or chemists, has been to prove a similarity—an identity—between the phenomena of living bodies and those of inorganic bodies. Bichat, in direct opposition to them, lays down as a principle that vital properties are absolutely opposed to physical properties, so that, instead of going over into the camp of the physicists and chemists, he remains a vitalist, with Stahl and the school of Montpellier. With them, he conceives that life is a conflict between contending activities; he admits that the vital properties preserve the living body, by counteracting the physical properties that tend to destroy it. When death occurs, it is nothing but the triumph of physical properties over their opponents. Moreover, Bichat summarizes his ideas completely in the definition he gives of life: "*Life is the group of functions that resist death*;" which means, in other words, life is the group of vital properties which resist physical properties.

This view, which consists in regarding vital properties as a sort of metaphysical entities, not capable of clear definition, except as opposed to common physical properties, no doubt led investigators into the same mistakes that the other

vitalist theories induced. Yet Bichat's conception, freed from those errors which at his time were hardly to be avoided, remains, nevertheless, a conception of genius, on which modern physiology is founded. Before his day, the doctrines of philosophers, animist or vitalist, soared to a point too lofty and too remote from reality to permit their entering with force and growth into the science of life; they could have no other action upon it than that paralyzing effect shared with the inert sophisms then prevalent in that school. Bichat, on the other hand, by diffusing life away from a centre, by showing it dwelling in the tissues, and connecting its manifestations with the properties of these very tissues, still makes them dependent, it is true, on a metaphysical principle, but that principle is one of a less lofty philosophic dignity, one that may be used with far greater convenience as a scientific basis by the spirit of research and progress. In a word, Bichat, like his predecessors, the vitalists, fell into errors upon the theory of life, but he made no mistakes as to the methods of physiology. It is his glory to have founded that science, by placing in the properties of tissues and of organs the immediate causes of the phenomena of life.

The ideas of Bichat effected a deep and general revolution in physiology and medicine. The anatomical school issued from them, seeking eagerly in the vital properties of healthy and unsound tissues the explanation of the appearances of health and disease. In another direction the advance of physical methods, the splendid discoveries of modern chemistry, with the broad light they threw upon the vital functions, added every day a new protest against the view maintained by Bichat, as well as by the vitalists, of a necessary separation and opposition between the organic and the inorganic phenomena of Nature.

We thus find Bichat and Lavoisier, very near our own day, standing as representing those two great distinct tendencies of philosophy, antagonistic as we have discerned them from the earliest times, in the very beginning of knowledge, one attempting to reduce the phenomena of life to the laws of chemistry, physics, and mechanics; the other, on the contrary, seeking to set them apart and place them under the government of a special principle, a peculiar power, what name soever be given it, whether soul, or *archæon*, or *psyche*, or plastic intermediary, or guiding spirit, vital force, or vital properties. This contest, so ancient already, is still, as we show, not ended; but how must it end? Will one of these doctrines at the last win the day over the other,

and have undivided sway? I do not so believe. Advances in sciences result in weakening by slow degrees, and in equal measure, those earlier exclusive ideas sprung from our little knowledge. As it is the unknown that gives all their strength, in proportion as it vanishes disputes must end, conflicting theories disappear, and the scientific truth that takes their place must rule without a rival.

II.

We may say of Bichat, as of most of the great promoters of science, that he had the merit of inventing a formula for the indefinite conceptions of his day. All the notions as to life of his contemporaries, all their efforts to shape them in a phrase, are in a manner little else than an echo or paraphrase of his teaching. A surgeon of the Paris school, Pelletan, says that life is the resistance opposed by organized matter to the causes which incessantly tend to destroy it. Cuvier himself unfolds the same thought, that life is a force which resists the laws that rule inert matter; death can be only the return of living matter to the control of those laws. What distinguishes the corpse from the living body is that principle of resistance which upholds or deserts organized matter; and to clothe his thought in a more striking and attractive form, Cuvier paints for us the figure of a woman in the splendor of youth and health, suddenly seized on by death. "See," he says, "those voluptuously rounded forms, that pliant grace of motion, that soft warmth, the rose-hued cheeks, the countenance brightened by the flash of wit, or kindled with the fire of passion; nothing is wanting to complete the enchantment of her presence. A moment is enough to destroy that charm; often without a visible cause, motion and feeling cease suddenly, the body loses its warmth, the muscles relax and reveal the angular, bony projections; the eyes grow dim, the lips and cheeks livid. This is but the beginning of more frightful changes; the flesh discolours into blue, green, and black; it draws in moisture, and while part of it goes into evaporation and exhales infection, part drips away in putrid matter, which soon in turn dissolves in air; in brief, at the end of a few days, nothing is left but a few earthy and saline principles; the other elements are scattered in air and water, to unite in new combinations. It is plain," Cuvier adds, "that this separation is the natural result from the action of air, warmth, and moisture, in short, of all outward agents upon the dead body, and it is occasioned by the elective attraction of these various agents for

the elements that made its structure. Yet that body was just as much surrounded by them during its life; their affinities for its particles were the same, and the latter would have yielded to the power in the same way, had they not been kept combined by a force stronger than those affinities, which ceased to act on them only at the moment of death."

These ideas of contrariety and conflict between the vital forces and the outward physico-chemical forces, which we find repeated in the doctrine of vital properties, had been before expressed by Stahl, though in obscure and almost barbarous terms; when set forth by Bichat with lucid clearness and great charm of style, the same ideas won and carried away all minds. Bichat does not think it enough to assert opposition between the two orders of properties that share Nature; but, in the very description of either order, he brings them strikingly into contrast. "The physical properties of bodies," he says, "are eternal. At creation, these properties seized upon matter, which must continue for the endless course of ages possessed by them. Vital properties, on the other hand, are temporary in their very nature; inert matter, coming into combination through living bodies, imbibes those vital properties, which thus become united with physical properties; but the connection cannot be lasting, because it is part of the nature of vital properties to waste away; time wears them out in any one body. Vigorously active in early age, they remain stationary, as it were, in adult life; they grow feeble and waste to nothing in the later years. Prometheus is said to have stolen fire from heaven to give life to statues of men made by his art. That fire is an emblem of vital properties; so long as it burns, life is kept up; whenever it goes out, life drops into nothing."

It is from this single point of the contrast in kind and in duration between physical properties and vital properties that Bichat draws by inference all the distinctive characters of living beings and lifeless substances, all the differences between the sciences devoted to their respective study. Physical properties being eternal, he says, lifeless bodies have no necessary beginning nor end, no age nor evolution; they have no other limits than such as chance assigns. Vital properties, on the contrary, being changeable and of fixed term of duration, living bodies are fluctuating and perishable; they have a beginning, a birth, a death, ages—in brief, a course of evolution which they must go through. Vital

properties being in a state of constant conflict with physical properties, the living body, the arena of that strife, must suffer its alternations. Health and disease are simply the vicissitudes of that strife; if physical properties gain a positive triumph, death is its consequence; if, on the other hand, the vital properties regain their control, the living being recovers from its malady, its wounds scar over, its organism heals, and it resumes the harmony of its functions. In lifeless bodies nothing like this is remarked; those bodies remain as unchanging as the death of which they are the image. Thence arises a marked distinction between the sciences which he calls vital and those he styles non-vital. The physico-chemical properties being steady and uniform, the laws of those sciences that treat of them are not less constant and unchanging; they may be foreseen and counted on with certainty. As the vital properties have instability for their distinguishing note, as all the vital functions may be impressed with a multitude of variations, nothing in their phenomena can be calculated or foreseen. Therefore, Bichat holds, it must be concluded that "absolutely diverse laws control each one of these classes of phenomena."

Such, in its main features and with its inferences, is the doctrine of vital properties, which long prevailed in the schools, spite of the just objections to which it is open. We will briefly inquire whether that separation of phenomena into two great groups, demanded by the doctrine of which Bichat stood forth as the eloquent champion, is sound in its foundation, or whether it should not be thought rather a theoretical system than the expression of the truth. Is it true, to begin with, that substances in inorganic Nature are eternal, and that living bodies are the only perishable ones? May not the differences between them in this respect be merely one of degree, which deceive us by the greatness of their disproportion? For instance, it is plain that the life of an elephant may seem an eternity, compared with the life of an ephemeron; and, if we regard the life of man in relation to the continuance of the cosmical medium he dwells in, it must seem to us but an instant in the infinity of Time. The ancients thought in the same way: they viewed the living world, in which everything is subject to change and death, in contrast with the sidereal world, changeless and incorruptible. This notion of the incorruptibility of the heavens prevailed down to the seventeenth century. The earliest telescopes then made it possible to observe the appearance of a

new star in the constellation *Serpentarius*; this change in the heavens, taking place, we may say, under the observer's very eyes, began to shake the belief of the ancients that "the substance of the heavens is unalterable." At the present day the minds of astronomers have grown familiar with the idea of constant mobility and evolution in the starry world. "The stars have not existed forever," says Faye; "they have had a period of formation; they will similarly have a period of decline, followed by final extinction." Therefore, that eternity of the heavenly bodies to which Bichat appeals is not real; they go through an evolution, as living bodies do—an evolution which is slow when compared with our hasty life, and which ranges over an extent of time out of all proportion to that we are wont to think of in our own surroundings. In another view, before astronomers understood the laws of movement of the heavenly bodies, they had formed the notion of sidereal powers and forces, as physiologists recognize vital powers and forces. Even Kepler admitted a "governing sidereal spirit," under whose influence "the planets follow calculated curves in space, without disturbing the stars that roll in other orbits, or deranging the harmony established by the divine geometer."

If living bodies are not the only ones subject to the law of evolution, neither is the power of self-restoration, of scarring over their wounds, exclusively theirs, although its more active manifestations take place in them. We all know that when a living organism has been mutilated, it tends to its own restoration in accordance with the laws of its special morphology; the hurt heals over in the plant and animal, the lost substance is renewed, and the being repairs itself in its form and unity. This phenomenon of reconstruction, of redintegration, has made a deep impression on philosophic naturalists, and they dwell earnestly on that striving of life for individuality which moulds the living creature to an harmonious whole, a kind of little world within the great one. Whenever the concord of the organic structure is disturbed, it strives for re-establishment, but these facts do not require for their explanation any appeal to a force, a vital property in opposition to physical ones. Indeed, mineral substances show the possession of a like morphological unity, and of the same tendency to self-repair. Crystals, as well as living beings, have their shapes and special plan, and are capable of influence from perturbing actions by the surrounding medium. That physical force which

sets the crystalline atoms in order accordant with the laws of reasoned geometry, works similar results with that which arranges organized matter in the form of an animal or a plant. Pasteur has noted certain facts of crystalline cicatrization and restoration well worthy of our study. He examined several crystals, and subjected them to mutilations, which he observed to be repaired with great regularity and rapidity. The result of his researches is that, "when a crystal is broken on any one of its faces, and replaced in the fluid of crystallization, we remark that while the crystal increases in all directions by the deposit of crystalline particles, a very decided simultaneous action takes place at the broken or injured part, and this action suffices in a few hours, not merely for the general, regular formation of increase over all parts of the crystal, but also for the restoration of regularity in the injured part." These singular facts of crystalline reparation are exactly comparable with those that living beings present to view when a wound, more or less deep, is inflicted on them. In the crystal, as in the animal, the injured part scars over, regains by degrees its original shape, and in either case the work of reformation of the tissues at that point is much more energetic than it is under the usual conditions of development.

The considerations thus briefly set forth, which might be enlarged on without end, seem to us to prove convincingly that the deep line of reparation which the vitalists propose to draw between living bodies and lifeless substances in regard to their continuance, their development, and their faculty of formative restoration, is not authorized by facts. As regards the conflict they imagine between physical forces or properties and vital forces or properties, it is the expression of a serious mistake.

This theory of vital properties maintains that in inert substances there is to be found only a single order of properties, and that in living bodies two kinds are to be found—physical and vital—which are in a state of constant conflict and opposition, each striving to prevail over the other. "While life lasts," Bichat says, "the physical properties, fettered by the vital properties, are perpetually checked in the phenomena they would tend to produce." The logical result of this opposition must be, that the stronger the influence and control the vital properties gain in a living organism, the more feeble and subordinate the physico-chemical properties will become; and that reciprocally the vital properties will droop and fail in proportion to the greater

power acquired by the physical properties. In reality, the exact opposite of this proposition expresses the truth, and that truth has been proved over and over again by the labors of Lavoisier and his successors. Life does in the last result represent a combustion, and combustion itself is nothing more than a series of chemical phenomena, with which there are directly connected certain calorific, luminous, and vital manifestations. Exclude oxygen, the agent in combustion, from the atmosphere, and instantly the flame dies, instantly life stops. If we proceed to lessen or increase the quantity of burning gas, vital phenomena, as well as the chemical phenomena of combustion, will be heightened or weakened in like proportion. Therefore, we cannot view the relation between chemical phenomena and vital manifestations as an antagonistic one; on the contrary, there exists perfect parallelism, harmonious and essential connection. Throughout the series of organized beings, their intensity of vital manifestations is in direct accord with the activity of their organic chemical manifestations. Proofs of this press forward in every quarter. When a man or animal is seized on by cold, the chemical phenomena of organic combustion at first decline; then motion grows slower, sensibility and intelligence droop and become dull, a complete benumbing comes on. On reviving from that lethargy, the vital functions resume their play, but always parallel with the reappearance of chemical phenomena. When life is suspended in a dried specimen of infusoria, and is restored by the action of a few drops of water, it is not because desiccation assailed life or the vital properties, but because the fluid indispensable for the production of the physical and chemical phenomena was withdrawn from the organism. When Spallanzani revived rotifers, that had been dried for thirty years, by moistening them, he merely produced in their bodies a reappearance of the physical and chemical phenomena which had been checked in them for thirty years. Water contributed nothing else whatever, neither a force nor a principle.

How could we possibly understand an opposition or antagonism between the properties of living bodies and those of inert substances, since the elements that make up these two orders of bodies are the same? Buffon, seeking a reason for the difference between organized and inorganic beings, was logical in imagining the former possessed of a special elementary organic substance, with which the latter were unprovided. Chemistry entirely upset that hypothesis by the proof

that all living bodies are wholly formed from mineral elements borrowed from the cosmic medium. The human body, the most complex of living bodies, is made of material yielded by fourteen of these elements. We can easily understand that these fourteen simple bodies might, by uniting and coalescing in all ways, produce infinite combinations, and form compounds endowed with the most various properties; but what we cannot possibly conceive is that such properties could be of a different order or a different essence from the combinations themselves.

To state conclusions, the opposition, antagonism, or conflict, between vital phenomena and physico-chemical phenomena, allowed by the vitalist school, is an error which the discoveries of modern physics and chemistry have thoroughly exploded.

More than this, the vitalist theory does not merely rest on false suppositions and mistaken facts; it contradicts the scientific spirit by its very nature. By insisting on the creation of two orders of sciences, one for lifeless substances, the other for living bodies, that theory ends in a pure and simple denial of all science whatever. Bichat, we have seen, lays it down as a principle that the laws of the physical sciences are in absolute opposition to the laws of the vital sciences. In the former, everything must be steady and unchanging; in the latter, everything must be unsettled and variable. The divergence between these two orders of sciences must leave them strangers to each other, and disable them from furnishing any mutual aid. This is the conclusion which Bichat inevitably reaches. "As the physical and chemical sciences," he says, "were highly cultivated before the physiological ones, it was supposed that the latter would gain clearness by connection with the former, but the result was confusion. It could not be otherwise, since applying physical sciences to physiology is explaining the phenomena of living bodies by the laws of lifeless substances. Now, this is a false principle; therefore, all its consequences must be marked with the same stamp." Were we to ask what the special notes are of this science of living beings, Bichat answers, "It is a science which is like the vital functions themselves, in being capable of infinite variations, one which eludes every sort of calculation, in which nothing can be foreseen or foretold, and mere approximations, oftenest vague ones, are presented to us." These are heresies in science so enormous that it would be difficult to understand them did we not see how logically such a system must needs lead to them.

It is a strange abuse of the term *science* to admit that vital phenomena cannot be brought under any exact law, any constant and settled condition, and to allow that such phenomena so defined compose a vital science that has the peculiarity of being vague and uncertain. There seems to be no reply to be made to such reasonings, for their very meaning is the want and denial of all scientific sense.

And yet how often has not the same kind of argument been brought forward; how many doctors have maintained that physiology and medicine could never be more than half-sciences, sciences of conjecture, because we shall never grasp the principle of life, or the hidden character of disease! These assertions, still echoing in our ears, like the far-off voices of obsolete teachings, have no power to make us pause. Descartes, Leibnitz, and Lavoisier, have taught us that matter and its laws are alike in living bodies and in lifeless substances; they have shown us that in the world there is but one mechanism, one physics, one chemistry, common to all natural beings. There are not, then, two orders of sciences. Any science worthy to be called so is one which, understanding the exact laws of phenomena, foretells them with certainty, and controls them when within its reach. Anything that is wanting in this character is merely quackery or ignorance, for there can be no such thing as half-sciences or conjectural sciences. It is a grave mistake to suppose that in living bodies we have to concern ourselves with the very essence and principle of life. We cannot attain to the principle of anything, and the physiologist has nothing more to do with the principle of life than the chemist has with the principle of the affinity of bodies. First causes elude us everywhere, and everywhere alike we can reach only the immediate causes of phenomena. Now, these immediate causes, which are nothing else than the very conditions of phenomena, are capable of as rigorous ascertainment in the sciences of living bodies as in those of lifeless ones. There is no scientific difference among all natural phenomena other than that in the complexity or delicacy of the conditions under which they appear, making it more or less difficult to distinguish and define them. Such are the principles that should guide us. Thus, we must unhesitatingly conclude that the duality set up by the vitalist school in the sciences of living and of lifeless bodies is totally opposed to science itself. Unity reigns throughout its domain. The sciences of living bodies and those of inert substance rest upon

the same principles and must be pursued in study by the same methods of investigation.

III.

If vitalist doctrines have come to nothing through the capital error of their principle of dualism or opposition between living Nature and inorganic Nature, the problem always exists. We have to make answer to this eternal question, "What is life?" or else to the other one, "What is death?" for the two questions are closely bound together, and cannot be parted.

The living being has for its essential characteristic *nutrition*. The organic structure is the seat of an unceasing nutritive movement, a secret inward action which leaves no rest for any part; each, without pause or cessation, feeding itself in the medium that surrounds it, and throwing off into that medium its products and its refuse. This molecular renewal is invisible to direct sight; but, as we see the beginning and the end, the entrance and the exit of substances, we imagine their intermediate changes, and we represent to ourselves a flow of matter that perpetually travels through the organism, and renews its substance while preserving its form. This movement, which has been called the vital torrent, the material circulation between the organic and the inorganic world, exists in the plant as well as in the animal, is never interrupted, and becomes the condition and the immediate cause at once of all other vital manifestations. The universality of such a phenomenon, the constancy it shows, its necessity, make it the fundamental characteristic of the living being, the most general sign of life. There will be no reason for surprise, then, that some physiologists have been tempted to take it as a definition of life itself.

This phenomenon, however, is not a simple one; it is of consequence to analyze it, and penetrate more deeply into its mechanism, so as to give exactness to the idea of life we may gain from its superficial observation. The movement of nutrition involves two operations, which are distinct, though inseparably connected: one, that by which inorganic matter is fixed or incorporated into living tissues as an integral part of them; the other, that by which it releases itself from and quits them. This unceasing twofold movement is actually only a perpetual alternation of life and death; that is, of waste and repair of the component parts of the organism. The vitalists misunderstood nutrition. Some of them, filled with the idea that the essence of life is resistance to death—in other words, to physical and

chemical forces—could not but necessarily believe that the living being, having reached its full development, had only thenceforth to keep itself in the most stable possible equilibrium, by counteracting the destructive effect of outward agents. Others among them, better informed as to the phenomenon, and seeing the meaning of the incessant change in the organism, would not admit that this movement of molecular repair could be produced by general natural forces, but referred it to a vital force. None of them perceived that this destruction of the organism, effected under the influence of general physical and chemical forces, is exactly that which produces the constant movement of exchange, and thus becomes the cause of reorganization.

Acts of organic destruction or disorganization are directly visible to us, their signs are obvious, they are renewed and clearly displayed upon each vital manifestation. On the contrary, acts of assimilation or organization remain wholly inward, and give hardly any apparent expression; they control an organic synthesis which groups together in a mute and hidden way the materials that are afterward to be consumed in the striking manifestations of life. It is a very singular truth, and one most important to be understood, that these two phases of the circuit of nutrition take expression in ways so contrasted, organization remaining latent, and disorganization impressing itself on the senses by all the phenomena of life. In this case, as in most others, appearances mislead: that which we call phenomenon of life is at bottom a phenomenon of organic death.

Thus the two factors of nutrition are assimilation and disassimilation, otherwise called organization and disorganization. Disassimilation always attends on vital manifestation. When motion occurs in man or an animal, a part of the active substance of the muscle is wasted and burned up; when will and sensibility are displayed, the nerves are consumed; when thought is exerted, the brain is used up, etc. Thus we may say that the self-same matter is never used twice for the purposes of life. When an act is through with, the little portion of living matter that served to produce it is gone. If the phenomenon appears a second time, it is by borrowing the aid of new matter. Molecular waste is always proportioned to the intensity of vital manifestations. The more actively life is displayed, the deeper and more considerable is the material change. The substances thrown off in the depths of the organism by disassimilation are oxidized by vital combustion in proportion to the energy with

which the organs have acted. These oxidations or combustions produce animal warmth, occasion the carbonic acid breathed out from the lungs, and the different products carried off by the other emunctories of the system. The body wastes, and suffers a consumption and loss of weight that express and measure the intensity of its functions. In brief, in all cases, physico-chemical destruction is joined with functional activity, and we may hold the following proposition as an axiom in physiology: *Every manifestation of a phenomenon in the living being is of necessity connected with organic destruction.*

A law like this, that links the phenomenon produced with the matter wasted, or, more correctly, with the substance transformed, is in no respect special to the living world; physical Nature obeys the same rule.

So, then, a living being in the fullness of its functional activity does not show us the increased power of some mysterious vital force; it simply exhibits the intense activity in its organism of the chemical phenomena of combustion and organic destruction. When Cuvier paints life in its bloom and beauty in the person of a young woman, he errs in supposing with the vitalists that physical and chemical forces or properties are then subdued or sustained by vital force. On the contrary, all the physical forces are set free, the organism burns and consumes itself more vividly, and for that very reason life glows with its full splendor.

Stahl was right in saying that physical and chemical phenomena destroy the living body, and lead it to death; but the truth escaped him because he failed to see that the phenomena of vital destruction are of themselves the stimulants and forerunners of that repair of substance hidden from our sight, that lurks in the depths of the tissues. All the time that the phenomena of combustion are strikingly displayed by external vital manifestations, the formative process is going on in the stillness of the vegetative life. It has no other expression than itself, meaning that it is betrayed in no other way than by the organization and renovation of the living structure. The comparison of life to a torch is very old. That metaphor is in our time changed to a truth by Lavoisier's means. A living being is like a burning torch: the body wastes, the substance of the torch burns; the first shines with a physical flame, the other with a vital flame. Yet to make the comparison absolutely exact, we must imagine a physical torch, with the power of lasting, maintaining and renewing itself, like the vital torch. Physi-

cal combustion is a single phenomenon, accidental in a way, having no harmonious connections in Nature out of itself. Vital combustion, on the contrary, presupposes a correlated renovation, a phenomenon of the highest importance. The description of its chief characteristics will complete our subject.

The movement of renovation or organic synthesis presents two chief modes. Sometimes synthesis composes nutritive principles by the assimilation of surrounding substance, and sometimes it forms the elements of the tissues from it immediately. Thus we observe, alongside the formation of direct products of chemical synthesis, the appearance of the phenomena of moultings, or histologic reparations, sometimes continuous, sometimes periodic. The phenomena of renewal, restoration, reparation, displayed in the adult individual, are of the same kind as the phenomena of generation and evolution, by which the embryo in the beginning, composes its organs and anatomical elements. The living being, then, is distinguished by generation and nutrition at the same time; we must combine and mingle these two orders of phenomena, and, instead of dividing them into distinct categories, we treat them as a single act, completely similar in essence and mechanism. With this conception, it is entirely correct to say that *nutrition is only continuous generation*. Organic synthesis, generation, regeneration, renovation, and even electrization, are aspects of one and the same phenomenon—various manifestations of one and the same agent, *the germ*.

The germ is chiefly and specially the agent of organization and nutrition; it attracts cosmic matter about it, and organizes it to form the new being. But the germ can only manifest its organizing power by itself performing combustion—organic destructions. For this reason it is, at the beginning, inclosed in a cell—the cell of the egg—and there surrounds itself with those elaborated nutritive materials which take the name of the *vitellus*.

The egg-cell, thus composed of the germ and the vitellus, unfolds the new organism by segmentation, by an infinite self-division into a numberless quantity of cells, each provided with a germ of nutrition. This cellular germ, called the nucleus of the cell, attracts around it and elaborates those special nutritive materials designed for combustion in action by each of the elements of our tissues or organs. When natural or accidental phenomena of renovation occur; when, for instance, a nerve that is cut repairs itself, and resumes its functions, in such a case, too, it is the

cellular kernels that, like the primordial germ they are derived from, divide and increase in number, to recompose new tissues in the adult, in exact repetition of the processes followed by the embryo in its growth.

All these very various phenomena of renovation and organic synthesis have the distinctive mark, as we have said, of being in a manner invisible to outward view. From the stillness that reigns in an egg in course of hatching, we could have no suspicion of the activity which is at work in it, and the importance of the phenomena that are there taking place; at its exit only the new being will display to us, by its vital manifestations, the wonders of that slow and secret work.

It is the same with all our functions; each one has, we may say, its period of organizing incubation. When a vital act shows itself outwardly, the conditions of it had been for a long time gathering in that deep and quiet elaboration that makes ready the causes of all phenomena. It is important not to leave these two phases of physiological operation out of view. If it is desired to modify vital actions, they must be attacked in their hidden unfolding; when the phenomenon comes to light, it is too late. In this, as in everything else, nothing comes by sudden chance; events seemingly most abrupt have had their secret causes. The object of science is exactly to discover these elementary causes, and gain the power of modifying and thus controlling the final appearance of phenomena.

In fine, we shall perceive, with distinction, in the living body, two great groups of inverse phenomena: *functional* phenomena, or vital waste; *organic* phenomena, or vital concentration. Life is kept up by two orders of acts wholly contrasted in their nature: the combustion of disassimilation, which uses up living matter in the acting organs; the synthesis of assimilation, which repairs the tissues in the organs at rest. The agents employed in these two kinds of phenomena are not less diverse. Vital combustion borrows from without that common agent of combustions—oxygen; or, when that is not to be had, the *ferments*, whose disassimilating action may interpose in the inner parts of the organism not reached by the air. Organizing synthesis, on the contrary, has a special agent—the germ, properly so called, or the kernels of cells, the secondary germs that emanate from it, and are found scattered throughout all the elementary parts of the living body. So, too, the conditions of functional disassimilation and those of organic assimilation are widely different. The same agents of combustion that waste the

organic structure during life continue their destructive work after death, when the phenomena of repair in the organism have ceased. It follows from this that all functional phenomena, attended by combustion, fermentation, or organic dissociation, can take place as well outside as inside of living bodies. This fact puts into the power of the physiologist to analyze vital mechanism by the aid of experiment. In a mutilated organism, he artificially keeps up respiration, circulation, digestion, and so on; and he studies the properties of living tissues separated from the body. In these dis severed parts, the muscle contracts, the gland secretes, the nerve conducts stimulus exactly as during life; yet, if these tissues, severed from the group of their organic conditions, can still act and waste, they have no longer the power of repair, and therefore it is that their final death then becomes inevitable. The phenomena of organic renewal, unlike the phenomena of functional combustion, can only be displayed in the living body, and each in its special place; no contrivance has as yet availed to make up for these essential conditions of the activity of the germs—being in their place, and in the structure of the living body.

It would be a grave error to reason, from the marked differences just noted, that in the system combustion and organic restoration might each take a vital part, independent of the other: since the two orders of phenomena are so mutually active in the work of nutrition that they may be said to be distinct only in thought; in Nature they are inseparable. No living creature, animal or vegetable, can manifest its functions otherwise than by the simultaneous employment of vital combustion and of organic synthesis. On this ground, chemical and anatomical schools must come together in reconciliation, for the solution of the physiological problem of life demands the united labors of both.

IV.

We have thus followed the characteristic phenomenon of life, nutrition, even to its inmost manifestations: let us see what conclusion that study can yield us as regards the answer to that question so often attempted—the *definition of life*. Were we to choose for expression the fact that all vital functions are the necessary result of organic combustion, we should repeat what we have already declared: *Life is death*, the destruction of the tissues; or else we might say with Buffon, "Life is a Minotaur, it devours the organism." If, on the contrary, we preferred to dwell on that other aspect of the phenomena of nutrition, that life

is kept up only on condition of the constant renovation of the tissues, we should look upon life as a *creation* effected by means of a forming and repairing act opposed to vital manifestations. In fine, were we to attempt combining the two aspects of the phenomenon, organization and dis-organization, we should come near to the definition of life given by De Blainville: "Life is a twofold internal movement of decomposition, general and continuous at once." More lately Herbert Spencer has offered the following definition: "Life is the definite combination of heterogeneous changes, which are both simultaneous and successive;" and under this abstract definition the English philosopher mainly aims at pointing out the idea of evolution and succession observed in vital phenomena. Such definitions, how incomplete soever they may be, have at least the merit of expressing one aspect of life; they are not merely verbal ones, like that of the Encyclopædia, "Life is the opposite of death;" or, again, like Bécclard's, "Life is organization in action;" or that of Dugès, "Life is the special activity of organized beings;" which is as much as to say, Life is life. Kant defined life "an inner principle of action." This definition, which reminds us of the idea of Hippocrates, has been accepted by Tiedemann and other physiologists. As a matter of fact, there is no more an inner principle of activity in living matter than there is in inert matter. The phenomena that occur in minerals are, it is true, directly influenced by external atmospheric conditions; but that is the case also with the activity of plants and of cold-blooded animals. The seeming freedom and independence of men and warm-blooded animals in their vital manifestations depends on the fact that their body presents a more perfect construction, which enables it to produce such a quantity of heat that it has no absolute need of borrowing warmth from the surrounding medium. In a word, the spontaneity of living matter is but a false appearance. There is the constant presence of outward principles, foreign exciting causes, which always act in calling out the manifestation of the properties of a matter which is at all times, in the same way, of itself inactive.

We will not proceed with these citations, which might be multiplied endlessly without finding a single thoroughly satisfactory definition of life. Why is this so? It is because, in regard to life, we must distinguish the word from the thing itself. Pascal, who understood so well all the weaknesses and illusions of the human mind, bids us observe that true definitions are really

only the creations of our own thought, meaning that they are *definitions of names*, or agreed terms for shortening speech; but he recognizes primitive words that are understood without any need of defining them.

Now, the word *life* is in that situation. All men understand each other when they speak of life and death. It would be impossible, at any rate, to separate these two terms, or these two correlative ideas, for that which lives is that which will die, and that which is dead is that which has been alive. When we are dealing with a phenomenon of life, as with any phenomenon of Nature, the first condition is, to understand it; its definition can only be given a *posteriori*—it is the conclusion gathered from a previous study; but, properly speaking, such a proposition is not a definition, it is a view, a conception. Our business, then, will be to learn what conception we should shape for ourselves of the phenomena of life, at this day, in the present state of our physiological knowledge.

That conception has varied, as a matter of course, with epochs and in accordance with the advance of knowledge. At the beginning of this century a French physiologist, Le Gallois, published, even at that date, a volume of experiments on the *principle of life, and the seat of that principle*. We are now no longer looking for the seat of life; we know that it dwells everywhere, in all the molecules of organized matter. The vital properties are in reality only in the living cells, and all the rest is merely arrangement and mechanism. The very various manifestations of life are expressions, combined and diversified in many thousands of ways, of fixed and unchanging organic elementary properties. Therefore it is of less consequence to know the immense variety of vital manifestations which Nature seems unable even to exhaust, than it is to fix with rigorous precision the properties of tissues that give rise to them. At this day, for this reason, all the efforts of science are directed to the histological study of those infinitely little points which conceal the true secret of life.

How deeply soever we may now be able to penetrate into the secrets of those phenomena peculiar to living beings, the question rising for solution is always the same. It is the very question asked in the oldest times, at the beginning of science. Is life due to a special power, or force, or is it only a mode of action of the general forces of Nature? In other words, does there exist in living beings a peculiar force, distinct from physical, chemical, or mechanical forces? The vital-

ists have always taken up their position in the impossibility of explaining all the phenomena of life through physics or mechanics; their opponents have always answered by bringing an increasing number of vital manifestations within well-demonstrated physico-chemical explanations. It must be owned that the latter have steadily gained ground, and that especially in our times they gain more and more every day. Will they thus succeed in reducing everything to their theories, and will there not remain, spite of all their efforts, a *quid proprium* of life, still irreducible? This is the point we now have to examine. By carefully analyzing all vital phenomena, whose explanation belongs to physical and chemical forces, we shall press vitalism back into a region of smaller extent, and therefore more easily defined.

Of the two orders of nutritive phenomena that substantially compose life, and originate all its manifestations, without exception, there is one, that of destruction, of organic disassimilation, which henceforward takes its place unquestionably among chemical actions; these decompositions in living beings present no greater nor less mystery than do those shown us by inorganic bodies. As to the phenomena of organizing through genesis, and of renovation through nutrition, they do seem at the first glance to be of an entirely special vital nature, not reducible to general chemical action. This, however, is only so in appearance, and to account for the matter completely we must study these phenomena under the twofold aspect they present, that of an ordinary chemical synthesis, and of an organic evolution which is proceeding. In truth, vital genesis comprises phenomena of chemical synthesis arranged and unfolded after a special order, which makes their evolution. It is necessary to distinguish chemical phenomena in themselves from their evolution, for these are two completely separate things. In so far as they are synthetic acts, it is clear that these phenomena arise only from general chemical forces; and this is plainly proved by studying them one by one in their succession. The calcareous matters found in the shells of mollusks, the eggs of birds, the bones of mammals, are very certainly formed during the evolution of the embryo according to the laws of common chemistry. The fatty and oily matters, too, are formed in the same way, and chemistry has already succeeded in the artificial reproduction in its laboratories of a large number of immediate principles and essential oils which naturally belong to the animal or vegetable kingdom. So, too, amylaceous substances that are developed in animals, and

are produced in the green leaves of plants by the union of carbon and water under the influence of the sun, are really very well-marked chemical phenomena. If the synthetical processes are much less clear in the instance of azoted or albuminoid matters, the reason is, that organic chemistry is not yet far enough advanced to explain them; but it is very certain, nevertheless, that these substances are formed by chemical processes in the organisms of living beings. It must be owned that the agents of organic synthesis, the germs and cells, may be said to be entirely exceptional agents. It might be said, in the same sense, as to phenomena of disorganization, that ferments are agents special to living beings. In my own view, it is a fact that there is such a general law, and that chemical phenomena are made to occur in the organism by special agents or processes; but that fact does not at all affect the purely chemical nature of the phenomena that take place, and of the products that result from it.

After this study of chemical synthesis, let us take organic evolution. The agents of chemical phenomena in living bodies do not stop with producing chemical syntheses of exceedingly various substances, but go on to organize them and apply them to the morphological construction of the new being. The most potent and wonderful among these agents of living chemistry is unquestionably the egg, the primordial cell that contains the germ, the organizing principle of the whole body. We are not present at any creation of the egg *ex nihilo*: it comes from the parents, and the origin of its virtue of evolution is hidden from us; but science is ascending nearer to this mystery every day. It is by the germ, and by reason of that kind of power of evolution it possesses, that the perpetuity of species and the descent of beings are established; by it we understand the necessary relations existing between the phenomena of nutrition and those of development. It explains for us the limited duration of the living being, for death must come when nutrition stops, not because aliment fails, but because the developing progress of the being has reached its end, and the cell's impulse of organization has exhausted its virtue.

Again, the germ directs the organization of the being, by forming living substance with the aid of surrounding matter, and by giving it those qualities of chemical instability which become the cause of the unceasing vital movements that take place in it. The cellulæ, those secondary germs, in the same way govern the nutritive cellular organization. It is very clear that these are purely chemical acts; but it is not less plain that these

chemical acts, in virtue of which the organism increases and builds up, follow in linked succession with a view to this result, which is, the organization and the growth of the individual, whether animal or vegetable. There is, as it were, a scheme of life, which sketches the plan of every being and of every organ; so that if, considered by itself, each phenomenon of the organization depends on the general forces of Nature, yet, taken as a whole, and in their succession, these phenomena seem to disclose a special bond among them; they seem to be guided by an unseen conditioning something in the course they follow and in the order that holds them together. Thus, the chemical synthetic acts of organization and nutrition come to view as if they were ruled by an impulsive force governing matter, working with a chemistry applied to an end, and bringing together the laboratory's senseless reagents, as the chemist himself does. That force of evolution, imminent in the ovule which is to reproduce a living being, unites within it, as we have explained, the phenomena of generation and of nutrition; both, therefore, have an unfolding character, which is their basis and essence.

It is this evolutive power, or property, which we now merely designate, that alone could compose the *quid proprium* of life, for it is certain that this evolutive property of the egg which will produce a mammal, a bird, or a fish, belongs neither to physics nor to chemistry. The theories of the vitalists cannot, at this day, hover over the whole field of physiology. The evolutive power of the egg and the cells is thus the last stronghold of vitalism; but, in taking refuge there, it is easy to see that vitalism changes into a metaphysical conception, and breaks the last tie that bound it to the physical world, or to physiological science. When we say that life is the guiding idea, or the *evolutive force of the being*, we merely express the thought of a unity in the succession of all the morphological and chemical changes effected by the germ, from the beginning to the end of life. Our mind grasps that unity as a conception it cannot escape from, and explains it by "a force;" but the mistake is in supposing that this metaphysical force acts after the manner of a physical force. That conception does not quit the region of mind, to react in presence upon those phenomena for the explanation of which the mind has formed it; though it issues out of the physical world, it has no retroactive effect upon that world. In a word, the metaphysical evolutive force by which we may describe life is useless to science, because, being outside of physical forces, it can

exert no influence upon them. We need here to draw a distinction between the metaphysical world and the phenomenal physical world, which serves as its basis, but which can borrow nothing from it. Leibnitz expressed that discrimination in those words of his we repeated at the beginning of this essay; science recognizes and adopts it in our day.

To conclude, if it is possible to define life by

the help of a particular metaphysical conception, it remains no less the truth that mechanical, chemical, and physical forces are the only efficient agents in the living organism, and the physiologist has nothing else than their action to note and explain. Descartes's phrase must be accepted: "We think metaphysically, but we live and act physically."

IMPRESSIONS OF AMERICA.

By R. W. DALE.

I.—SOCIETY.

IN the autumn of last year I spent two very pleasant months on the other side of the Atlantic. Since my return I have been asked, as a matter of course, by all my friends, what I think of America. I had to answer or to evade the question almost as soon as I was on the landing-stage at Liverpool, and before my portmanteaus were fairly through the custom-house; I am nearly sure, indeed, that the question was asked me on the tender before we had reached the landing-stage. I have had to answer or to evade it nearly every day since.

I say that I have had to "answer or to evade" it; for the question cannot be fairly answered in an omnibus, or between the courses at a dinner-party, or while putting on one's great-coat after a committee-meeting, or while talking under an umbrella to a friend one has happened to meet in the street in a shower of rain. Indeed, I am not sure that I have a right to express any opinion on America and the American people, even when there is the opportunity for expressing it deliberately and fully. I sailed from Liverpool on the 1st of September, and reached Liverpool again on the 17th of November. In seven or eight weeks what trustworthy judgment can a man form of the habits, manners, temper, and character, of a population so varied in its origin and occupations as that of the United States, and covering so vast a territory? After so brief a visit, what right have I to form any confident opinion on American institutions?

I do not imagine that all Americans are like the accomplished professors at Yale, or like the clergymen I met in New York, Brooklyn, Boston, and in several of the smaller cities of New

England, or like the distinguished physicians who showed me hospitality at Philadelphia and Chicago, or like the Education Commissioners and the chairmen and members of school committees, with whom I spent many interesting days in several great cities, or like the heads of famous commercial houses to whom I was introduced by my friend and fellow-traveler Mr. Henry Lee. Nor do I suppose that I have a complete and exhaustive knowledge of American manners and character because I staid in many American hotels, and traveled several thousands of miles on steamboats and in railway-carriages. I can but tell what I saw. But I saw enough to convince me that some of the representations of the American people which have become popular in England are gross and slanderous libels.

An American who had formed his conception of Englishmen from the typical "John Bull" in top-boots, with a cudgel in his hand, would be rather perplexed on meeting Dean Stanley, whose hospitality to Americans has given him a reputation on the other side of the Atlantic almost as enviable as that which he has won by his literary genius; nor would his perplexity be lessened if from the deanery at Westminster he crossed over to the House of Commons, and happened to see and hear Mr. Gladstone. He might go to fifty London dinners and still wonder where the ideal Englishman was to be found. At churches, concerts, museums, picture-galleries, and theatres, his curiosity would still be unsatisfied. He might ride in innumerable omnibuses, he might travel morning after morning by the underground railway, and go from London Bridge to Chelsea every afternoon in a penny boat, and never see the object of his search. He might go down to Oxford, or York, or Brighton, or Salis-

bury, and still look in vain for the John Bull of his imagination. Neither in appearance nor in manners would the men he met with correspond to the familiar type. At an agricultural show he might find a man here and there who looked dressed for the character, but the chances are ten to one that if he began to talk with the burly-looking farmers he would discover that many of them, though a little rough in their ways and rather loud in their speech, were wholly unlike in their temper and spirit what he had supposed that every Englishman ought to be. Occasionally, no doubt, the type is realized—realized physically and realized morally—but it is possible to live for months in many parts of England without seeing a man who has anything of the appearance of the John Bull of one of *Punch's* cartoons; and when you have found a man who looks as if he might have sat for the picture, he often turns out to have no moral resemblance to the conventional ideal of our national character. The people I happened to meet with in New York and Chicago, in Boston and Philadelphia, in Washington and the manufacturing towns of New England, were equally unlike the high-falutin', self-asserting American of caricature and popular fancy. They were quiet instead of noisy, modest instead of ostentatious and boastful, reticent rather than demonstrative.

My own impressions were confirmed by an English friend who had been living in New York for several months, and who asked me whether I had not been struck with the extreme gentleness of American manners. Nor was it the gentleness merely that impressed me. There was something of the old-fashioned formal courtesy which has now almost disappeared in this country. It is one of the reproaches, indeed, which the Republicans of America fling at the Democrats that the triumph of the Democratic party in 1801 destroyed the good manners of the people and made them rude and insolent. Before Jefferson's election to the presidency—so it is said—the children, when they passed their elders on country roads or in the streets of the smaller towns, made a respectful bow; but with the accession of the Democrats to power the bow began to subside, "first into a vulgar nod, half ashamed and half impudent, and then, like the pendulum of a dying clock, totally ceased." To illustrate this charge, a popular author, Mr. Goodrich, tells a characteristic story: "How are you, priest?" said a rough fellow to a clergyman. "How are you, Democrat?" was the clergyman's retort. "How do you know I am a Democrat?" asked

the man. "How do you know I am a priest?" said the clergyman. "I know you to be a priest by your dress." "I know you to be a Democrat by your address," said the parson.¹

It is true, no doubt, that the kind of respect which the people in an English agricultural village sometimes show to their pastors and masters is not to be found, as far as I know, in the United States. The little girls do not draw up against the wall and make a respectful courtesy to every well-dressed stranger they meet. If you say "Good-morning" to a man you happen to pass in the rural parts of New England, and who looks like a prosperous agricultural laborer, but who is probably the owner of a farm of eighty or a hundred acres, he will not feel so honored by your condescension as to stand still and pull the front lock of his hair; he may even stride on with a grunt which is hardly courteous. The servants or "helps" have not exactly the manners of servants in England. I always found them respectful and attentive, but there is a certain something with which we are familiar on this side of the Atlantic that is absent. It is quite clear that they do not suppose that their master and their master's guests belong to a superior race. At an English picnic the younger ladies and gentlemen sometimes spread the cloth, hand the lobster-salad, the cold chicken, and the bread, pour out the wine, and take round the fruit; they wait "for love" and not for wages. Perhaps, when the dinner is half over, they take their seats and are waited on themselves. American servants reminded me occasionally of these kindly volunteers. Seneca tells one of his correspondents that he should treat his slaves not like beasts of burden, but as "humble friends." Seneca would have found himself quite at home in America. If he thought that the slaves who waited on him should be treated as "*humble friends*," he would have treated free men and women who waited on him as friends that required to be described by another epithet. I found that the servants took quite a hospitable interest in me. The day before I left New Haven I called to bid good-by to a friend, whose guest I had been during the earlier part of my stay in the city. He happened to be out, but the house-maid who opened the door understood the object of my call, and hoped I was well, and that I had had a pleasant time in America, and that I should have a good voyage, and find all well at home. I do not think that the girl

¹ James Parton's "Life of Thomas Jefferson," pp. 584, 585.

did her work at all the worse because she felt herself at liberty to speak in this way to her master's friend. Sometimes, indeed, this sense of social equality may show itself in ways which strike an English traveler as rather odd and not quite agreeable. An English gentleman told me that he was being driven through the beautiful park at Philadelphia by an American lady with whom he was staying. She wanted to leave the carriage at a particular point, walk through the Exhibition Building, and meet the carriage at another entrance, and she asked her coachman, a colored man, whether he thought the doors at the other end of the building were open. "Dunt know," was the reply; "hadn't you better get down and ask?" If he had proposed that the gentleman should "get down," it would have been more consistent with our notions of propriety.¹

I was told that there are delicate distinctions among the servants which it is necessary for a stranger to remember. When you leave the house an Irish girl will take your dollar with as much satisfaction as a servant in England receives the customary "vail." I believe that most German and Swedish girls will be equally accommodating. But I heard that if by chance your friend has a genuine American girl for a house-maid, she will resent the offer of money as an insult. Whether this is true or not I cannot say, as I did not happen to have the opportunity of trying the experiment. A story that was told me by an English lady living at Ottawa—the wife of a colonel in the English army—shows that the conditions of American life have affected Canada. A girl applied to her for a house-maid's place, and asked what seemed to the lady extravagant wages. "How much did you have at your last situation?" asked my friend. "Well, ma'am," was the reply, "I only had six dollars a month, but the lady gave me music-lessons."

American mistresses have their sorrows, and are disposed to envy ladies in England, who seem to have their servants more perfectly under command. But English mistresses are not without their annoyances. I believe that the real

trouble on the other side of the Atlantic, as on this, is the difficulty of finding servants who really understand their work. In the relations between servants and masters I saw nothing that was offensive; indeed, I am democratic enough to think that the friendly ease of the American "help" is more satisfactory than the absolute self-suppression and mechanical deference which are seen in the servants of many English houses.

When I said that in America there remains something of the old-fashioned courtesy which among ourselves must have vanished for at least fifty years, I was not thinking of the relations of the "lower orders" to their "betters," but of the manners of educated American society. Again and again I was reminded of the characters in Miss Austen's novels. There was just a touch of the same formality. "Politeness," which is a word that has very much gone out of use in England, still survives in America; according to an American author, "politeness appears to have been invented to enable people who would naturally fall out to live together in peace." As the word is in more common use in America than among ourselves, so I think that in the ordinary life, even of those who are in no danger of "falling out," there is more of what the word denotes. The disappearance of the reverential habits of the last century is, of course, deplored. Jonathan Edwards's children always rose from their seats when their father or mother came into the room. This surprising custom does not exist in any of the families that showed me hospitality; but I noticed that one of my young lady friends often called her father "sir," and that she used the word not playfully, but with all the respect with which she would address a stranger. Her father was not "stiff and unsociable" as Jonathan Edwards was thought to be by "those who had but a slight acquaintance with him,"¹ but one of the kindest, simplest, and most genial of men. His children were on the freest and easiest terms with him, teased him and played with him just as children on this side of the ocean tease and play with their fathers; but the line of filial respect was never passed, and the respect showed itself in the deferential "sir." The "sir" was used, indeed, unconsciously. I asked my young friend, who was a bright, clever girl, whether she generally called her father "sir;" she said that she did not know that she ever did, but within five minutes the word was on her lips again. A day or two afterward I asked a gentleman, whom I met

¹ An English servant who has not been well "broken in" can sometimes be sufficiently free and independent. A lady in the south of England had a new house-maid who, after being in the house a fortnight, omitted to put any water on the dinner-table. When she was reminded of her omission, she replied, "Fur varteen days I ha' putt they bottles on the table and none of yur have drunk any watter; I dunt mean to put 'em on any more."

¹ Hopkins's "Memoir" prefixed to English edition of Edwards's Works, p. 44.

frequently, whether it was customary for children when addressing their father to say "sir." He said, "Oh, yes—is it not customary in England? We teach our children to do it; we have not too much of the spirit of reverence in America, and we think it desirable to cultivate it."

I came to the conclusion—to me a very unexpected one—that the Americans are a reserved people. They are not eager to talk to you about their own affairs. Manufacturers, except when I asked them, did not tell me how many men they employed. Merchants were not anxious to impress me with the magnitude of their business transactions. Nor, indeed, did I find that the strangers I met were very anxious or, indeed, very willing to talk at all. I often found it hard to discover whether the people I was traveling with approved of Mr. Hayes's Southern policy or not, or even whether they belonged to the Republican or the Democratic party. When I was fortunate enough to find a man with a cigar in his mouth standing on the platform of a Pullman car, I could sometimes make him more communicative; and occasionally, under these conditions, I learned a great deal about the country. But, as a rule, strangers opened slowly and shyly. Nor was this because I was an Englishman. I used to watch the people in railway-carriages—a dozen or twenty in a Pullman drawing-room car, forty or fifty in an ordinary car—and if they did not know each other they would travel together all day without exchanging half a dozen words. Occasionally three men who were friends would ask a stranger to take a hand at whist, but this was not very common. Perhaps the reticence is confined to the wealthier people. On the lines which have two classes of carriages I often spent half an hour in a smoking-car intended for both classes of passengers. There I generally found much more freedom. Working-men talked to each other without any difficulty; but even there the passengers who had come from the first-class carriages sat and smoked in silence.

I remember one conspicuous exception, however, to the general reserve. In the smoking-cabin of a steamboat a Southern gentleman, a professor in a college of some reputation, gave the company an elaborate account—*à propos* of nothing—of the exercises he had had to perform for his degree in a German university. As most of the men were obviously men of business, and just as uninterested in university affairs as in the incidents of the gentleman's personal history, they smoked on in silence, looking at him occasionally with an expression of stolid wonder, alleviated

slightly with perplexity and amusement. On another occasion, and equally without provocation, the same gentleman gave the same company the most minute information about his physical ailments and how he treated them, and was listened to with the same look of amusement, perplexity, and wonder. It was very odd. He was under fifty, so that he had not become garrulous through old age. He had not lost the control of his tongue by drinking whiskey-and-water. I had several private talks with him outside the smoking-room, and found him an intelligent and well-read man. He had seen a great deal of the world, and though he was extraordinarily communicative about his opinions and doings, he could talk pleasantly about many things besides his own learning, headaches, and attacks of indigestion. But he was the only instance I happened to meet with of an American absolutely free from reserve. As a rule, the people appeared to me to be more reserved than ourselves.

The same quality of their national temperament shows itself in another form; as a rule, they are undemonstrative. The late Lord Lytton tells us that on one occasion when Kean was performing in the United States, he came to the manager at the end of the third act and said: "I can't go on the stage again, sir, if the pit keeps its hands in its pockets. Such an audience would extinguish Etna." After receiving this alarming threat the manager appeared before the curtain and informed the audience that "Mr. Kean, having been accustomed to audiences more demonstrative than was habitual to the severer intelligence of an assembly of American citizens, mistook their silent attention for disapprobation; and, in short, that if they did not applaud as Mr. Kean had been accustomed to be applauded, they could not have the gratification of seeing Mr. Kean act as he had been accustomed to act."¹

Mr. Oliver Wendell Holmes was lecturing many years ago in some city in Vermont or New Hampshire, and the same "severe intelligence of an assembly of American citizens" baffled and perplexed him. There was no sign of interest. His brightest wit and his shrewdest humor failed to produce even a passing smile. The people sat as if they had been in church listening to the dullest of sermons. But as he was walking away from the lecture-room with the full conviction that he had made a miserable failure, his host said to him quietly: "Why, Mr. Holmes, you said

¹ "Upon the Efficacy of Praise," "Caxtoniana," vol. i., p. 335.

some real funny things to-night; I could hardly help laughing." Mr. Holmes was comforted. I also heard of a politician from the South who made a long speech to a political meeting in New England without provoking the faintest expression of sympathy or approbation. He thought that the audience was unfriendly. But as soon as he sat down a gentleman rose and moved, with great gravity, that the meeting should give the speaker three cheers; and when the motion had been duly seconded and formally put from the chair, the cheers were given with well-regulated enthusiasm.

The last two stories seem to show that this undemonstrativeness is characteristic of the New-Englanders, and is not common in other parts of the country, though perhaps it may exist in those districts in the Middle and Western States which have been settled by immigration from New England. My own impressions favor this supposition. I think that the manners of the people I saw in Chicago, Philadelphia, and New York, though quiet, were freer and more cordial than the manners of the people I saw in New England. There was less restraint upon the expression of kindly feeling, in words and tone and bearing. The New-Englander is apt to keep his heart where he keeps the furnace which heats his house—underground. He does not care to have an open grate in every room, and to let you see the fire. But the fire is there, and the heat makes its way secretly to every part of the house. You see no coals burning, but behind the door of the dining-room there is a hole in the carpet, and through the register there comes a stream of hot air which keeps the room at 70° on the coldest day. There is another register in the hall and another in your bedroom. I missed the sight of the fire. When we had what the Americans call the first "snap" of cold weather, I wanted the assurance of my eyes to make me believe that though there was a frost outside there was no reason for shivering indoors. Sydney Smith tells us that soon after the introduction of plate-glass Samuel Rogers was at a dinner-party, and thought that the window near him was open all the evening. The window was shut, but Rogers went home with a severe cold which he had caught from an imaginary draught. Unkindly critics might affect to mourn that his imagination was not always equally active when he was writing his verses. He soon learned that a window might be shut though he could not see the window-frame; and I soon learned in America that a house may be warm on a cold day—too warm, indeed—though I could not see the fire. And so, though Americans, and especially per-

haps the New-Englanders, are not demonstrative, a stranger soon discovers that they are among the kindest people in the world. There are no limits to their kindness. They find out what their guest would like to see and to do, and spare themselves no thought or trouble to gratify him. Their hospitality is of the best sort; they do not force a stranger to visit the places which they themselves may think the most interesting and attractive; they consult his tastes, and place themselves absolutely at his disposal. A Brooklyn host would probably be very much distressed if an Englishman persistently put aside a proposal to drive to Greenwood Cemetery, and a Philadelphian would be vexed if he could not persuade his guest to take a drive through the charming park in which the Centennial buildings were erected; but they would bear their disappointment quietly. I wanted to see the common schools. Most of my friends had become familiar with the common schools, and saw very little in them that was novel or surprising; they therefore wished me to go to lunatic asylums, prisons, and hospitals, where they thought that I should see something that was much more remarkable. But when they discovered that my preference was no mere whim they took a great deal of trouble to satisfy it.

I was struck with the admirable temper of the people. Though I traveled several thousands of miles on steamboats and in railway-carriages—westward as far as Chicago, and southward as far as Richmond—I never heard the noisy quarreling which some sketches of American manners might have led me to expect. On my way from Chicago to Washington, the train was delayed for several hours. The "watchman," as I think they called the man who had charge of a portion of the line near one of the stations, had left his post to attend a Democratic meeting. While he was away, a wooden bridge was burned down. The train was stopped for an hour or two at a small station some ten or twelve miles distant from the burning bridge. There was no refreshment-room, no "bar," and the passengers could do nothing except lounge about the line, speculate on the cause of the accident, smoke, and wonder when the train would get to Washington; but every one was in excellent temper, and accepted the delay without any resentment. After a time we went on, and when we were within a mile of the river which the train could not cross, we were met by an omnibus, and several of the rough wagons of the country. The passengers packed themselves

as close as they could in the several conveyances—some of them having to climb to the summit of a mountain of luggage on the top of the omnibus—and were driven, still in excellent humor, round the country and over a bridge which crossed the river a mile above or below the point where the flames revealed the scene of the disaster. At the little town on the other side we had to wait two or three hours more; but still there was not a sign of bad temper, there was no abuse of the railway in general, and only a very measured and moderate condemnation of the official whose political zeal had led him away from his post, where he might have prevented the accident. It occurred to me that if the Limited Mail between London and Edinburgh were stopped for three or four hours by a similar accident, there would be the expenditure of a great deal of stormy eloquence; the company would be denounced for having even a single wooden bridge on the line; there would be loud threats of letters to the *Times*, and of actions to recover damages caused by the delay; the zealous Liberal who had deserted his duty to listen to Mr. Chamberlain or to some other orator of his party would be vigorously abused; the offense would be treated as a characteristic illustration of the effect of Liberal principles; Mr. Gladstone would be made indirectly responsible for the whole business. But the Americans treated the delay with as much equanimity as if it had been an eclipse of the moon, for which no one was to be blamed, and at which no one had a right to grumble. This was not because they are more accustomed to railway accidents and delays than we are. The trains seem to me to keep as good time in America as in England, and it is maintained by the Americans that their accidents are not more frequent than ours.

It is possible, I think, that the war produced a great effect on the national manners. An immense number of men went into the army, and had to learn to obey the word of command, and to submit to a rigid drill. For three or four years they were "under authority." While in the army they had no time for idleness and dissipating pleasures. They had to make long marches and to do a great deal of fighting. The self-control and orderliness which seem to me to characterize the mass of the American people may be partly the effect of the discipline, the serious work, and the perils and sufferings of those terrible years. Such an experience could hardly fail to produce a deep impression on the national character.

The absence of a powerful and hereditary

aristocracy, the trustees and heirs of the culture and refinement of many generations, produces, no doubt, a sensible difference between American society and our own. In England the classes which are never brought into contact with the country gentry or with families wearing old titles are affected more or less powerfully by aristocratic traditions and manners. Even the servants and tradesmen of great people acquire habits of courtesy and deference which are not likely to be found in societies organized on a democratic basis, and these habits have an effect on their friends and neighbors. But, on the other hand, when the power of an aristocracy has begun to wane, their position and their pretensions will probably provoke in the classes which do not share their dignity a spirit of self-assertion which is far more "vulgar" and far more alien from the "sweet reasonableness" which Mr. Arnold wishes us to cultivate than the spirit of equality which troubles some English travelers in America. When the mass of the English people supposed that a duke with estates covering a whole county was as much an ordinance of Nature as Skiddaw or Ben Nevis—when the existence of an aristocracy of wealth and of title was accepted just in the same spirit in which men accept the succession of day and night—there were certain gracious habits of mind produced by the inequalities of our social order. But for good or evil that time has gone by. The best men of the middle classes are, indeed, almost unconscious of the existence of the classes above them, and devote themselves to their business, their books, their pictures, and their public work, without troubling themselves about "society." But the men of inferior quality cannot make themselves quite happy unless they can penetrate into the charmed circle. There is a certain measure of suppressed resentment as long as they are excluded from it; and even when they obtain occasional admission, and are tolerably well content with their own good-fortune, the mischief is not over. They begin to draw invisible lines between themselves and the "ruck" of the people about them. This in its turn provokes ill-feeling and self-assertion, and the feeling spreads—assumption on the one side and resentment on the other—through all the imaginary degrees of social inferiority beneath them. Some years ago, a Birmingham manufacturer told me that the girls who wrapped up his goods in the warehouse refused to tolerate the humiliation of leaving the premises by the same entrance as the girls who made them in the workshops. The "uppishness" which of-

fends many of the critics of the manners of English manufacturing districts is, I believe, the direct result of our aristocratic social order. There is no reason for a man to be "uppish" in America. He does not live in the presence of social institutions which permanently assert the social superiority of a class to which he does not belong.

To an English traveler the scare which the Americans received last autumn from the railway disturbances is very surprising. I talked with many grave and wise men—men who had studied the political and social history both of America and of Europe—who imagined that the Pittsburg riots were an outburst of the spirit of communism, and that they indicated the existence of a serious conspiracy against the institution of private property, and against the whole social order of the country. The strikes were no doubt very annoying. They showed that some of the economical and social troubles from which the old countries of Europe have suffered will have to be faced in America. Perhaps, too, they showed that the present means for repressing popular disturbances are inadequate. But that the strikes were the result of a deep and general hostility against the present social organization of America, that they were the premature explosion of forces which threaten America with a social revolution, appeared to me to be one of the wildest and most grotesque fancies which ever found a lodgment in the brains of reasonable men.

It is very possible that in several of the great manufacturing cities there may be a few hundreds of restless and discontented men who have carried with them across the Atlantic the bitter hostility to government and to society which exists among the less fortunate classes in many Continental nations. Men with similar passions may be scattered thinly through the agricultural States. In the New World as in the Old, some of these men see visions and dream dreams. They are hoping for a social millennium in which all the present contrasts between poverty and wealth, luxurious ease and severe labor, will disappear. They have clung to the hope so long and so passionately that they cannot easily surrender it. They see that under a republic these contrasts, if less violent than in the monarchical countries from which they came, are still violent enough. They believe that it is an economical, not a merely political, reorganization of society which is to remedy all human evils and redress all human wrongs. But, of all the great countries in the world, America contains the smallest number of

people that can have any motive for desiring a social revolution. The fiercest hatred of the institution of private property gradually cools when a man finds that he is getting his house filled with good furniture; it vanishes altogether when he is able to buy a farm. There has been considerable distress during the last few years in some of the manufacturing districts of America; but the distress has been very slight and transient compared with what was suffered in this country during the first quarter of the present century; and the enormous numbers of the population holding property in land constitute a conservative social force of enormous and irresistible power.

While I was staying at Bridgeport, in Connecticut, my host proposed that we should drive twenty miles round the neighborhood, that I might have some impression of the agricultural districts in New England. It was a charming afternoon in October, and the maple and the oak and the hickory were beginning to clothe themselves in their autumnal splendor of scarlet and gold. But it was not the beauty and the glory of the foliage which struck me most powerfully. We drove on for mile after mile, but there was not a laborer's cottage to be seen. We came to a village—it was a group of beautiful houses with lawns and trees about them. In the open country, at intervals of every few hundred yards along the road, there was a cozy, clean-looking farmhouse. The houses were nearly all built of wood, and were painted white; the windows were protected against the sun by green Venetian shutters. I hardly ever saw a house that was in bad condition. The paint was nearly always bright and fresh. There were no mansions belonging to great landlords. The farms belong to the men who cultivate them. On my voyage out a New York lawyer, with a large knowledge of American affairs, said to me: "A girl will not look at a man who wants to marry her, if he hasn't a farm of his own. Marry a man that hires his land!—she will not dream of it. It sometimes happens that a man takes a farm and can't pay the money down; in that case he engages with the owner to rent it for four or five years; but it is arranged that at the end of that term—or earlier if he is able to find the money—he shall have the farm for a price that is fixed when his occupation begins. Tenant-farmers are almost unknown in America."

The farmer owns the farm and works on the land himself. His sons, if he has any, work with him. If he wants additional labor, he may get help from a neighbor whose farm is too small to

occupy all his own time, or he may get help from his neighbors' boys when their fathers can spare them. If he is obliged to engage laborers, they are described as "hired men," and they live in the house with their employer. In the census for 1870¹ the total number of persons, over ten years of age, engaged in agriculture, is given as 5,922,471. Of these, only 2,885,996, or considerable less than half, are described as "agricultural laborers;" if we add "dairymen and dairywomen,"² "farm and plantation overseers," and "turpentine-laborers," we have a total of 2,895,272 persons employed in agriculture who are not their own masters. The "farmers and planters" number 2,977,711—that is, the masters are more numerous by 80,000 than the men. Add to these, "apiarists," "florists," "gardeners and nurserymen," "stock-drovers," "stock-breeders," "stock-raisers," "turpentine-farmers," and "vine-growers," and we have a total of 3,027,099; and even if some of these should be included in the class of "hired men," the error is very slight, for the whole of these minor classes together, number only 49,388, and we still arrive at the result that in the United States the men that employ agricultural labor are more numerous than the men they employ.

Of course, this implies that the farms are small. In Connecticut the average size of a farm in 1850 was 106 acres, and of this acreage there was a percentage of 25.8—more than a fourth—consisting of "unimproved" land; in 1860 the average size of a farm was 99 acres, with 26.9 per cent. of "unimproved" land; in 1870, 93 acres, with 30.4 per cent.—nearly a third—of the land "unimproved." In Maine, in 1850, the average size of a farm was 97 acres; in 1860, 103 acres; in 1870, 98 acres; and the proportion of "unimproved" land at these periods was 55.2, 52.8, and 50 per cent. of the whole. In Massachusetts the farms averaged 99 acres in 1850, 94 acres in 1860, and 103 acres in 1870; of this acreage in the same years 36.1, 35.4, and 36.4 per cent. were "unimproved." For the whole of the States the average size of a farm was 208 acres in 1850, 199 acres in 1860, and 153 acres in 1870; the "unimproved" land included in this acreage was 61.5 per cent. in 1850, 59.9 per cent. in 1860, and 53.7 per cent. in 1870.³

¹ "Compendium," table lxx., "Occupations," pp. 604, 605.

² It is doubtful whether all the "dairymen and dairywomen" should be included in the class employed by others.

³ "Farms . . . include all considerable nurseries, orchards, and market-gardens, which are owned by

It follows, therefore, that the average amount of land which each "farmer" was actually cultivating amounted in 1850 to about 77 acres, in 1860 to about 80 acres, and in 1870 to about 70 acres.

If "considerable nurseries, orchards, and market-gardens" had not been enumerated as farms, the average holdings of those who are properly described as "farmers" would have been slightly increased; but an examination of the tables will show that the difference would probably have amounted to not more than an acre.

In New England the person whom we describe as the "gentleman-farmer" is, therefore, almost as unknown as the "tenant-farmer." The same man is landlord, farmer, and laborer. He owns the soil, and he cultivates it with his own hands—cuts the drains, loads the manure, holds the plough, sows the seed, works in the harvest-field, and does the thrashing. Even if he employs "hired" labor, he shares the work with the "hired men." In the Southern States, where the plantations are worked by the colored people, the economical condition of the country is, of course, very different. Even there the small farm system is being rapidly introduced. It was difficult, however, at the last census, to obtain exact returns from the Southern States "in consequence of the wholly anomalous condition of agriculture at the South. The plantations of the old slave States are squatted all over by the former slaves, who hold small portions of the soil—often very loosely determined as to extent—under almost all varieties of tenure." The holdings of these squatters have been treated in the census as farms "of more than three and less than ten

separate parties, which are cultivated for pecuniary profit, and employ as much as the labor of one able-bodied workman during the year. Mere cabbage and potato patches, family vegetable-gardens, and ornamental lawns, not constituting a portion of a farm for general agricultural purposes, will be excluded. No farm will be reported of less than three acres, unless five hundred dollars' worth of produce has actually been sold off from it during the year. The latter proviso will allow the inclusion of many market-gardens in the neighborhood of large cities, where, although the area is small, a high state of cultivation is maintained, and considerable values are produced. A farm is what is owned or leased by one man and cultivated under his care. A distant wood-lot or sheep-pasture, even if in another subdivision, is to be treated as part of the farm; but, wherever there is a resident overseer or a manager, there a farm is to be reported. By "improved land" is meant cleared land used for grazing, grass, or tillage, or lying fallow. Irreclaimable marshes, and considerable bodies of water, will be excluded in giving the area of a farm, improved and unimproved."—*Compendium of the Ninth Census of the United States*, pp. 688, 689, notes.

acres," and it is believed that the assumption answers to the real facts of the case in ninety-nine out of every hundred instances.¹ In the Middle and Western States there are larger farms, and there must be, I imagine, an occasional reproduction of our own idea of a farmer, as a man who employs agricultural laborers but does none of the rough work himself; but in these cases, too, it is necessary to remember that the farmer is not a tenant but a freeholder.

This organization of agriculture, so remarkable to an Englishman, raises many economical and social questions. I was especially anxious to learn its effects on the intellectual and moral life of the farming population. What kind of men are these New England farmers? That they have advantages which raise them to a condition far above that of our own agricultural laborers might be assumed without much inquiry; but are they, as a class, inferior to those tenant-farmers of England who have land enough and capital enough to release them from the necessity of working in the fields? What kind of women are their wives and daughters? Are the men made coarse and dull by the severity of their physical labor? Do the women suffer any injury from constant association with men engaged in rough, out-door labor, and from the necessity of doing their own housework?

I was driving one afternoon, in the neighborhood of New Haven, with a gentleman who lived among New England farmers for many years, and I told him that I should like to see the inside of one of the pleasant-looking farmhouses which we were continually passing. He said, "By all means," and, at the next farmhouse, he pulled up. I asked him whether he knew the people who lived there. "No." My friend's daughter, a young lady who has also seen a great deal of country-life in New England, went and asked whether two English gentlemen might see the house, and in a few moments she came to us and said that we might go in. The farm belonged to a widow. She met us at the door, and received us with a quiet dignity and grace, which would have done no discredit to the lady of an English squire owning an estate worth four or five thousand a year. Her English was excellent—the English of a refined and educated woman. Her bearing and manners had an ease and quietness which were charming. The house had three good sitting-rooms, well furnished. Books and magazines were lying about; and there was a small

but pretty greenhouse. I went into one bedroom and saw that it was extremely neat, and that the linen looked as white as the driven snow. I found that the farm was an unusually large one, being about 200 acres. How much of it was under actual cultivation and how much was "unimproved," it did not occur to me to ask. The farm-work was done by the lady's two sons, and either two or three "hired men" who lived in the house. There was another "hired man" who did "chores"—cut the wood, lit the fires, attended to the garden, cleaned the boots, went on errands, and relieved the solitary "girl" of the rougher part of the house-work; when the hay had to be got or the wheat cut, I dare say he was employed on the farm. The house gave me the impression that the people who lived in it must be surrounded by all the comforts and many of the luxuries and refinements of life. The lady, whom I have already described, was the only member of the family that I was fortunate enough to see.

When we had got back into the carriage, I charged my friend roundly with having played me false. I told him that I felt sure that the house was not a fair specimen of its kind, and that the lady I had seen must be very unlike most of the ladies of the same class; that he must have selected the farm in order to give me a favorable impression. However, he assured me that it was not so. Then I appealed to the young lady who had gone into the house with my traveling companion and myself. She said that the house was certainly rather better than the average farmhouse, but that there were very many others quite as good; and that the lady was rather superior, both in education and in refinement of manners, to the average farmer's wife, but that she knew very many ladies living in farmhouses who were quite her equals. The suspicion of my friend's good faith had to be dismissed, and though I was unfortunate in happening to hit upon what was admitted to be an exceptionally favorable illustration of farm-life in New England, what I had seen made it easier for me to understand and to believe those of my friends who were never so eloquent as when they were celebrating the virtue, the intelligence, and the comfort that exist in the rural districts of Connecticut, Massachusetts, Rhode Island, Vermont, New Hampshire, and Maine.

They reminded me that it was in the farmhouses of the New England States that a large number of the most eminent Americans—statesmen, theologians, orators, men of science—had

¹ "Compendium of the Ninth Census," pp. 692, 936, notes.

received their early training; and that the sons of these plain and homely farmers had not only created the great manufacturing industries which are now established in the older parts of the country, but had been among the most adventurous and successful settlers in the West. An Englishman whom I met in New York the day after I landed, said that wherever I went I should find that the brains came from New England; my New England friends did not make quite so strong a claim as this, but they asserted that from the farmhouses of the New England States had been derived a very large proportion of the intellectual and moral strength of the country. One of the most learned and accomplished men in America, who for some years had preached to a congregation of New England farmers, assured me that they were generally men of strong, shrewd sense and sound judgment, rather slow in their intellectual movements, but with a healthy appreciation for solid thinking. Many of them, he assured me, had a considerable number of excellent books and read them. On the other hand, I was told by a distinguished lawyer that the intellectual development of the farmers was seriously checked by the severity of their out-door work. On the whole, however, the testimony which reached me from those who had the largest acquaintance with them supported very strongly the most favorable estimate both of their intelligence and their morals. What I heard about the farmers' wives and daughters was still more decisive. These ladies generally rise early and spend their morning in house-work; but after an early dinner, which most of them cook with their own hands, they "dress," and are generally free to visit their friends or to occupy themselves with their books, their music, or their needle. They take a pride in cultivating the refinements of life. At dinner and supper the table-cloth is as white and the silver as brilliant as in the houses of wealthy merchants in Boston or New York. The farmhouses are planted so thickly over the country that evening entertainments are very numerous, and at many of these—so I was assured—the conversation is very bright and intelligent. It is a common thing for a farmer to send at least one of his boys to college, and during the vacations the lads find in their mothers and sisters the keenest sympathy with their literary ambition. One lady, who had been surrounded from her childhood by the most cultivated society in New England, told me that she knew a large number of women living in farmhouses, that she constantly corresponded with some of them, and

that among the farmers' wives and daughters there were some of the most attractive, most intelligent, and best informed women that she had ever met with.

About the effect of the New England agricultural system on the intellectual activity and refinement of the population there may be differences of opinion; but there can be no difference of opinion as to the effect it must produce on their political spirit and principles. A population of farmers, owning the land they cultivate, is certain to have strong conservative instincts. Nor is the conservative temper the special, or at least the exclusive, characteristic of New England. To an English radical the conservatism of the people generally is very striking. If a couple of million American voters were suddenly transferred to English constituencies, the conservative reaction would probably receive a great accession of vigor. Of course, the Church would be disestablished within a few months after the first general election; perhaps the House of Lords would be abolished; there would perhaps be an attempt to change the monarchy for a republic; but there might be a very vigorous conservative spirit in England, as there is in America, in the absence of a throne, a House of Lords, and an ecclesiastical establishment. The respect for the rights of property, for instance, is positively superstitious. Some of the most "liberal" of my American friends were astounded by Mr. Cross's "Artisans' Dwellings Act." They were doubtful themselves about the policy and the justice of it; they were certain that no such act could be carried in America. The proceedings of the Endowed Schools Commission under the late Lord Lyttleton, and of the present Charity Commissioners, appear to many Americans perfectly revolutionary. There are trusts in the United States which are utterly useless, because the conditions under which they were created have become obsolete; the money is lying idle or is being applied in ways which confer no benefit on the community, but to change the trusts seems like sacrilege or spoliation. A few men are plucking up courage to make the attempt, and are coming to the conclusion that the ghosts of the founders are not likely to appear if the trusts are modified, and that there is nothing in the Ten Commandments requiring us to confer upon any man the right to determine the uses of property for a thousand years after his death; and yet the boldest of them show a certain tremor and awe when they are drawn into a discussion of the question. They are like those pa-

gans who, having discovered that their gods are wood and stone, want to displace them from their shrines, but approach the sacred places with a nervous dread lest, after all, they should be committing some terrible offense against mysterious powers.

This conservative instinct reveals itself in many directions. From what I know of Oxford and Cambridge, I am inclined to believe that in neither of them is the conservative temper so strong as at Yale. I mean that at Yale there is less disposition to try adventurous experiments, and to turn aside from the old paths; there is a more deeply-rooted belief in the "wisdom of our ancestors," and a greater reverence for methods of education which are sanctioned by the example and authority of past generations. At Har-

vard, however, there is far less reluctance to try new schemes, and I imagine that the changes which have been made there during the last few years would almost satisfy the most advanced liberals in our own universities.

It is possible for a nation with republican institutions to be intensely conservative, and it is possible for a nation with monarchical institutions to be earnestly liberal. I do not say that, on the whole, America is more conservative than England, but there is a strength of conservative sentiment in America which some English statesmen would be very glad to transfer to this country. But what I have to say about the political spirit and character of the American people must be reserved for another paper.—*Nineteenth Century*.

ON THE ORIGIN OF REASON.

BY PROFESSOR MAX MÜLLER.

THE book to which I should wish to call the attention of English philosophers bears the title of "The Origin of Language," by L. Noiré.¹ More clearly, however, than by the title, the real purpose of the book is set forth by a short sentence from the late Lazar Geiger's work "On the Origin of Language and Reason," printed as a motto on the title-page—"Language has created Reason; before there was Language, man was without Reason." Indeed, the more appropriate title of Prof. Noiré's book would have been, "On the Origin of Reason." It is a work which stands apart from the large class of treatises lately published by comparative philologists on the beginning of human speech, most of which, though containing the fruits of original thought and the results of careful research, are disappointing for one and the same reason, their authors not having perceived that the problem of the origin of language cannot be treated by itself, but must be viewed as an integral part, nay, as the corner-stone, of a complete system of philosophy.

THE ORIGIN OF LANGUAGES, AND THE ORIGIN OF LANGUAGE.

It is one thing to trace one language, or a number of languages, or, it may be, all languages, back to their first beginnings; it is quite another

to investigate the origin of language. How languages can be arranged into families, and how all the languages and dialects belonging to one family can be broken up into their simplest constituent elements, may be seen in any of the numerous books published during the last twenty years on the science of language. While engaged in these researches, we feel that we are on firm ground. We are simply carrying on a process of analysis, and as in a chemical experiment we arrive in the end at residua, which resist further separation, so in dealing with language we find that, after having explained all that can be explained in the growth of words, there remain at the bottom of our crucible certain elements which cannot be further dissolved. It matters little how we call these stubborn residua, whether roots, or phonetic types, or elements of language. What is important is, that, when we have removed all that can be removed, the whole crust of historical growth in words, when we have broken up every compound, and separated every suffix, prefix, and infix, there remain certain simple substances, the results, not of synthetic speculation, but of experimental analysis. These simple substances being granted, we can fully understand how out of them the whole wealth of language, as treasured up in its dictionaries and grammars, could have been brought together. We can unmake a language and make it again, and it was this process

¹ "Der Ursprung der Sprache," von Ludwig Noiré: Mainz, 1877.

of analysis and synthesis which I tried to represent as clearly as possible in my "Lectures on the Science of Language," first published in 1861.

ROOTS OR PHONETIC TYPES.

Those who have read those lectures will remember how strongly I opposed any attempt on the part of the students of language to go beyond roots, such as we actually find them as the result of the most careful phonetic analysis. It was thought at the time that my protests against all attempts to ignore or skip those roots, and to derive any word or any grammatical form straight from mere cries or from imitations of natural sounds, were too vehement. But I believe it is now generally admitted, even by some of my former opponents, that the slightest concession to what, not ironically, but simply descriptively, I called the bow-wow and pooh-pooh theories in the practical analysis of words, would have been utter ruin to the character of the science of language.

But to show that a certain road, and the only safe road, leads us to a mountain-wall, which from our side can never be scaled, is very different from saying that there is or that there can be nothing behind that mountain-wall. To judge from the manner in which some comparative philologists speak of roots, one would imagine that they were not only *indiscernibilia*, but Pallasia fallen straight from the sky, utterly incomprehensible in their nature and origin. It was in order to guard against such a view that, at the end of my lectures, I felt induced to add a few lines, just as a painter, when he has finished a landscape, dots in a few lines in the background to show that there is a world beyond. The science of language, I felt, had done its work when it had reduced the vague problem of the origin of language to a more definite form, viz., "What is the origin of roots?" How much has been gained by that change of front those will best be able to appreciate who have studied the history of the innumerable attempts at discovering the origin of language during the last century.

Beyond that point, however, where the student of language is able to lay the primary elements of language at the feet of philosophers, the science of language alone, apart from the science of thought, will not carry us. We must start afresh, and in a different direction; and it was in order to indicate that direction, in order to show to what quarter I looked for a solution of the last problem, the origin of roots, that I appealed

to the fact that everything in Nature, when set in motion or struck, reacts; that it vibrates, and causes vibrations. This seemed to me the highest generalization and at the same time the lowest beginning of what is meant by language. The two problems, how mere cries, whether interjectional or imitative, could develop into phonetic types, and how mere sensations could develop into rational concepts, I left untouched, trusting that philosophers by profession would quickly perceive how some of the darkest points of psychology might be illuminated by the electric light of the science of language, and fully convinced that they would eagerly avail themselves of the materials placed before them and ready for use to build up at last a sound and solid system of mental philosophy.

SCIENCE OF LANGUAGE AND SCIENCE OF THOUGHT.

Prof. Noiré seems to me the first philosopher who has clearly perceived that in the direction indicated by the Science of Language there was a new world to discover, and who discovered it. Already in his earlier works there are repeated indications that the teaching of comparative philology had not been lost on him.

I confess I have often wondered at the apathy, particularly of the students of psychology, with regard to the complete revolution that has been worked before their eyes in the realm of language. They simply looked on, as if it did not concern them. Why, if language were only the outward form of thought, is it not clear that no philosophy, wishing to gain an insight into the nature of thought, and particularly into its origin, could dispense with a careful study of language? What would Hobbes or Locke have given for Bopp's "Comparative Grammar?" What should we say if biologists were to attempt to discover the nature and laws of organic life without ever looking at a living body? And where are we to find the living body of thought, if not in language? What are the two problems left unsettled at the end of the Science of Language—"How do mere cries become phonetic types?" and "How can sensations be changed into concepts?"—what are these two, if taken together, but the highest problem of all philosophy, viz., What is the origin of reason?

PROFESSOR NOIRÉ'S WORKS.

It is impossible to do justice to Prof. Noiré's last book, "On the Origin of Language," without going back to his earlier works. His last work is the last stone that finishes the arch of his philosophical system, but it is held in its place by

the works which preceded it. The most important of them are:

1. *Die Welt als Entwicklung des Geistes*, 1874. "The World as an Evolution of Spirit."
2. *Der monistische Gedanke, eine Concordanz der Philosophie Schopenhauer's, Darwin's, R. Mayer's, und L. Geiger's*, 1875. "Monistic Thought: a Concordance of the Philosophy of Schopenhauer, Darwin, R. Mayer, and L. Geiger."
3. *Grundlegung einer zeitgemässen Philosophie*, 1875. "Foundations of a new System of Philosophy."
4. *Die Doppelnatur der Causalität*, 1875. "The Double Nature of Causality."
5. *Einleitung und Begründung einer monistischen Erkenntnislehre*, 1877. "Introduction to a Monistic Doctrine of Perception."

These works, though written, or at least published, within a short space of time, show a constant advance toward a clearer perception of the nature of language. Noiré is not one of those philosophers who sacrifice their delight in truth to a stationary infallibility. He is one of the few students who can still say, "I was wrong." With regard to the origin of language, he has openly retracted what he had written but a few years before. In his first book, "The World as an Evolution of Spirit," he still looked upon language as some sort of copy of the external world.

"The first human sound," he wrote (page 255), "which deserves the name of word, cannot have differed from the warning calls of animals, except by a higher degree of luminousness in the images which excited and followed these calls. They excited the idea of approaching danger among fellow-animals. . . . I assume that men were held together by the ties of social life in herds or tribes even before the beginning of the language. War was then the natural state—war against animals of another species, and against neighbors of the same species. It is not unlikely that a peculiar sound or watchword united the members of a single tribe, so that they could collect by it those who were scattered abroad and had lost their way, or encourage each other while engaged in fight with other tribes. Let us suppose that but once one member of a tribe warned the other members by imitating the watchword of a hostile tribe when he saw the enemy approaching, and we have in reality the origin of the first human word, capable of doing what words have to do, viz., to excite, as they were intended to do, an idea in the mind of cognate and homogeneous creatures."

"I found afterward," Prof. Noiré continues, "that Darwin, in his 'Descent of Man,' had start-

ed an hypothesis almost identical with my own. After declaring that he could not doubt that language owed its origin to the imitation and modification, aided by signs and gestures, of various natural sounds, the voices of other animals, and man's own instinctive cries, he says: 'As monkeys certainly understand much that is said to them by man, and as in a state of nature they utter signal-cries of danger to their fellows, it does not appear altogether incredible that some unusually wise ape-like animal should have thought of imitating the growl of a beast of prey, so as to indicate to his fellow-monkeys the nature of the expected danger; but this would have been a first step in the formation of a language.'

"The difference between my own hypothesis and that of Darwin consists only in this, that I after all see in the contents of the first sound of language something more natural, more familiar, more human, viz., the hostile neighbors, while Darwin makes the wild animal the first object of a common cognition. With a little reflection, however, it can be seen that such an attempt is utterly impossible, for the objects of fear, and trembling, and dismay, are even now the least appropriate to enter into the pure, clear, and tranquil sphere of speech-thought (*λόγος*), or to supply the first germs of it. The same objection applies of course to my own theory.

"From whatever point of view we look at them, these hypotheses can never stand against serious criticism. A call of warning is a call of terror, and terror communicates itself by sympathy. But according to mine and Darwin's theories, one more particularly gifted *Homo primigenius* would have had to ruminate and reflect thus: 'How can I make my fellows conscious of the threatening danger?' and then, by some kind of momentary inspiration, he would have uttered the dreaded sound. Let us grant, what is impossible and utterly incredible, that he calculated on his being understood; how could he have been understood by others without there being the same inspiration on their part answering to his own? And that is to be the beginning of language! The fierce howling of the wild animal, the battle-shout of the enemy, are these to have been the first germ, the centre of crystallization, of that wonderful intellectual creation which, resting on the solid ground of human consciousness, has become the mirror of the world, of earth and heaven and all their marvels? Nothing is more incredible, more unlikely. And as I recognize the insufficiency of my own hypothesis, it was impossible that the whole philosophical significance of the problem, and the crying disproportion between it and his own lightly-uttered guesses, could long remain a secret to the serious and profound mind of Darwin. He, too, in a clear and consid-

¹ "Ursprung der Sprache," p. 170.

² "Descent of Man," vol. i., p. 57.

erate confession, has admitted the inadequacy of his former views, and I can do no better than to quote his last words, which dispose of our common phantasmagoria once and forever: 'But the whole subject of the differences of the sounds produced under different states of the mind is so obscure, that I have succeeded in throwing hardly any light on it; and the remarks which I have made have but little significance.'"¹

We cannot sufficiently honor the noble spirit that dictated these words, particularly if we compare it with the manner of other philosophers who seem to consider the suggestion that they could ever grow wiser as the greatest insult.

To watch the struggles of a mind impelled by a strong love of truth, and following up his prey in the right direction, though not without occasional swervings to the right and to the left, is certainly far more interesting and far more useful than to have results set before us without our knowing how they have been obtained. Prof. Noiré has evidently been for a long time under the influence of Schopenhauer and Geiger, the former by this time well known in England also; the latter, a man of high promise and full of original thought, who died in 1870, after having published two books: one "On the Origin of Human Language and Reason," 1868; the other "On the Origin of Language," 1869. After a time, however, Noiré went beyond Schopenhauer and Geiger; and though he continues to express for both of them the warmest admiration, he now differs from them on some very essential points. He differs from Schopenhauer because he, Noiré, is a thorough-going evolutionist in body and mind; he differs from Geiger, because he no longer recognizes the first beginnings of language in involuntary interjectional sounds, but in sounds naturally accompanying the earliest acts of man. Where Noiré agrees with Geiger, I am generally at one with both of them; and I say this, not in order to establish any claims of priority, which are utterly out of place in a disinterested search after truth, but simply in order to define my own position in this decisive battle of thought. Whatever others have done before him, to Noiré belongs the merit of having rallied the scattered forces and led them to victory. When a student of the science of language points to the supreme importance of a right understanding of language for the solution of the most intricate problems in psychology or logic—when

he tries to show, for instance, that the formation of species is a question belonging in the first instance to subjective philosophy, and inseparable from the question of the formation of concepts—when he represents the whole history of philosophy as in truth an uninterrupted struggle between language and thought, and maintains that all philosophy must in the end become a philosophy of language—he is apt to be taken for an enthusiast. But, when a philosopher by profession subscribes to every one of these positions, the case becomes different. In Germany Prof. Noiré's reputation as an original thinker is by this time firmly established; and if less has been heard of him and his system in journals and newspapers, this is said to be due to the fact that, like Schopenhauer, he is not a university professor, and therefore without colleagues to support him, and without a large train of *clientes*, which originally meant *cluentes* or hearers, to swear by their master. It has also been said that the age of abstract philosophy in Germany has passed away, and that physical science now occupies the throne which formerly belonged to Kant, Fichte, Schelling, and Hegel. This is not so. There is no lack of philosophical productiveness, but there is certainly a lack of philosophical receptivity in Germany, so that books which thirty or forty years ago would have excited general attention, now pass unheeded, except by the smaller circle of working philosophers. Books which in England would sell by thousands, and be reviewed in all the leading journals, sell in Germany by hundreds hardly, and are generally discussed in the correspondence only that passes between the author and his friends.

There are exceptions. Some philosophical books have made a stir in Germany even in these days of iron and blood. But there is generally a reason for these exceptional successes. The same taste which finds a satisfaction in the more or less Turkish atrocities of sensational novels, is gratified, it seems, by a class of philosophical writers who try to outbid each other in startling assertions and unblushing negations, and who, if they speak but loud enough, and have some friends to speak still louder, attract, at least for a time, a crowd of idle listeners. The following specimens of this kind of popular, or rather vulgar, philosophy are taken from Noiré's books, and elsewhere:

"Man possesses many internal qualities, such as imagination and the milt."

"An external quality is seeing, an internal one is digestion."

"Thought is a secretion of the brain, as other secretions come from the kidneys."

"Man is what he eats. *Homo est quod est.*"

¹ Darwin, "Expression of the Emotions," p. 93. I feel bound to add that I do not see in the words of Mr. Darwin so complete a retraction of his former philosophy of language as Prof. Noiré imagines.

A lady published some letters addressed by her to Prof. Moleschott, in which the following sentiments occur :

"The moral rule for each man is given by his own nature only, and is different, therefore, for each individual. What are excesses and passions by themselves? Nothing but a larger or smaller overflowing of a perfectly legitimate impulse."

A philosopher¹ belonging to the other sex indulges in the following dithyrambus :

"Enjoyment is good, and frenzy and love are good, but hatred also! Hatred answers well when we cannot have love. Wealth is good, because it can be changed into enjoyment. Power is good, because it satisfies our pride. Truth is good, so long as it gives us pleasure; but good is lying also, and perjury, hypocrisy, trickery, flattery, if they secure us any advantage. Faithfulness is good, so long as it pays; but treason is good also, if it fetches a higher price. Marriage is good, so long as it makes us happy; but good is adultery also for every one who is tired of marriage, or who happens to fall in love with a married person. Fraud is good, theft, robbery, and murder, if they lead to wealth and enjoyment. Life is good, so long as it is a riddle; good is suicide also after the riddle has been guessed. But as every enjoyment culminates in our being deceived and tired, and as the last pleasure vanishes with the last illusion, he only would seem to be truly wise who draws the last conclusion of all science—i. e., who takes prussic acid, and that without delay."

I need hardly say that Prof. Noiré's style is as far as possible removed from such ravings, at which even a Greek cynic would have smiled, but he is nevertheless by no means a timid philosopher, and never shrinks from any conclusion that is forced on him by facts or real arguments. What distinguishes him from most philosophers is his strong feeling for the history of philosophy. There is in all he writes a warm sympathy with the past, without which there is no prophet and no philosopher. He is not always anxious to impress us with the fact that his system is a new system, that his thoughts are quite his own, quite original. He knows what has been said before him on the old questions which disturb our own philosophical atmosphere, whether by the ancient philosophers of Greece, or by the schoolmen, or by any of the great leaders of philosophic thought, from Descartes to Kant. He never announces as a new discovery what may be read in any manual

of the history of philosophy. He never indulges in the excited language of the raw recruit with whom every little skirmish is to rank as one of the great battles of thought. He has a clear perception that the roots of his own system of philosophy go back through Schopenhauer, Kant, and Leibnitz, to Spinoza and Descartes, and it is with a full consciousness of what he owes to every one of his intellectual ancestors, that he takes his own position on the high-road of philosophic thought. On the tower built up to a certain height he rears his own story, and he invites us to see whether it does not command a wider and clearer view than the loop-holes of his predecessors. If there is an evolution anywhere, it is in philosophy, and a philosophy which ignores its antecedents is like a tree without roots. The great leaders in metaphysical speculation during the last four centuries are to Noiré not only names to be cited, but living powers with whom he has to reckon, and from whom, even when he treats of the most recent problems of the day, he demands an answer in accordance with their principles.

HISTORICAL ANTECEDENTS OF NOIRÉ'S PHILOSOPHY —DESCARTES.

Thus, when he has to define the point from which he himself starts, in approaching the great questions of our time, and more particularly the questions of the origin of reason and language, he, like every true philosopher, feels the influence of Descartes, the founder of modern metaphysics. His *Cogito* remains the starting-point of modern philosophy, whatever we may think even of the very first of his conclusions, *ergo sum*. What separated Descartes from the philosophy of the middle ages, and gave him that strong position which he still holds in the history of philosophy, was his fixing his starting-point on the subjective side, and assigning to cognition the first place among all philosophical problems. We must know "how" we know before we ask "what" we know. Every system of philosophy which plunges into the mysteries of Nature without having solved the mysteries of the mind, the systems of natural evolution not excepted, is pre-Cartesian and mediæval.

But, though breaking the fetters of many of the traditional ideas of the schoolmen, Descartes remained under the sway of others. He remained a dualist, never doubting the independent existence of two separate worlds, the world of thought and the world of matter. The world of thought was given him in his *Cogito*, but the world of

¹ R. Schnricht, as quoted in Carrière's remarkable book, "Die sittliche Weltordnung," p. 24 (Leipzig, 1877).

matter was a world by itself, beyond the reach of the *Cogito*. Mind with Descartes was a substance possessed of the property of thinking, if we use that word in its largest sense, so as to comprehend perceiving, willing, and imagining. Matter was a substance possessed of the property of extension—extension comprehending the qualities of divisibility, form, and movement. Having put asunder these two substances, how was he to join them together again? And, even if he could have joined them, how was he to prove that the knowledge which mind seemed to possess of matter was correct?

Descartes's solution sounds strange to our ears, yet it can be translated into modern philosophic thought. He starts with the conception of God, which he finds impressed on his mind; and, as the conception of God involves the conception of a perfect being, Descartes considers that every possibility of delusion in the world which he has created, is *ipso facto* removed. This step, which changed the uncompromising skepticism with which Descartes begins his philosophy into an equally uncompromising faith, was influenced no doubt by the theological atmosphere of his time. But we must guard against suspecting in it a mere concession to the prejudices of the day, or, as many have done, a compromise with his own convictions. Every man, even the greatest philosopher, is a slave of the language in which he has been brought up. He may break some of its fetters; he will never break them all. If Descartes lived now, he might have expressed all that he really wished to say on the character of our cognition in the words of Dr. Martineau: "Faith in the veracity of our faculties, if it means anything, requires us to believe that things are as they appear—that is, appear to the mind in the last and highest resort; and to deal with the fact that they 'only appear' as if it constituted an eternal exile from their reality, is to attribute lunacy to universal reason."

"Trust in God as a perfect being," and "an unwillingness to attribute lunacy to universal reason," sound very different; but their intention is the same.

Noiré takes his first step with Descartes. He starts from the *Cogito*, as what is certain above everything else, and as that without which nothing can be certain; but he protests against the rapture between the subject and object of knowledge, and still more against any attempt to heal it by means of the *concursus divinus*, maintained by Descartes and his followers. One of the most

distinguished Cartesians, Malebranche, went so far as to maintain that when our soul wills, it does not act on the body, but that God intervenes to produce the desired effect; while, when the soul perceives, it is not influenced by outward objects, but again by God only, calling forth in the soul the sensations which we ascribe to the action of the material world. Here we have the true precursor of Bishop Berkeley.

SPINOZA.

At this point Noiré, like all modern philosophy, becomes for a time and up to a certain point Spinozistic. The very fact that we cannot bridge the gulf between two heterogeneous substances, such as mind and matter, shows us that there can be no such gulf. Thus Spinoza was led on to admit, in place of the two, or, in reality, three, substances of Descartes's philosophy, one substance only, of which mind and matter, or, as he would say, thought and extension, are inherent qualities. Body and soul being the same substance under two different aspects, the problem of body acting on soul, or soul on body, vanishes. Individual souls and bodies are modes or modifications, whatever that may mean, of the one eternal substance, and every event in them is at the same time both material and spiritual.

Noiré goes hand-in-hand with Spinoza, but only for a part, though a very important part, of his journey. The permanent gain from Spinoza's philosophy, in which we all share, is the clear perception that spirit cannot be the product of matter (materialism), nor matter the product of spirit (idealism), but that both are two sides of one and the same substance.

LEIBNITZ.

Noiré parts company with Spinoza where Leibnitz diverged from the great monistic thinker, viz., when it became a question whether all existing things, material or spiritual, could be satisfactorily explained as so-called modes of one eternal substance. What are these modes? Whence did they arise? What would the eternal substance be without such modes? Such questions led Leibnitz to postulate, as an explanation of the given universe, not one substance, like Spinoza, nor three, like Descartes, but an infinite number of individual monads. Each monad was to him a universe in itself, each was endowed with two qualities of thought and force. The two important differences between Spinoza and Leibnitz were, first, Leibnitz's recognition of the individual as something independent, not derivative;

and, secondly, his substitution of force instead of extension.

DESCARTES, SPINOZA, LEIBNITZ, AND LOCKE, ON LANGUAGES.

But Noîré not only turns away from Descartes and Spinoza on these points, but he declares himself most emphatically a pupil of Leibnitz on another point also, viz., the proper study of language, as before all things an empirical study. He had asked Descartes what place he assigned to language in his system of philosophy, but he received from his works no answer which would show that he had ever given serious thought to the relation between his *Cogito* and the *Logos*. We might have expected that Descartes would have treated words as material sounds, as mechanical products running parallel with the ideas of the mind, but neither provoking ideas nor provoked by them, and fulfilling their purpose simply by means of the *concursus divinus*. But, instead of this, he simply repeats the views then current, that, "if we learn a language, we join the letters or the pronunciation of certain words, which are material, with their meanings, which are thought; so that whenever we hear the same words again we conceive the same things, and, when we conceive the same things, the same words recur to our memory."¹

Neither does Spinoza return a more satisfactory answer as to the mutual relation between language and thought, and we look in vain for any passage in which he might have attempted to bring the facts of language into harmony with his general system of philosophy. He distinguishes in one place very clearly between ideas or concepts on one side, and images or percepts and words on the other. But it is again the old story. Words are there to signify things,² but how they came to be there and to perform such an office, is never even asked. In another place, words and images are said to consist in corporeal movements which have nothing to do with thought (ideas). Once Spinoza asks himself the question how, on hearing the sound of *pomum*, a Roman thought of what had no similarity what-

ever with that sound, viz., an apple; and the answer is, by the concatenation of ideas. "The body," he says, "has frequently been affected at one and the same time by the sound of *pomum* and by the sight of an apple, and hence, on perceiving the sound of *pomum*, it perceives its frequent or constant concomitant, the apple."¹ The question, "Whence that sound of *pomum*, and whence its first concomitancy with an apple?" is never asked by Spinoza. One remark only shows that his thoughts must have dwelt on the difficulties of language. In one passage he compares words with footprints, and remarks that when the soldier sees the footprints of a horse, he thinks of cavalry and war, while the peasant who sees the same marks is carried away in his thoughts to the plough and the field. This shows an advance beyond the then current view of the purely conventional character of language, and some apprehension of the fact that words imply far more than they express.

Noîré, not satisfied with Descartes and Spinoza, turns to Leibnitz, not, however, because that philosopher seemed to him to have solved the problem as to the relation between language and reason, but because he was the first to point out that, as in every other part of Nature, so in language, it was the inductive method only that could lead to any valuable results. Before you attempt to find out how language arose, he would say, collect all that there is of language, classify, analyze, sift, label; only when that has been done, and done thoroughly, will there be a chance of discovering the simple elements of human speech. This was the conviction which guided Leibnitz in his own linguistic labors, in his collection of living dialects, in his bringing to light the earliest documents of his own language, in his encouraging emperors as well as missionaries in the compilation of dictionaries of hitherto unknown and barbarous tongues. It was in this way that he became the founder of the science of language, as an inductive science. It was in this way also that he was led to conceive the possibility of a more perfect, or so-called universal, philosophical language. But the vital question as to whether thought was possible without language, or language without thought, remained outside the horizon of his speculations.

At the same time, while Leibnitz was laying the foundation of comparative philology, Locke approached nearer than any one before him to

¹ Epistola i., 35: "Sic quum linguam aliquam ad-discimus, literas sive quarundam vocum, quæ materiales sunt, prononciationem conjungimus cum earum significationibus, quæ sunt cogitationes, ita ut auditis iterum iisdem vocibus easdem res concipiamus, atque iidem rebus conceptis, eadem voces in memoriam recurrant."

² "Ethica," ii., Propositio xlix., schol.: "Verba quibus res significamus." Ibid.: "Verborum namque et imaginum essentia a solis motibus corporeis constituta, qui cogitationis conceptum minime involvunt."

¹ "Ethica," ii., Propositio xviii.

² "Lectures on the Science of Language," vol. i., p. 158 (tenth edition).

what is now called the philosophy of language. In his great though very unequal work, "On the Human Understanding," he pointed out that words were not the signs of things, but that in their origin they were always the signs of concepts; that language begins in fact where abstraction begins, and that the reason why animals have no language is that they do not possess the power of abstraction. This observation was little regarded at the time, till it was remarked how completely, and yet how undesignedly, it had been confirmed in our own time by the discoveries of the comparative philology.¹ When it had been shown by a very considerable amount of evidence that every word in every language that had been carefully analyzed was formed from a root, and that every root expressed an abstract idea, a concept, not a percept, then the coincidence between Locke and Bopp became startling, and gave a new impulse to a new philosophy both of language and thought. Lange, in his "History of Materialism," has called Locke's work "On the Human Understanding" a "Criticism of Language." We may go further, and say that, together with Kant's "Criticism of Reason," it forms the true starting-point of modern philosophy.

LEIBNITZ'S "MONADOLOGIE."

But, before we leave Leibnitz and the lesson which Noiré thinks should be learned from him even at the present day, we must endeavor to see more clearly how Leibnitz freed himself from the charm of Spinoza's monistic philosophy, and how Noiré, who calls his own philosophy *Monismus*, yet breaks loose from Spinoza, by admitting not one *monon*, but many *mona*. The escape from the *ἐν καὶ πᾶν* is not so easy to those who have once been under its spell, as Leibnitz would have us believe. His well-known remark, "Spinoza aurait raison, s'il n'y avait point de monades," is rather the saying of a philosophical cavalier, and might be met by the easy retort, "Leibnitz aurait raison, s'il n'y avait point de substance." Nor did Leibnitz by any means shake off the almost irrepressible longing of the human mind after the One, as the source of the Many. At first sight his monads seem to form a real republic of small divinities; but not only is there for them all a "preëstablished harmony," but in the end his monads are represented as created by one monad, which itself is not created. There is an "unité primitive ou substance simple originaire dont

toutes les monades créées ou dérivatives sont des fulgurations continuelles, de moment en moment."¹ Are these *fulgurations pour ainsi dire* a very real advance on Spinoza's modes? The real solution, if there can be a solution of what is in reality one of the so-called antinomies of the human mind, would seem to lie in our clearly understanding that we can never conceive the Many without the One, nor the One without the Many; but it will be best to let Prof. Noiré speak for himself:²

"Spinoza's doctrine received its necessary complement through the great Leibnitz. That the Infinite alone exists and can be conceived by itself only; that all single phenomena are throughout dependent on the Eternal and the Infinite; that the two true attributes of substance, namely, extension and thought, cannot be given to us by experience, but must be conceived immediately; that our imagination misleads us when it attempts to count and measure, where, according to their nature, counting and measuring are impossible—all these were precious truths which, difficult to understand, could ripen and bear fruit at a much later time only.

"The principle of individuality remained entirely neglected in the philosophy of Spinoza. Individual beings are nothing but modifications, affections of the One-and-All, the eternal and infinite God-world. Nature, however, there can be no doubt, is entirely founded on individuality, and higher knowledge as well as higher reality arises only through the combination of forces which were originally distinct. '*Spinoza aurait raison, s'il n'y avait Point de monades.*' With these words the opposition of the philosophy of Leibnitz to that of Spinoza is clearly pronounced. The thought of an evolution of the world has already pierced through the mind of Leibnitz.

"That the lowest monad consists in extreme limitation, most perfect isolation and exclusion; that with the progress of evolution higher monads are formed, endowed with constantly brighter perception, and having the law of their existence in themselves; that an inner quality is given to all beings down to the lowest inorganic matter, determining their form and expressed in it, until the highest form of existence, man, lets shine forth the light of his intelligence as the very crown of creation, illuminating himself and the world around: this is the object and the true kernel of Leibnitz's 'Monadologie.'

"And if man himself is a true individual, therefore a being in active and passive relation to the rest of the world, it follows that all his endeavors, and all his acts, and all his knowledge, proceed from his limited nature only. Absorption in the

¹ "Monadologie," § 47.

² "Einleitung und Begründung einer monistischen Erkenntnis-lehre," p. 126.

¹ See M. M.'s "Lectures on the Science of Language," vol. i., p. 405.

Infinite would annihilate him no less than a dissolution into primary atoms. His individuality exists and maintains itself only in opposition to all the rest. Independent active force is the true character of all things in the world."

THE INTELLECT ACCORDING TO LOCKE, KANT, SCHOPENHAUER, AND NOIRÉ.

What Noiré takes away with him from Leibnitz are the monads, or, as he prefers to call them, the *mona*, leaving the preëstablished harmony in the same philosophical lumber-room with the *concursus divinus*, and pronouncing no opinion on the necessity of admitting, beyond all individual monads, one supreme or creative monad. Having settled his accounts with Leibnitz, Noiré has next to pass through the ordeal of Locke, and to defend his *mona* from becoming mere canvas, or *tabula rasa*. What are the monads with which he undertakes to build up the world; and, more particularly, what are those monads of which we have to predicate the old Cartesian *Cogito*? The so-called faculties of the soul had long ago been destroyed by Spinoza, the innate ideas had fallen under the strokes of Locke. Well did Herder say:¹ "All the forces and faculties of our souls, and of animal souls, are nothing but metaphysical abstraction. They are effects, subdivided by us, because our weak mind cannot grasp them as one. They are arranged in chapters, not because in Nature they act in chapters, but because an apprentice apprehends them most easily in this manner. In reality, the whole soul acts everywhere undivided." In Locke's philosophy there remained nothing but the perceiving subject as *tabula rasa* on one side, and on the other the objective world, throwing its picture on the white surface of the soul. Nothing was in the intellect except what had come into it through the senses; and if Leibnitz rejoined, "No, nothing, except the intellect itself," the next question clearly, which philosophy, in its historical progress, had to answer, was, "What, then, is that intellect?"

The answer was given from two opposite quarters, by the philosophers of France and by the philosophers of Germany. *Penser c'est sentir*, was the answer of Condillac, La Mettrie, and Diderot. Kant's answer was the "*Critik der reinen Vernunft*," giving to the world what is the only possible definition of the intellect, i. e., the fixing of its limits. What these limits are, according to Kant, is well known by this time to all students of philosophy. Man can possess a knowledge of phenomena only; what lies beyond the phenomenal

world is beyond his perception and conception. Space and time are the inevitable forms of his sensuous perception, the categories the inevitable forms of his mental conception. These forms of perception and conception are, according to Kant, neither innate or cognate, but inevitable, irremovable; they cannot be thought away, as he expresses it, when we speak of perception and conception. They are contained in them as light is contained in color, as number is contained in counting, analytically, not synthetically. They are that without which thought could not be conceived as possible in man. If it made their nature more intelligible, there would be no harm in calling them laws of sense, and laws of thought.

Within the charmed circle described by Kant, the human intellect is safe; outside it, it becomes entangled in antinomies or inevitable contradictions, without finding any criterion of its own to solve them. According to Kant, we have on one side man, imprisoned within the walls of his senses, and with no more freedom of movement than the categories or the chains of his intellect will allow him; on the other side we have a world, of which we know nothing except that it is, and that by its passing shadows it disturbs the repose of our prison.

As far as the prisoner is concerned, nothing that later philosophers have added has materially changed his position. Space and time have remained, what Kant was the first to prove them to be, necessary forms of our sensuous intuition. The number of the categories has been changed, and by some philosophers, in particular by Schopenhauer, they have been reduced to one, the category of causality, as the one primary form of all human thought. Thus armed, the subject, or, as we might say with Noiré, the *monos*, expects the *mona*.

But what about these *mona*? What about the outside world? Can we really know it only as it appears? Can we predicate nothing of it? It is from this question that the most powerful impulse to philosophic thought proceeded. We might follow the stream of philosophy which, starting from this point, and following the course indicated by Fichte, Schelling, and Hegel, seems for the present, like the river Sarasvati, to be lost beneath the ground. But Noiré calls us away from that enchanted valley, and bids us follow him in another direction, from Kant to Schopenhauer, and then onward to his own system.

The transition from Kant to Schopenhauer is easy, and may be stated in the form of a single syllogism. He accepts all that Kant teaches about

¹ Noiré, "*Ursprung der Sprache*," p. 47.

the subject or the I; or, if he modifies Kant's doctrines, he does so chiefly by simplifying them. But he differs from Kant in his view of the object, or the Non-I. Our only real knowledge, he says, of anything really existing is our knowledge of the I, which involves not only being, but conscious being, resisting, or, as he prefers to call it, willing. Therefore, if we say that the Non-I exists, we say at the same time that it exists as something willing, resisting, and, if not actually, at least potentially, conscious. We know no other kind of being, and therefore we cannot predicate any other. As we, the I, are to others as the Not-I, so the Not-I must be to us as the Not-I. This is the bridge from Kant to Schopenhauer, from death to life. As soon as we have arrived on the opposite shore, as soon as we have recognized in all Nature, in all that is not ourselves, something like ourselves, Noiré bids us welcome. This is the threshold of his own philosophy.

THE TWO ATTRIBUTES OF SUBSTANCE.

The first question with him, after he has arrived at his monads, is, What are their inherent attributes? He does not ask, What is intellect? or, What is matter? but, What is essential in order to explain the whole of the subjective and objective evolution of the world? Like Descartes, like Spinoza, and like Leibnitz, he requires two attributes only, but he defines them differently from his predecessors, as *motion* and *sensation*. Out of these materials he builds up his universe, or rather, taking the universe as he finds it, he traces it back through a long course of evolution, to those simple beginnings. As Goethe said, "No spirit without matter, no matter without spirit," Noiré says, "No sensation without motion, no motion without sensation."

According to these two attributes, philosophy has to deal with two streams of evolution, the subjective and the objective. Neither of them can be said to be prior. On the one hand it may be said that motion precedes sensation, because motion causes vibration, and vibration of the conscious self is sensation. I see, I hear, I feel, I taste, I smell—all of these, translated into the highest and most general language, mean, I vibrate, I am set in motion. But, on the other hand, motion exists only where there is sensation; it presupposes sensation; it means something which is nothing except in relation to something else, and that something else capable of perceiving. The two streams of evolution

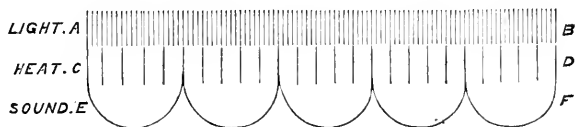
run parallel, or, more correctly, the two are one stream, looked at from the two opposite shores.

SUBJECTIVE EVOLUTION.

Taking the subjective aspect first, Noiré shows how sensation begins in its lowest form, as a mere disturbance or irritation. But even that irritation presupposes something that reacts, some force which is *conserveatrix sui*, and it is that power of reacting against foreign disturbance which constitutes the beginning of real sensation. Sensation is, in fact, conscious motion or reaction.

We may define every kind of sensation as conscious vibration, and we are able now to determine the different kinds of sensation by the number of vibrations acting within a given time upon certain specially receptive organs. Let the line AB represent the $\frac{1}{1000000}$ part of a second; let each straight line (|) represent 4,000,000,000 vibrations, and each curved line (—) one vibration. Then, disturbed and set to vibrate in unison with these vibrations, the eye within this $\frac{1}{1000000}$ part of a second would see red, the skin would perceive about 31° of heat (Centigrade), and the ear would hear the tone of e'''''' .¹

While one *monon* maintains itself against the inroads of another, or in reality of an infinite number of other *mona*, it vibrates. It asserts its existence by vibration, i. e., by a constantly and regularly repeated attempt to maintain itself against foreign inroads. Vibration in the highest sense is the struggle between being and not being. So far as for a moment one *monon* has to yield, and as it were to surrender some of the ground which belonged to itself, it recognizes in the very act of yielding the existence of something else, able to disturb, but unable to annihilate, so that when we say of something that it exists, what



we really mean is that for a moment it is where we were before.

And here we have the first glimmering of the category of causality. It is by looking upon a disturbance as caused, and by fixing that cause outside ourselves, that we translate disturbance, or irritation, or vibration, into the perception of an object. The gradual change from the one to the

¹ Noiré, "Grundlegung," p. 56.

other has been so fully elaborated by the most recent school of English philosophy, that English readers will hardly find anything new in this portion of Noiré's philosophy. We must only remark, as against all philosophers from Descartes to Kant and his school, that even the most primitive perceptions or empirical cognitions are never entirely passive. Malebranche said: "In the same manner as the faculty of receiving different figures and configurations in the body is entirely passive, and involves no action whatever, the faculty also of receiving different ideas and different modifications in the mind is entirely passive, and involves no action whatever. I call this faculty, or this capacity which the mind possesses of receiving all those things, the understanding (*l'entendement*)." We hold, on the contrary, that every impression becomes perceived by our resistance only, and every resistance is active and self-conscious. We suffer, no doubt, in seeing and hearing, but we suffer because we resist.

Kant says, "If I take away all thought from an empirical cognition, there remains no cognition whatever of an object, for nothing is thought by mere intuition, and the fact of my sense being affected gives me nothing that relates to any object." But whatever we may do in abstract reasoning, we cannot in *rerum natura* take away all thought from an empirical cognition, without destroying it. This is what Schopenhauer urges, with great success, against Kant. He shows that even the simplest intuition involves activity, sensation, and thought. In giving to our sensuous disturbances an object, in saying of these objects that *they are*, we are not only passive; we are active, we think, we are using Kant's own category of *causality*, in addition to the intuitions of space and time. In placing the cause of our sensuous disturbance outside ourselves, we apply what Kant calls one form of our sensuous intuition, viz., *space*. In placing one disturbance by the side of another, we begin to count, and apply Kant's second form of sensuous intuition, viz., *time*. There is, in fact, according to Schopenhauer, no real sensation without the first germs of intellect in it. Kant takes the intellect as something given, as ready at hand, whenever we want to apply it to the brute material supplied by the senses. Noiré looks upon the intellect as gradually developing from the lowest indications of conscious sensation to the highest achievements of discursive reasoning. On this point he was, for a time, as it would seem, chiefly under the influence of Geiger. Geiger, speaking historically rather than psychologically, says:

"One thing is certain, that as far as our observation reaches, man is rational. And yet he has not always been rational. Reason does not date from all eternity. Reason, like everything else on earth, had an origin and beginning in time. And, like the species of living beings, reason did not spring into existence suddenly, finished, and in all its perfection, as it were by a kind of catastrophe; but it has had its own development. We have in language an inestimable and indispensable instrument for seeing this. Nay, I believe that whatever plausible theories on the descent of man may have been started elsewhere, certainty and assurance can be obtained from language only."

Geiger seems to me to mix up two ideas in the word rational. When he says that man was not always rational, he means *rationalis*, not *rationalibus*; and between these two words the difference is immense. We agree with Noiré when he says:

"How is it possible that from unconscious and non-sentient matter consciousness and sensation should suddenly shine forth, unless the inner quality, though in a dark and to us hardly perceptible manner, belonged before to those substances from which the first animal life, in its most elementary form, was developed?" (p. 193).

It may probably be objected that the inner quality here spoken of is only a different name for the *qualitates occultæ*, which form the terror of modern philosophy. But honest philosophers must not allow themselves to be swayed by the clamor of the day. No doubt the abuse that was made of occult qualities, innate ideas, and of faculties and instincts, was very great; but because modern philosophy had shown that these terms were musty with the crust of long-accumulated misconceptions, there was no ground for throwing away these old terms, like broken toys. Every one of them, if only carefully defined, has its legitimate meaning; and with all the prejudice attaching to their name, the theory of occult qualities and their gradual manifestation rules really supreme at the present day, though thinly veiled under the new name of evolution and potential energy.

Noiré's philosophy rests on a most comprehensive theory of evolution; it is the first attempt at tracing the growth of the whole world, not only of matter, but of thought also, from the beginning of time to the present day. As the philosophy of Nature strives to account for all that exists by a slow progress of evolution, beginning from the simplest elements, and ascending through endless combinations to the highest effort of Nature, realized in man, the philosophy of thought starts

from the lowest indications of conscious feeling, and follows the growth of thought through every variety of perception, imagination, and conception, to the latest work of philosophy.

OBJECTIVE EVOLUTION.

Noiré is a true evolutionist, subjectively and objectively. But he is a follower of Cuvier, not of Lamarck. He avails himself of all the new light which modern science, particularly through Robert Mayer and Charles Darwin, has shed on that oldest of all problems; but he is not a Darwinian, in the ordinary sense of the word. With Robert Mayer, he holds¹ that "there is but one universal force of Nature in different forms, in itself eternal and unchangeable. Whatever we perceive, whether in the form of light, heat, sound, or anything else, is due to motion, and must be solved as a purely mechanical problem. Nor can any motion be lost; it can only be changed into a new kind of motion."

Even organic life is looked upon as a mechanical process, though it is fully admitted that science has not yet mastered it. In this respect we have, in fact, advanced but little beyond Descartes, who likewise looked upon animals, and even on the human body, as mere machines, though in the case of man the machine was connected with a new substance, the soul. Physical science is no doubt fully justified in always keeping the solution of the problem of life before its eyes; nay, in representing such a solution as the highest triumph which mechanical or chemical science could achieve. But it should never allow the anticipation of that triumph to influence philosophical speculation. We know exactly what a cell is composed of, but no synthesis has yet produced anything like a living cell, absorbing, growing, and generating, if only by self-division. We may laugh at the occult quality of vital force, but we cannot confess too openly that as yet vital force is to us an occult quality.

Leaving the origin of organic life as an open question, and remembering that even Charles Darwin requires a Creator to breathe life into matter, we may afterward follow the progress from the lowest to the highest forms of life, with all the new light that patient research has thrown upon it. Noiré here goes entirely with the evolutionists, he believes even in the *Bathybios Haeckelii*. To me he does not seem to lay sufficient stress on the many gaps which the most laborious members of the evolutionist school are the most ready to acknowledge, nor to dwell sufficiently on

the indications, supplied by Nature herself, that she may have had more than one arrow in her quiver. He differs, however, most decidedly from the evolutionists in the explanation of the process of evolution. He looks upon the struggle for life, the old *πόλεμος πατήρ πάντων*, the *bellum omnium contra omnes*, on the survival of the fittest, on natural selection, influence of environment, and all the rest, as merely concomitant agencies, and places the original impulse in what Schopenhauer called Will—a word, as it seems to me, as badly chosen as could be to express what Schopenhauer wished to express. What he means by Will is simply the subjective form of what appears objectively as Force. Where other philosophers would say that everything is what it is by its own nature, what the Hindoos call *svabhāvat*, Schopenhauer says it is so by its will, wishing to indicate thereby that the nature of everything, from a stone to an animal, is not determined by any other higher will, but by itself alone. He is thus driven to speak of an unconscious will in stones and plants, and he dates the beginning of a conscious will from its first manifestation in the animal kingdom.

It is not quite easy to see how far Noiré adopts Schopenhauer's theory of will. Will, as used by Schopenhauer, does not differ much from fact, however, or—from another point of view—from accident. The broader question is really this, whether we are to admit that each thing is a law to itself, or that there is a higher, universal law for all. Schopenhauer ends with a republic of separate wills, without a supreme ruler—nay, without a superintending law. Hence the aversion he felt and expressed to the theory of evolution. "What has philosophy to do with becoming?" he writes; "it ought to try to understand being."¹ No doubt, what exists, and is what it is by its own will, cannot easily be conceived as changing, and yet what greater change can be imagined than that from an unconscious will in stones and plants to a conscious will in animals and men? Here it is where Noiré separates himself decidedly from Schopenhauer. To him all being is becoming, and all becoming is determined from the first. There could be no consciousness in the animal world unless its undeveloped germs existed in the lower stages from which animal life proceeds. Here is the fundamental difference between Lamarck's chaotic, pan-genetic evolution, and that development which is from beginning to end the fulfillment of a will, a purpose, a law, or a thought.

¹ "Grundlegung," pp. 6, 11.

¹ "Einleitung," p. 193.

KINETICS AND ÆSTHETICS.

Noiré divides the whole of philosophy, according to the views just explained, into two branches, which he calls *Kinetics* and *Æsthetics*.

By *Kinetics* every problem from the first motion of the atom to the revolutions of the solar system, from the formation of the first cell to the life of man, has to be solved as a purely mechanical problem.

By *Æsthetics*, using that word in the Kantian sense, he tries to unravel the growth of the subjective world, from the first tremor of the embryo to the brightest thoughts of man, from the first reaction of the moneres to the highest flights of human genius.

The field for the study of *Kinetics* is open; it is the whole realm of Nature, which anybody may explore who has eyes to see. It is physical science in the largest sense of the word. Experience and experiment are the two tools, Nature the never-failing material, for those who want to work out the history of evolution in the objective world.

For the study of *Æsthetics* the same tools are at hand, but where is the material? where are the documents in which to study the growth or history of the sentient subject? Must we be satisfied either with introspection, for those uncertain of all vivisectionary experiments, in which he who dissects is at the same time he who is being dissected? or with the study of that short period of growth which we call the history of the world, comprising no more than a few thousand years, filled with names of kings and battles rather than with an account of the silent growth of the mind? No wonder that men accustomed to deal with facts, and to base their theories upon them, should turn away with dismay from mental science in which every fact can be disputed by men who profess that they do not see it, and where there is hardly one technical term that admits of one definition only. An exact philosophy of the human mind seemed to become more and more hopeless the greater the achievements in the conquest of Nature.

LANGUAGE, AS SUBJECTIVE NATURE.

And yet while philosophers complained about the scarcity or the total absence of trustworthy materials, there were old archives brimful of them, if people would only see them, open them, and read them. What should we say if we were told that, in studying the growth of the earth, we must be satisfied with looking at its surface only—that everything else was hidden and lost?

Were there not chronicles of the past written on that very surface, if people would only recognize them as such? Was there not a history to be read in every bit of coal, in every flake of flint? We can hardly understand how men could have been so blind as not to see what stared them in the face; and yet all mental philosophy has hitherto been struck with such blindness. Noiré is, in fact, the first philosopher by profession who has perceived what students of the science of language, more particularly Geiger, have pointed out again and again, that language is the embodiment of mind, the nature, so to say, of mind, the subjective universe in which the whole objective universe is reflected, perceived, imaged, and conceived. Here is the realm of mental science, here are materials, as real as any that physical science has to deal with. Nor have we only the surface, the living language of the day, in which to study the remnants of that unbroken series of growth which begins with the first conscious sensation. We possess in the so-called dead languages petrifications of former stages of growth, and in the many families of human speech a wealth of form comparable only to the numberless forms of vegetable and animal life which overwhelm the student of objective Nature. The evolution of sensation, therefore, can be studied as well as the evolution of motion, viz., in the enormous wealth of language. The history of the human mind is the history of language; the true philosophy of the human mind—true, because resting on facts—is the philosophy of language.

I quote from Noiré ("Einleitung," p. 213):

"How could such a new creation as we have in reason spring from antecedent and less perfect forms? How could what is rational and thinking proceed from what is without reason and without speech?"

"If we want to know the means by which human reason worked its way from small beginnings to always-increasing clearness with reference to the qualities of things, and always higher self-consciousness, this can be done historically only, by investigating the regular development of the conceptual contents of words, which, without such contents, are empty sound. Concepts, as Geiger shows, determine each other in their genesis, so that not every one could spring accidentally from every other, but certain concepts only from certain concepts, according to rule. While there can be no science to determine the connection between concept and sound, a scientific method must be found, following the development of concepts, without reference to their phonetic forms; and in

the same manner the development of phonetic forms, without reference to their meanings. We must try to find the empirical laws according to which concepts can be concatenated, laws which alone enable us to judge of real relationship of ideas, as phonetic laws of real relationship of sounds. Thus only shall we gain an insight into the nature of reason, and be enabled to ascribe to it that certainty which consists in a knowledge of a necessity determined by law."

Let us see now how Noiré works out this new discovery. What he takes as granted on the subjective side of his philosophy is sensation, corresponding to motion. That sensation, however, is something different from what we have made it, by separating from it in language what in reality can never be separated from it, viz., some kind of self-conscious thought. Even the faintest shiver is pervaded by something which we must accustom ourselves to call thought. The fact is, we suffer from the abundance of terms which have been created to signify the various manifestations of sensation as well as the faculties corresponding to them, and which, from being used loosely, have encroached on each other to that extent that it is almost impossible now to disentangle them. It would be the greatest benefit to mental science if all such words as perception, intuition, remembering, ideas, conception, thought, cognition, senses, mind, intellect, reason, soul, spirit, etc., could for a time be struck out of our philosophical dictionaries, and not be admitted again until they had undergone a thorough purification. Sensation, then, in the sense in which Noiré uses it, so far from being the lowest degree only of mental activity—so far from being what is most easy to understand and what would seem to require no explanation at all—is really the most mysterious act, the act which we can explain by no other, of which there is no simile or metaphor anywhere. Like motion, sensation will always remain an ultimate fact—a *ne plus ultra* of human philosophy. French philosophers imagined that by their tenet of *Penser c'est sentir* they were degrading thought, and such had been the influence of fashion that few only at the time could see that sensation, being at all events the indispensable antecedent of thought, was in no way a viler function, but had a perfect right to claim precedence of thought. The French tenet became faulty only because Condillac and his school took *sentir* in its unnaturally restricted sense. They had previously taken out of *sentir* all that is *penser*, and then thought they could startle the world, like a

juggler, by showing that the bird was still to be found in the empty egg-shell. Give us sensation, such as it really is, not such as it has been imagined to be for logical purposes, as something distinct from thought, but impregnated with thought, and everything in the human mind becomes intelligible, and *penser* may as truly be said to be *sentir* as the oak-tree is the acorn.

But then it has been asked: "Is there no such thing as mind, soul, reason, intellect, etc.? Is not the soul a simple substance? Is not reason a special gift?" Such is the influence of words on thought, that as soon as we throw away a word, or attempt to define its meaning, everybody thinks he is being robbed. But the sun rises just the same, though we say now that it does not rise; the moon has not been diminished, though for thousands of years she has been told that she is waning; and all our mental life will remain just the same, though we deny that reason has any independent substantive existence. All the various shades of sensation from the first to the last were doubtlessly distinguished and named for some very useful purpose. The mischief was, that there were too many distinctions to remain distinct, and that, as usual, what was meant as an adjective was soon changed into a substantive. Perception, intuition, remembering, ideas, conception, thought, cognition—all these exist as modes or developments of sensation, but sensation itself exists only as a quality of the *monon*, and therefore neither mind, nor intellect, nor reason, nor soul, nor spirit, being all modes or products of sensation, can claim any substantive existence beyond what they derive through sensation from the *monon*. To speak of reason as a thing by itself, as even Kant does, is simply philosophical mythology; to speak of mind, intellect, reason, soul, or spirit, as so many independent beings, with limits not very sharply defined, yet each differing from the other, is neither more nor less than philosophical polytheism. A man is not, however, an atheist because he does not believe in Aphrodite as a goddess; nor is a philosopher to be called hard names because he does not believe in mind, intellect, reason, soul, or spirit, as so many independent substances, or powers, or faculties, or goddesses.

Noiré sees all this quite clearly in some parts of his works; but at other times he seems still under the sway of the old philosophical theogony. Thus he sometimes identifies himself with Geiger, whose words he quotes on the title-page of his text-book: "Language has created Reason; before there was Language, man was without Reason."

I do not object to this statement so long as it is only meant as a protest against the received opinion that language is the handiwork of reason; that man, because he was possessed of reason, was able to frame for himself and others an instrument of communication in language. Geiger's words convey much truth, as calling attention to the fact that it is reason rather which was built up by language than language by reason. But what is reason without language? What shall we think of language without reason? When we say that language has been built up by reason, it is the same as when we say that a living body is built up by a vital force. Reason, like vital force, is a result which we substantiate and change into a cause. With every new word there is more reason, and every progress of reason is marked by a new word. The growth of reason and language is coral-like. Each shell is the product of life, but becomes in turn the support of new life. In the same manner each word is the product of reason, but becomes in turn a new step in the growth of reason. Reason and language, if we must separate them for our own purposes, are always held together in mutual dependence; and if we wish to arrive at a true understanding of their nature, all we can do is to break up the two words and knead them into one, viz., *Logos*. Then and then only shall we see that reason by itself and language by itself are nonentities, and that they are in reality two sides of one act which cannot be torn asunder.

"Then what is *Logos*?" it will be said. "Is that term clearer than language and reason? Are we not simply placing one idol in the place of two?" I believe not. *Logos* is the act of the *monon*, freeing itself, by means of signs, from the oppressive weight of sensations. *Logos* is what its name signifies, the act of collecting, arranging, classifying; and this act is performed by signs, and chiefly by words.

PERCEPTS AND CONCEPTS.

In order to understand this process of gathering and naming, we must go back to where we left the stream of the philosophy of language, and chiefly to Locke's observation that words are the signs of concepts, confirmed as it was by the later discoveries of Comparative Philology, that all words are derived from roots, and that roots express general concepts. If that is so—and no one doubts it—then the question recurs, "How does sensation, which deals with percepts only, arrive at concepts, and how can concepts be ex-

pressed by vocal sounds?" Our chief difficulties here too are again created by language. Nothing is more useful than the distinction between percepts and concepts, yet the line which separates them from each other, like that which separates sensation from reason, is by no means so sharp as we imagine. Instead of saying that we cannot think in sight nor see in thought, I should say, on the contrary, that we never really see without thought, and never really think without sight. There is no percept which, if we examine it closely, does not participate more or less in the nature of a concept, nor is a concept possible except on the ruins of percepts. We hardly ever take in a thing as a whole. When we look at a poppy, we see its red color, and perhaps, to make quite sure, the shape of its leaves; but then we have done. We have here a percept which, on account of its very incompleteness, represents the first step toward a concept. From these imperfect percepts still more drops away when the immediate impression ceases. I call this a kind of involuntary abstraction, I might also call it memory. Much difficulty has been raised about the so-called faculty of memory, but the truth is, that the real problem to be solved does not lie in our remembering, but in our forgetting. If no force is ever lost, why should the force of our sensations ever become less vivid? The right answer is that their force is never lost, but determined only by new forces, and in the end changed into those faint and more general sensations which we call memory. These remembered sensations lead us another step nearer toward concepts. In one sense concepts may be called higher than percepts, and they certainly constitute, as all true philosophers have seen, the chief difference between man and brute. But from another point of view concepts are lower, less vivid, less clear and accurate than percepts, and they certainly constitute the chief source of our errors. Kant says that concepts without percepts are empty, percepts without concepts blind; it would perhaps be truer to say that concepts and percepts are inseparable; and if torn asunder, they are nothing.

HOW ARE CONCEPTS NAMED?

The process by which percepts are constantly being changed into concepts is by no means uniform, but admits of endless variety. What concerns us, however, at present, is not so much the formation of concepts, as the process by which a concept can be fixed and named. We may understand how the faint recollection of the red

color of the poppy, separated from everything else, particularly after it has been strengthened by the red color of other flowers, of birds, of blood, or of the sunset, becomes in the fullest sense of the word a concept. But while we can point to the flower, the bird, and the red sky, we never can point to the red as such, apart from the things to which it belongs. Unless, therefore, we have signs to assist our memory in the retention of concepts, they would vanish almost as soon as they have risen. This is not a merely theoretic difficulty, but it must have been felt as a very serious practical difficulty, from the first beginnings of civilized life. How to distinguish blood from water, except through the concept of red, and through some sign for red?

It is the object of Prof. Noiré's last book to give an answer to this question, "How are concepts framed and named?" That language does not begin with mere sensation, that man never attempted to name a single subject in its completeness, he takes for granted, for the single reason that it is a superhuman task. Try to name a whole oak, and you will find that language cannot even get near it. All names are made from roots, all roots are signs of concepts. Bring the oak under a concept, under the concept of eating, for instance, and you can name it, as it was named *φηγός*, the eaten tree, the food-tree, *par excellence*; but not otherwise. I believe, however, that one class of roots has here been overlooked, and must indeed be ascribed to the purely perceptive phase of the human mind, viz., the demonstrative or pronominal as opposed to the predicative roots. Those sounds which simply point to an object—this, that, I, thou, he, etc.—are in their most primitive form purely sensational. They are few in number, but they are made to render the greatest service in the later formation of words.

With the exception of this small class of roots, however, Prof. Noiré is certainly right that all roots are signs of concepts. We may take any word we choose, it will invariably lead us back in the beginning, not to a single sensation, but to a concept. A *book* is originally what was made of beech. The English beech, the Latin *fagus*, the Greek *φηγός*, oak, were all so called from the root *φαγ*, to feed, to eat; that is to say, the tree was conceived as giving food to cattle, whether acorns or beech-nuts. But even *φαγ*, to eat, is a secondary root, and may be traced back to the Sanskrit root *bhag*, which has preserved the more general meaning of dividing.

Wool, *vellus*, *ἐρπον*, Sanskrit *urnā*, all come

from a root *var*, to cover. A horse was called *equus*, Sanskrit *asva*, the swift, from a root *as*, to be sharp and quick; while the cow, in contradistinction to the runner or the horse, was called *βοῦς*, Sanskrit *gāus*, from a root *bā* or *gā*, to go, to move slowly. We may tap language wherever we like, the sap that runs from its veins is always conceptual.

We saw before how concepts arose; we also saw why it was necessary that concepts should have signs. They would have vanished without signs, and it was desirable that they should not vanish. The question that remains to be answered is, how concepts were expressed in sounds.

THE INTERJECTIONAL AND MIMETIC THEORIES.

The most common theories hitherto advocated on that point have been the *interjectional* and the *mimetic*, or, as they have also been called, when misapplied to etymological purposes, the Pooh-pooh and Bow-wow theories. According to the former, roots are derived from involuntary exclamations forced out by powerful impressions. According to the latter, they are formed from imitations of natural sounds, such as the barking of dogs, the lowing of cows, etc. In my lectures on Mr. Darwin's "Philosophy of Language," I tried to explain how, with certain modifications, both of these theories could be defended, not indeed as supplying actual roots, still less actual words, but as furnishing the materials out of which roots might be formed. Yet the arguments against this theory of mine are powerful. It is perfectly true, as Prof. Noiré points out, that the simplest sensations which, we should think, might be expressed by interjections, are never so expressed, but are reached by language in the most circuitous way. To hunger and to thirst are two very primitive sensations; but have they been expressed interjectionally?

The word *hunger* is as yet without any etymology; it may possibly be connected with Sanskrit *kars*, to dwindle away; *kṛśa*, lean, lank; the German *hager*. The Latin *esurio*, derived from *edo*, means I wish to eat. The same meaning we find in the Sanskrit *asanāyati*, to desire food. The Greek *πείνα*, hunger, is connected with *πόνος*, labor, *πένομαι*, I labor, I strive, I reach after food; the original conception being most likely what we find in *σπένω*, to draw out, the German *spannen*, to stretch.

To *thirst*, Gothic *thaur-sja*, Sanskrit *trish-yāmi*, shows its original conception in Greek, *τῆρσομαι*, I am dry; Latin, *torreo*; Gothic, *thaur-sus*, dry. The same root supplied material for

terra, dry land; tes-ta, dried clay, bowl, French tête; testudo, turtle; probably for torrens, torrent, torris, torch, and even for French aussitôt.¹ This shows how language works.

And with regard to objects which might most easily have been named after the sounds which they utter, we find again that generally they are not so named, while in such words as cuckoo, *cuculus*, Noiré points out that these are not names, but rather proper names, or nicknames, and that they came in long after the concept of the bird had been framed. Sounds such as *bow-wow*, or *baa* or *moo*, would remind us, he thinks, of single objects only, and would never be fit to express conceptual thought.

I had tried to show, in my lecture on Mr. Darwin's "Philosophy of Language," how even out of such sounds the materials for roots or phonetic types might have been elaborated, and how in the same manner as various cries would leave the concept of crying, various sounds, such as *baa* and *moo*, might, by mutual friction, be raised to a root, containing the concept of to cry.

THE SYMPATHIC THEORY.

Prof. Noiré has brought forward no arguments against this theory, but he has started a new theory, which, so far as it reaches, supplies certainly a better explanation of phonetic types and rational concepts than my own. He points out that whenever our senses are excited and the muscles hard at work, we feel a kind of relief in uttering sounds.² He remarks that particularly when people work together, when peasants dig or thrash, when sailors row, when women spin, when soldiers march, they are inclined to accompany their occupation with certain more or less vibratory or rhythmical utterances. These utterances, noises, shouts, hummings, songs, are a kind of reaction against the inward disturbance caused by muscular effort. These sounds, he thinks, possess two great advantages. They are from the beginning signs of repeated acts, acts performed by ourselves and perceived by ourselves, but standing before us and continuing in our memory as concepts only. Every repeated act can be to us nothing but a concept, comprehending the many as one, and having really nothing tangible corresponding to it in the outer world. Here, therefore, was certainly an easy bridge from perception to conception. Secondly, as being uttered, not by one solitary man, but by

men associated in the same work, these sounds have another great advantage of being at once intelligible. It cannot be denied that Noiré's arguments in support of his theory are very strong, nor can there be any doubt that, as most of our modern tools find their primitive types in cave-dwellings and lacustrine huts, a very large portion of our vocabulary can be derived, and has been derived, from roots expressive of such primitive acts as digging, cutting, rubbing, pulling, striking, weaving, rowing, marching, etc.

My only doubt is whether we should restrict ourselves to this one explanation, and whether a river so large, so broad, so deep as language may not have had more than one source.

Human language had, for instance, from a very early time, to express not only acts, but also states, or even sufferings. In fact, as Prof. Noiré has himself shown, all the work of our senses admits of a double application, an active and passive one. We listen actively, and we hear passively; we watch actively, and we perceive passively; we scent and sniff, and we perceive disagreeable smells; we grope, and we feel; we taste tentatively, and we taste something bitter, whether we like it or not. Though in modern languages these two sides are often expressed by one and the same verb, the two concepts were originally quite distinct. To hear was probably to vibrate, to be moved, to be struck; and the root *kru*, or *klu*, which in all the Aryan languages means to hear, may have been connected with other roots, such as *kru*, to strike; *krad*, to sound. Where we say, I hear the thunder, the old expression might have been, I tremble, I shake from the thunder. Hence the old construction of such verbs with the ablative or genitive preserved in Sanskrit or Greek; while *audire* in Latin has lost every trace of the old concept, and governs the general objective case. To listen in the active sense of watching, giving ear (*ausculto*), might have been expressed by a root connected with the low, breathing sounds uttered by a number of people who are waiting together for some great event. Instead of this, we find that in Sanskrit it is expressed by a secondary root, *srush*, to hear, a kind of derivative from *srū*, to hear, still present in the English to listen, Anglo-Saxon *hlystan*, *hlystan*.

In some cases, again, Noiré's view comes very near the interjectional theory. Whether, for instance, the root *anh*, to choke, should be called interjectional or mimetic, or whether, as Noiré would have it, it was produced by the sympathy of activity, will be difficult to determine. If

¹ Bréal, "Mélanges," p. 318.

² This point has been illustrated by Mr. Darwin in his "Expression of the Emotions," chapter iv.

originally it was meant to express the sense of oppression and choking, it would be due to a sympathy of passivity, rather than activity; and a sound uttered from sympathy of passivity comes very near to an interjectional or mimetic sound.

Prof. Noiré has, I believe, struck a new vein, but when he comes to work out his theory more in detail, he will probably find that the primitive centres of force from which the endless rays of thought radiated, do not all lie in the same direction. Locke¹ remarked, long ago, and others had done so before him, that all words expressive of immaterial ideas are derived from words expressive of material subjects. "By which," as he adds, "we may give some kind of guess what kind of notions they were, and whence derived, which filled their minds who were the first beginners of language." Nothing is more likely than that their daily occupations should have supplied the first concepts through which the framers of language gradually laid hold of everything that attracted their attention. If they had a word for plaiting or weaving, they could derive from it not only the name of the spider, but likewise of the poet who weaves words and thoughts together. I agree with Aufrecht that we should derive from a root *vabh*, to spin, the Sanskrit *ūrvābhī*, spider, Greek *ῥπος*, web, and *ῥμνος*, poem, while Greek expressions such as *δόλους καὶ μῆτιν μύθους καὶ μῆδεα, οἰκοδομήματα, ὄλβον, κηρὸν ὑφαίνειν*, show how many branches may spring from one single stem. The same

root, in its simpler form, *vap*, gives us the Greek *ῥ-τριον*, warp. The roots *vabh*, however, and *vap*, before they came to mean weaving, meant throwing, also sowing; and in an intransitive sense, even our modern verb to wabble, clearly onomatopoeic, according to Mr. Wedgwood, has been traced back historically to that root by Prof. Pott.

I fully agree, therefore, with Noiré, that the primitive occupations of man, and the sounds which accompany them, would supply ample materials for carving out of them a complete dictionary. I also agree with him that man finds the most natural metaphors for the expression of natural phenomena by referring them to himself, by looking upon them anthropopathically. When the color red had to be expressed he called it a crying color, a bitter taste was a biting taste, a shrill note was a sharp-cutting note. All this is true, and much more. But though I willingly say *εὐρηκας* to Prof. Noiré, I still think we ought not to shut all other doors that may lead into the dark passages of language, and that we ought, in our searchings after the earliest ramifications of human thought and human language, to guard against nothing more than against the arch-enemy of all truth—dogmatism.

I hope in a future article to show more in detail how the gradual development both of the material and of the framework of reason, the so-called categories, may be studied by means of an historical analysis of language.

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THE LAW OF LIKENESS, AND ITS WORKING.

By DR. ANDREW WILSON.

THAT the offspring should bear a close resemblance to the parent forms one of the most natural expectations of mankind, while the converse strikes us as being an infringement of some universal law that is not the less recognizable because of its unwritten or mysterious character. "The acorn," says a great authority on matters physiological, "tends to build itself up again into a woodland giant such as that from whose twig it fell; the spore of the humblest lichen reproduces the green or brown incrustation which gave it birth; and at the other end of the scale of life, the child that resembled neither

¹ "Lectures on the Science of Language," ii., p. 373.

the paternal nor the maternal side of the house would be regarded as a kind of monster." Thus true is it of the humblest as of the highest being, that the law of likeness or "heredity," as it has been termed, operates powerfully in moulding the young into the form and resemblance of the parent. But the law that is thus admitted to be so universal in its operation exhibits, at the same time, very diverse readings and phases. The likeness of the parent may be attained in some cases, it is true, in the most direct manner, as, for example, in the higher animals and plants, where the egg or germ, embryo, and seed, become transformed through a readily-traced process of

development into the similitude of the being which gave it birth. So accustomed are we to trace this direct resemblance between the parent and the young in the higher animals and among ourselves, that any infringement of the law of likeness is accounted a phenomenon of unusual kind. Even extending to the domain of mind as well as of body, we unconsciously expect the child to exhibit the traits of character and disposition which are visible in its parents, and to grow up "the child of its father and mother," as the expression runs, in every phase of its bodily and mental life.

A wider view of the relations and harmonies existing in Nature, however, shows us that this direct development of the young into the similitude of its ancestors is by no means of universal occurrence. Many forms attain the resemblance to their progenitors only after passing through a series of changes or disguises, often of very complicated nature. And a very slight acquaintance with the facts of physiology would serve to show that the law of likeness, like most other laws regulating the world of life, has its grave exceptions, and that it exhibits certain phases of singular interest in what may be termed its abnormal operation. The young of an animal or plant may, and frequently do, exhibit very remarkable variations from the parent in all the characteristics which are associated with the special nature of the being. The circle of repeated and perpetuated likeness may thus be broken in upon at any point, and the normal law of heredity may be regarded as occasionally superseded in its working by the operation of another law—that of variation and divergence. Forms unlike the parents are thus known to be frequently produced, and these errant members of the family circle may be shown to possess no inconsiderable influence on the nature and constitution of the world of life at large. Family likeness, as every one knows, lies at the root at once of the differences between, and relationships of, living beings. The offspring must resemble their parents and their own kind more closely than they resemble other groups, else our knowledge of the relationship of one form to another must be regarded as possessing no sound basis whatever. But admit that the young may not resemble the parent, and a veritable apple of discord is at once projected into the apparent harmonies of Nature, and dire confusion becomes the order of the day. As will be hereafter shown, however, while the law of variation does undoubtedly operate, and that to a very great extent, among living beings, other and

compensating conditions are brought to light by the careful study of development at large; and the old law of like producing like may be seen, after all, to constitute the guiding principle of Nature at large. As a study of high interest, and one the elements of which are afforded by our observation of the every-day world, the investigation of the law of likeness may be safely commended to the seeking mind. And in the brief study of this law and its operations we may firstly glance at some instances of development by way of illustration, and thereafter try to discern the meaning and causes of similitude or heredity. "*Rassemblez des faits pour nous donner des idées*," says Buffon, and the advice is eminently appropriate to those who purpose to enter upon a popular study of an important natural law.

One of the simplest instances of development, in which the young are not only transformed directly into the likeness of the parent, but represent in themselves essential parts of the parent-body, is illustrated by the case of the little worms known to the naturalist as *Naidides*, and familiar to all as inhabitants of our ditches, and as occurring in damp mud and similar situations. If a *Nais* be chopped into a number of small pieces, each piece will in time develop a head and tail and become a perfect worm, differing in no respect, save in that of size, from the original form. A *Nais* cut into forty pieces was transformed through the operation into as many small worms of its own kind. Here the law of likeness or heredity operates in the plainest and most direct fashion. The young are like the parent-stock, because they consist in reality of detached portions of the parent's personality. The experiments of naturalists carried out on animals of lower organization than these worms, such as the little fresh-water polyp or hydra, show a power of artificial reproduction which is of literally marvelous extent; and all such animals evince at once the simplest mode of development and the plainest reasons why the young should exactly resemble the parent. It might, however, be alleged that such artificial experimentation was hardly to be accepted as illustrative of natural development; but in answer to such an observation the naturalist might show that an exactly similar method of reproduction occurs spontaneously and naturally in the *Nais* and in certain other animals of its class. A single *Nais* has been observed to consist of four connected but distinct portions, the hinder three of which had become almost completely separated from the original

body — represented by the front segment. A new head, eyes, and appendages, could be traced in course of formation upon the front extremity of each of the new segments; and, as development terminated, each portion could be seen to gradually detach itself from its neighbors; the original worm thus resolving itself into four new individuals. The most curious feature regarding this method of development consists in the fact that the bodies of these worms and of nearly-related animals grow by new joints being added between the originally-formed segments and the tail. If, therefore, we suppose that one of these new joints occasionally develops into a head, we can form an idea of the manner in which a process, originally intended to increase the growth of one and a single worm, becomes competent to evolve new individuals, each of which essentially resembles the parent in all particulars.

The great Harvey, whose researches on animal development may be regarded as having laid the foundation of modern ideas regarding that process, adopted as his physiological motto the expression, *omne animal ex ovo*. While it is undoubtedly true that the egg, or ovum, must be regarded as the essential beginning and type of development in animals, we note that, as in *Nais*, the production of new beings is not solely dependent on the presence of that structure. Just as plants are propagated by slips and cuttings, so animals may be developed from shoots or specially detached portions of the parent-body. And it is in the development of the egg, or in the course of what may be regarded as the most regular and defined stages of that process, that the exceptions to the law of likeness are most frequently met with. One of the most remarkable deviations from the normal law of development is seen in the case of the little *aphides*, or plant-lice, the insect so familiar to all as the pests of the gardener. At the close of the autumn season, winged males and females of these insects appear among their neighbor aphides, and these produce eggs, which, however, lie dormant throughout the winter. Waking into life and development with the returning spring, these eggs give birth each to a wingless female; no insect of the sterner sex being found among the developed progeny of these insects. The presence of both sexes is throughout the animal world regarded as necessary for the production of eggs capable of developing into offspring. Strangely enough, however, these wingless females not only produce eggs, hatching them within their bodies, but the eggs develop into

beings exactly resembling themselves, not a single male aphid being represented within the limits of this Amazonian population. Seven, eight, nine, or even eleven generations of these wingless females may be produced in this manner, and the swarms of plant-lice which infest our vegetation attest the fertility of the race. But in the last brood of these insects, produced toward the close of autumn, winged males appear in addition to the females, which latter also possess wings. The members of this last brood produce eggs of ordinary nature, which lie dormant during the winter, but which in the succeeding spring will inaugurate the same strange life-history through which their progenitors passed. The case of the plant-lice may for the present be dismissed with the observation that the law of heredity appears to operate in this instance in a somewhat abnormal, or, at any rate, in a very unusual manner. The true similitude of the winged parents is not attained until after the lapse of months, and through the interference, as it were, of many generations of dissimilar individuals; while no less worthy of remark is the circumstance that one sex alone is capable of giving origin to new beings, which sooner or later produce in turn the natural duality of sex, forming the rule of both animal and plant creation. And the case of the plant-lice is rendered the more remarkable by the consideration that of 58,000 eggs laid by female silk-moths which were separated from the opposite sex, only twenty-nine developed into perfect caterpillars — the female plant-lice possessing a fertility under like circumstances which would be amazing even if taking place under the normal laws and conditions of development.

Cases of the unusual development of animals, which serve as parallel instances to the case of the plant-lice, are by no means rare. Thus in the case of the starfishes, sea-urchins, and their neighbors, the egg gives origin to a free-swimming, active body, which develops a structure of its own, and appears in a fair way to become, as might be expected, the future starfish. But within the body of this first embryo another formation is seen to take place; and sooner or later this secondary development comes to assume priority, and appears as the true and veritable representative of the young starfish — the primitive body or embryo which produced it being either absorbed into its substance, or cast off on development being fully attained and completed. The production of the second starfish, as it were, out of a first-formed

embryo, is paralleled by the curious case of a certain kind of gall-flies (*Cecidomyia*), within the larvæ or caterpillars of which other young or larvæ are produced. The present case partakes thus of the nature of a striking exception to the ordinary laws of development, seeing that a young and immature form possesses the power of producing other beings, immature like itself, no doubt, but capable of ultimate development into true flies. In other words, heredity, or the power of like producing like, which ordinary observation demonstrates to occur usually in the mature and adult being, is here witnessed occurring in the young and imperfect form.

Certain very typical but more complicated cases of animal development than the preceding instances are witnessed in the reproduction of those curious animal-colonies collectively named "zoöphytes." Any common zoöphyte, such as we may find east up on our coasts or growing attached to the fronds of tangle, is found to consist of a plant-like organism, which, however, instead of leaves or flowers, bears numerous little animals of similar kind, connected together so as to form a veritable colony. Each of the little members of this colony possesses a mouth, surrounded by arms or tentacles, and a little body-cavity in which food is digested; and it may be noted that each member of the colony contributes to form the store of nourishment on which all the members, including itself, in turn depend for sustenance. Such a veritable animal-tree, growing rooted and fixed to some object, increases by a veritable process of "budding." As the animal-buds die and fall off, new buds are thrown out and developed to supply the place of the lost members; the zoöphyte, like the tree, renewing its parts according to the strict law of heredity, and each new member of the colony bearing as close a likeness to the existing members as that borne by the one leaf of a tree to its neighbor-leaves. But, as the tree sooner or later produces flowers which are destined to furnish the seeds from which new trees may spring, so the zoöphyte in due time produces animal-buds of a kind differing widely from the ordinary units which enter into its composition. These varying buds, in very many cases, appear in the likeness of bell-shaped organisms, and, when they detach themselves from the zoöphyte-tree and swim freely in the surrounding water, we recognize in each wandering bud a strange likeness to the familiar *Meduse* or jelly-fishes, which swarm in the summer seas around our coasts. Living thus apart from the

zoöphyte-parent, these medusa-buds may pass weeks or months in an independent existence. Ultimately, however, they develop eggs, and with the production of the eggs the clear, elegant, glassy bodies undergo dissolution, and vanish away amid the waters, to which, in the delicacy of their structure, they presented so close a resemblance. From each egg of the jelly-fish-bud there is gradually developed, not a medusa, but a zoöphyte. The egg, in fact, develops a single bud of the zoöphyte, and this primitive bud, by a process of continuous budding, at last produces the connected, tree-like form with which the life-history began. Thus the zoöphyte is seen to give origin to a jelly-fish, and the jelly-fish in turn reproduces the form of the zoöphyte—one generation of animals, as the older naturalists believed, "alternating" in this way with another.

The law of likeness would at first sight seem to be ill-adapted, in virtue of its essential nature, to explain the cause of an animal, such as the zoöphyte, producing an entirely different being, represented in the present instance by the jelly-fish-bud; and it might appear to be equally inexplicable that the progeny of the jelly-fish should revert to the zoöphyte stock and likeness. The case of those curious oceanic organisms, allied to the "sea-squirts," and known as *Salpæ*, presented to the zoölogists of former years phenomena of an equally abstruse kind. The salpæ are met with floating on the surface of the ocean in two distinct forms. One form exists in the shape of a long, connected "chain" of individuals, while the other form is represented by single salpæ. It was, however, ascertained that these two varieties were linked together in a singularly intimate manner by their development. The chain-salpæ were found to produce each a single egg, which developed into a single salpa; and the latter, conversely, produced each a long "chain" of individuals—the one variety, in fact, reproducing the other. The apparently mutual development of the zoöphyte and the jelly-fish, and of the chain and single salpa, is, however, explicable, as far as its exact nature goes, on other grounds than those on which the naturalists of former years accounted for the phenomena. The jelly-fish is not a distinct animal from the zoöphyte, but merely one of its modified buds, produced, like the other parts of the animal-tree, by a process of budding, and destined for a special end—that of the development of eggs. The latter illustrate the law of heredity because they are to be regarded as having been essentially and truly produced by the zoöphyte, into the form of which

each egg directly develops. And similarly with the salpæ. The chain-salpæ may be regarded as corresponding to the zoöphyte, each individual of the chain producing an egg, which develops again into a chain-salpæ, through the medium of the single and unconnected form.

To a still greater extent in insects and some crustaceans—such as barnacles, etc.—may the process of development be complicated and extended. The egg of the butterfly gives origin, not to the aerial winged insect, but to the mundane caterpillar, which, after passing an existence devoted solely to the work of nourishing its body, envelops that body in a cocoon and becomes the chrysalis; finally appearing from this latter investment as the winged and mature form. In the case of all insects which, like the butterfly, pass through a *metamorphosis*, as the series of changes is named, the law of likeness appears to be protracted, and its terms somewhat evaded or extended. The egg, in other words, develops into the mature form only after passing through an extended development, and evolves the similitude of the parent-form through certain intermediate stages of well-marked kind. And so, also, with the well-known barnacles which attach themselves to the sides of the ships and to floating timber. The young barnacle appears as an active little creature, possessing limbs adapted for swimming, along with feelers, eyes, and other appendages. Ultimately, the embryo barnacle forms its shell, loses its limbs and eyes, attaches itself by its feelers to some fixed object, develops its flexible stalk, and passes the remainder of its existence in a fixed and rooted condition. The development in this latter case, although in due time producing the likeness of the parent, clearly leads to a state of life of much lower character, and to a structure of humbler grade, compared with the life and organization of the young barnacle. The invariable law of heredity in the various examples detailed is thus seen to operate sometimes in clear and definite manner, converting the offspring into the likeness of the parent directly, and with but little change, save that involved in the process of growth, into the parent-form. In other cases, the operation of the law is carried out through an extended and often complicated process of development; and the observation of the manifold variations which the working of the law exhibits, adds but another to the many proofs of the inherent plasticity of Nature, and the singular adaptations which are exhibited to the varying necessities of living beings.

Among the higher animals, as we have noted,

the process of development for the most part evolves the likeness of the parent in a simple and direct manner. True, in all higher animals, as in lower animals, the mere formation of organs and parts in the body of the developing being constitutes a process in which, from dissimilar or from simple materials, the similarity of the animal to its parent and to the intricacy of the adult form are gradually evolved. But we miss in higher animals these well-defined and visible changes of form through which the young being gradually approximates to the parental type and likeness. Direct heredity forms, in fact, the rule in higher life, just as indirect heredity is a common feature of lower organisms. The frogs, toads, and newts, form the most familiar exceptions to this rule among higher animals; the young of these forms, as is well known, appearing in the form of "tadpoles," and attaining the likeness of the adult through a very gradual series of changes and developments. But in no cases can the existence of hereditary influences be more clearly perceived or traced than in cases of the development of higher animals, in which traits of character, physical peculiarities, and even diseases, are seen to be unerringly and exactly reproduced through the operation of the law of likeness; while in certain unusual phases of development the influence of the law can be shown not less clearly than in its common and normal action.

The case of the "ancon" or "otter" sheep serves as an apt illustration, not only of the transmission of characters to the offspring, but likewise of the sudden appearance and development of characters not accounted for by heredity. In the year 1791 a ewe belonging to a Massachusetts farmer produced a lamb differing materially from its neighbors in that its legs were disproportionately short, while its body was disproportionately long. This departure from the ordinary type of the sheep could not be accounted for in any way; the variation being, as far as could be ascertained, perfectly spontaneous. The single short-legged sheep became the progenitor of others, and in due time a race of ancons was produced; the variety, however, falling into neglect, and ultimately disappearing, on account of the introduction of the Merino sheep, and of the attention paid to the development of the latter breed. The law of likeness in the case of the ancon sheep proved normal in its working after the introduction of the first ancon. The offspring of two ancons was thus invariably a pure otter sheep; the progeny of an ancon and an ordinary sheep being also

pure either in the direction of the sheep or the ancon; no blending or mixture of the two races ever after taking place. The law of likeness thus holds good in its ordinary operation, but takes no account and gives no explanation of the abstruse and unknown causes arising from the law of variation, and on which the development of the first ancon sheep depended.

The heredity and transmission of mere influences, which have been simply impressed upon either parent, and which form no part of the parent's original constitution, presents some of the most marvelous, as well as some of the most inexplicable, features of animal and plant development. Thus, an Italian naturalist, taking the pollen or fertilizing matter from the stamens of the lemon, fertilized the flowers of the orange. The result was, that one of the oranges, subsequently produced, exhibited a portion of its substance which was not only colored like the lemon, but preserved the distinct flavor of the latter fruit. Changes of similar nature have been produced in the fruit of one species of melon by fertilizing the flowers with pollen of a different species, and thus producing, through the operation of the law of likeness, a blending of the character of the two species. Equally certain, as regards their effects on the young forms of animals, are the effects of the transmission of influences or qualities impressed on the parents. The birth of a hybrid foal, half quagga, half horse, has been of sufficient influence to transmit to the subsequent and pure progeny of the mother the banded stripes or markings of the quagga; the influence of the first male parent and offspring extending, as it were, to the unconnected and succeeding progeny.

The case of the human subject presents no exceptions to the laws of heredity and of hereditary influences, since the common experience of every-day life familiarizes us with the transmission of the constitution of body and mind from parent to child; while the careful investigation of the family history of noted artists, sculptors, poets, musicians, and men of science, clearly proves that the qualities for which they are or were distinguished have, in most cases, been transmitted to them as a natural legacy and inheritance—so fully does science corroborate the popular saying that qualities of body and mind “run in the blood.”

A notable case of the operation of the law of likeness in perpetuating a singular condition of body is afforded by the history of the Lambert family. Edward Lambert was exhibited in 1731, at the age of fourteen, before the Royal Society

of London, on account of the peculiar condition of his skin, which was covered with horny scales; these appendages, in their most typical development, according to one account, “looking and rustling like the bristles or quills of a hedgehog shorn off within an inch of the skin.” In 1757 the “porcupine-man,” as Lambert was called, again exhibited himself in London. He had in the interim suffered from small-pox; the disease having had the effect of temporarily destroying the roughened skin, which, however, reappeared during his convalescence. Lambert's children presented the same peculiar skin-development, and the correlation between parent and offspring in this case was most marked, even in the date of the first appearance of the abnormality, since the skin developed its scales in each of his children, as in himself, about nine weeks after birth. In Lambert's grandchildren this peculiarity was also well marked; two brothers, grandsons of Lambert, being exhibited in Germany on account of their peculiar body-covering.

The history of the Kelleias, a Maltese family, is no less instructive than that of Lambert, as tending to prove the distinct and specific operation of the laws of heredity. Gratio Kelleia—whose history is given by Réaumur in his “*Art de faire éclore les Poulets*,” as a kind of lesson in the rearing of poultry—was a Maltese, who possessed six fingers on each hand and six toes on each foot. His parents possessed the ordinary number of digits, and hence the law of variation may be regarded as operating in the case of the human subject, as in the ancon sheep and in lower animals still, in producing sudden and spontaneous deviations from the normal type of a species or race. Kelleia's family consisted of four children, the mother exhibiting no abnormality of hands or feet. The eldest son, Salvatore, exactly resembled his father. George, the second son, had five fingers and five toes, but his hands and feet were deformed. André, the third son, exhibited no abnormality; and Marie, the daughter, had deformed thumbs. The operation of the law of heredity was not especially marked in this first generation, but its effects were of very striking character in the second. To begin with the family of André, none of his children exhibited any divergence from the normal type. Of Marie's family, only one, a boy, had six toes; his fingers being normal. Of George's four children, one boy possessed hands and feet of ordinary type; one girl had six fingers on each hand, but, curiously enough, six toes on the right foot only; while the remaining two girls had each six fingers

and six toes on each hand and foot. Salvator's family likewise consisted of four children, three of whom possessed the six fingers and six toes of their father and grandparent; the fourth and youngest possessing the ordinary number of digits. The four mothers of the second generation of Kelleias exhibited no abnormality in respect of hands or feet, and hence the hereditary influence of the female parent doubtless made itself felt in the development of a proportion of normal hands and feet—although, as far as the genealogy of the family is traced, the proportion of six-fingered and six-toed members clearly tends to exceed that of those possessing the normal number of fingers and toes.

Having thus selected and marshaled some of the chief facts relating to the occurrence of heredity or the likeness between parent and offspring, it may be fairly urged that these facts seem to establish the existence of some well-defined law, in virtue of which the bodily structure, the mental characteristics, or even the peculiarities induced by disease, are transmitted from one generation to another. And it also becomes an important study to determine the causes which operate in producing such variations in the law of inheritance as we have endeavored to illustrate in the case of certain groups of lower animals. Can we, in other words, account for the similarities and resemblances, and for the diversities and variations, which living beings present, apparently as a natural sequence of their life, and of the operation of the laws which regulate that existence? The answer to some such question as the preceding closely engaged the attention of physiologists in former years, the result of their considerations being the framing of various theories whereby the facts of heredity could be correlated and explained. It is evident that any explanation of heredity must partake of the nature of a mere speculation, from our sheer inability to penetrate deeper into the investigation of its laws than the observation of phenomena can lead us. But, when rightly employed, generalizations and theories serve as leading-strings to the truth; and, moreover, aid in the most valuable manner in connecting facts which otherwise would present a most confusing and straggling array. We may, in truth, sketch in the outlines of the subject in theory, and leave these outlines to be deleted or intensified by the subsequent progress of knowledge. Buffon speculated, about the middle of last century, on the causes of heredity, and viewed the subject from a very comprehensive standpoint. He assumed that the ultimate parts of

living beings existed in the form of certain atoms, which he named "organic molecules," and maintained that these molecules were received into the body in the shape of food, and became stored up in the various tissues and organs, receiving from each part a corresponding "impression." The molecules in each living body were, in fact, regarded by Buffon as plastic masses, which not only received the imprint, in miniature, of the organ in which they had lodged, but were also fitted to reproduce that organ or part. Potentially, therefore, each molecule might be said to carry within it some special portion of the body of which, for a time, it had formed part. It was organic and, moreover, indestructible. For, after itself and its neighbors had been freed from corporeal trammels by the death of the organism in which it had existed, they were regarded as being capable of entering into new combinations, and of thus building up afresh the forms of living animals or plants similar to, or widely different from, those in which they had previously been contained. Buffon's theory had special reference to the explanation of cases of the "spontaneous generation" of animalcules in closed vessels, but it also served to explain the cause of heredity. The molecules, each charged with the form of the organ or part in which it existed, were believed ultimately to pass, in the case of the animal, to the egg-producing organs, or, in the plant, to the seed; the egg and the seed being thus formed, as it were, from materials contributed by the entire body. The germ was to the body at large, as a microcosm is to the greater "cosmos."

A second authority who framed an explanation of the causes of likeness was Bonnet, who maintained that lost parts were reproduced by germs contained in the nearest portions of the injured body; while, by his theory of *emboîtement*, it was held that each germ was in itself the repository of countless other germs, these bodies being stored up in a quantity sufficient for the reproductive needs of countless generations. Prof. Owen's explanation depends upon the recognition of the fact that certain of the cells of the germ from which the living being springs pass into its body, and there remain to transmit to its successors the material characters which it has acquired; while, also, the repair of injuries, and the propagation of new beings by budding and like processes, are explained on the supposition that these germ-cells may grow, increase, and operate within the organism which they are ultimately destined to propagate. Lastly, Mr. Dar-

win has come to the solution of heredity with his theory of *Pangenesis*, which may be said to avail itself of all that is reasonable and probable in the explanations just discussed, and also to include several new and important ideas of which the older theorists took no account.

As paving the way for an understanding of this and other explanations of the law of likeness, we may briefly glance at some of the chief facts with reference to the structure and intimate composition of living beings, with which microscopic study has made us acquainted. When the anatomist or physiologist seeks to unravel the complications of human structure, or when, indeed, he scrutinizes the bodies of all animals, save the very lowest, he finds that each organ or tissue of the body is composed of certain minute vesicles or spheres, to which he gives the name of *cells*. Cells, in fact, are the units of which the bodily whole is composed. Nerves thus resolve themselves, under the microscope, into fibres, and the fibres, in turn, are seen to originate from cells. Muscles similarly originate from muscle-cells. Each tissue, however compact it may appear, is capable of ultimate reduction to cells of characteristic kind. Nor is this all. The cells themselves are in turn composed of smaller particles, and these smaller particles—of infinitesimally minute size—may be regarded as consisting, in turn, of the essential material of life—the *bioplasm* or *protoplasm*—with the name of which every one must be more or less familiar from the part it has played in more than one grave biological controversy. But the body of every living thing is in no case stable, viewed either in its chemical or in its more purely physical aspects. It is continually, as the inevitable result of living and being, undergoing change and alteration. Chemical action is wasting its substance and dissipating its energy with prodigal hand on the one side, and rebuilding and reconstructing its parts on the other. Its material particles are continually being wasted and excreted, while new particles are as incessantly being added to its frame. A never-ending action of waste and repair is maintained within every living being; and it is not the least striking thought which may ensue from the study of such a subject that, notwithstanding the constant renewal of our frames, we continue to preserve the same recognizable form and features. The development of new particles in place of the old appears to follow the same course as that whereby the first formed particles were guided to their place in the developing young. Germs, or “nuclei”—“germinal centres,” as the

physiologist terms them—are abundantly to be descried within most of the tissues. Imbedded among the fibres of muscles, for example, are to be seen the germs from which new muscular fibres will be developed; and in the brain itself such reproductive bodies are to be observed. Thus the growth and continuance of our mental existence may be shown to be dependent on the presence of these new particles, which are destined to renew in a material sense those powers which, of all others in man's nature, most nearly approach the immaterial and spiritual.

Nor, lastly, is the problem of existence and structural complexity lessened in any degree by the consideration that man's frame, as well as that of all other animals, originates from a minute germ, composed primitively of a microscopic speck of living matter, and exhibiting in its earliest stages the essential features of one of the minute cells or units of his tissues. Through the powers with which this living germ-particle has been endowed, it is capable of passing through a defined series of changes, and of developing therefrom a being of more or less complicated kind; while the germ itself must be regarded as transmitting in some fashion or other, and in a material form, the likenesses which link parent and offspring together in so close and intimate a union.

Applying the reasoning of the theory of pangenesis to the explanation of heredity and likeness in the light of the physiological evidence thus briefly detailed, we are required to bear in mind that, as an established fact, the cells of which a living being is composed increase and multiply to form tissues and organs, the new cells retaining the form and essential characters of the parent-cells. The cell, in short, is formed, is nourished, grows, and reproduces its like, as does the body of which it forms part. And botanists and zoölogists would inform us that lowly plants and animals, each consisting of but a single cell, not only exist, but carry on the functions of life as perfectly, when regarded in relation to the wants of their existence, as do the highest animals or most highly-organized plants. Each cell, possessed thus of vital powers, may further be regarded as correlating itself with the life of the body at large, in that it is capable of throwing off minute particles of its substance. These particles, named gemmules, may be supposed to circulate freely through the system, and when duly nourished are regarded as being capable of developing into cells resembling those from which they were derived. These gemmules are further sup-

posed to be thrown off from cells at every stage of the development and growth of a living being. More especially do they aggregate together to form the germ, or the materials from which the germ is formed. Transmitted thus from parent to offspring, the latter may be regarded as potentially composed of the gemmules derived from its parent—which, like the organic molecules of Buffon, are charged with reproducing in the young form the characters they have acquired from the parent.

Regarded from a physiological standpoint, this explanation of the transmission of likeness from parent to offspring appears, it must be owned, to present no difficulties of very formidable kind. Scientific evidence regarding the functions and properties of cells is thoroughly in agreement with the theory, as far as the behavior of these bodily units is concerned. The exercise of scientific faith and the weighing of probabilities commence with the assumption of the development of the gemmules from the cells; and it may be asked if the belief that these gemmules are capable of transmission and aggregation, as held by this theory, is one inconsistent with the tenets and discoveries of biological science at large. If we inquire regarding the feasibility of the mere existence of such minute gemmules, we shall find that physical science opposes no barrier to the favorable reception of such an idea. The inconceivably minute size of the particles, for example, given off from a grain of musk, which scents a room for years without losing so much of its substance as can be determined by the most acute physical tests, lies beyond the farthest limit even of the scientific imagination. The particles of vaccine lymph diffused through the body by the lancet of the vaccinator, are much more minute than the smallest cells; yet, judged by the standard of development and by the effects of their multiplication in our frames, their existence must be regarded as anything but problematical. Then, as regards numbers, the eggs of some animals exist in quantities of which, at the best, we can only form a dim and approximate idea. A small parasitic worm, the *Ascaris*, is known to produce 64,000,000 eggs, and some of the orchids will produce as many seeds; while the fertility of some fishes is almost inconceivable. It has been objected, it is true, to this conception of the manner through which the law of likeness operates, that it is difficult to believe in the complicated powers and tendencies of the gemmules to select and carry the special qualities of the cells from which they originate; and that, in short, the conception credits the gemmules with

powers of too mysterious and occult a kind for ordinary acceptance and belief. But, in answer to this objection, it may be urged that the powers with which the gemmules are credited are not a whit more extraordinary than those possessed by cells, or than those which nerve-cells and nerve-fibres possess, for example, in forming and transmitting the undetermined, mysterious force which, under certain conditions, becomes resolved into thought and mind. The mere conditions of heredity which the theory explains, constitute, in fact, a greater draft upon scientific credulity than is demanded by any conditions or ideas included in the explanation itself. Moreover, there is hardly a condition, illustrated by the examples of heredity and animal development already given, which is insusceptible of explanation through the aid of this theory. The cases of fission illustrated by the fresh-water worms, and the process of budding exemplified by the zoöphyte, become intelligible on the idea that a determination of the gemmules to the parts concerned in these processes takes place, and that by their aggregation they form parts resembling those from which they were derived. The curious phases of reproduction in the plant-lice, in which, it will be remembered, female insects were seen to be capable of producing generation after generation of beings resembling themselves without the intervention of the opposite sex, are likewise explained by the supposition that gemmules aggregate in quantities in the egg-producing organs of the insects. These gemmules are further regarded as being charged with the power of perpetuating the likeness of the stock from which they were originally derived, and being transmitted from one generation to another, until, through some more special modification, the periodical production of fertilized eggs in autumn is once more illustrated. The exact nature of "alternate generations" of the zoöphytes and salpæ becomes clear to us if we presume that the gemmules of the producing form, such as the zoöphyte, are multiplied and specially developed to form the jelly-fish-bud, which, finally, as we have seen, is launched abroad charged with the task of reproducing the zoöphyte. Each egg of the jelly-fish contains thus the gemmules inherited from, and which convey the likeness and form of, the zoöphyte; the special development of new beings seen in this case presenting a contrast to the ordinary increase of the single zoöphyte by budding. The metamorphoses or changes which animals undergo in passing from the egg to the adult state—well illustrated by the insect-class—can similarly

be explained by the deductions of pangenesis, if we suppose that the gemmules which tend to form the perfect being undergo a progressive development, and a gradual elaboration in the earlier stages of the process. And we can the more readily apply this reasoning to the explanation of the manner in which the winged butterfly, for example, is evolved from the caterpillar, when we find that within the chrysalis-case or cocoon the body of the larva is literally broken down and resolved into atomic parts, while, by a wondrous process of reconstruction and rearrangement of these atoms, the perfect insect is in due time formed. Metamorphosis, in this respect, may truly be described as a process of the readjustment and rearrangement of the atoms and gemmules of the insect's frame. The variations of living beings may, in their turn, be explained by assuming an irregularity to exist in the arrangement of the gemmules which unite to form the germ of the varying form. Modified cells will give out modified gemmules, and these last will produce variations in the new being. Any cause producing alterations in the gemmules, either in the direction of over-fertility, or in that of deficiency, will tell with corresponding effect on the germ which they tend to form. While, in cases in which bodily structures, mental qualities, or even diseases, lie dormant in one generation, and become developed in the succeeding race, the gemmules may be regarded as having been transmitted in a latent condition in the former race, and as having been awakened and redeveloped in the latter.

The transmission of active disease to a particular generation, through an intervening and latent stage, represented by the preceding generation, is clearly explicable, if we suppose that the dormant condition acts on the gemmules as rest acts on wearied muscles in serving to restore their pristine strength. Some diseases are known to gain strength and virulence after the lapse of a generation, in which they have lain dormant and inactive. And the reappearance of the diseased condition becomes connected by the explanation just given, to use Mr. Darwin's words, with "the wonderful fact that the child may depart from the type of both its parents, and resemble its grandparents or ancestors removed by many generations."

The relativity of our knowledge, however, forms a subject which may well be suggested as a closing thought. Whether pangenesis or any other explanation of heredity be ultimately proved to be true or not, the consideration must be ever with us, that we are likely to remain ignorant of the primary causes which determine and regulate the more apparent laws of likeness. We may thus scarcely hope to reach that "law within the law" which operates through the medium of secondary laws and ascertainable conditions. But it should form, at the same time, no mean consolation, that we have been able to approach theoretically, at least, toward an understanding of one of the commonest, but at the same time most abstruse, parts of the puzzle of life.—*Gentleman's Magazine*.

FOREST AND FIELD MYTHS.

BY W. R. S. RALSTON.

ONCE upon a time—says a tale widely spread in Asia—four travelers spent a night in a forest, and agreed that one of them should keep watch by turns while the others slept. The first watcher was a carpenter. By way of passing the time, he took his axe, and out of the stem of a tree lying prostrate hard by, fashioned the form of a woman, shapely in figure and comely in face. Then he awoke one of his comrades, and lay down to rest. The second watcher was a tailor. And when he saw the wooden woman lying bare on the ground, he produced his work-basket and bundle of stuffs, and clothed her handsomely

from head to foot. Then he too resumed his slumber, after having aroused the third of the party, who was a jeweler. And the jeweler was struck by the sight of the fair and well-dressed female form leaning against a neighboring tree, and he opened his caskets and decked her with rings, and necklaces, and bracelets. Then he called the last of the party, who was a holy man, strong in prayer and incantation, and went to sleep. And when the fourth watcher saw the wooden woman, so well dressed and decked, he set to work, and by spells and prayers turned her wood into flesh and blood, and inspired her

with life. Just then his three companions awoke, and gazed with wonder and admiration at the lovely creature who stood before them. Simultaneously, each of the four travelers claimed her as his wife; the carpenter because he had framed her, the tailor because he had dressed her, the jeweler because he had adorned her, and the holy man because he had given her life. A fierce dispute arose. The authorities of the neighboring village were in vain appealed to; the problem, as to which of the four had most claim to the hand of the disputed bride, was too difficult for them to solve. At last it was resolved to submit the case to a higher court. The claimants, the judges, and the audience, all went out to the cemetery, and there prayed for a decision from on high. While the prayer went up, the woman leaned against a tree. Suddenly the tree opened, and the woman entered it, and was seen no more. As she disappeared, a voice from on high was heard, saying, "To its origin shall every created thing return."¹

The mythological core of this story is the idea that human and tree life may be connected. The rest of it has been supplied by teachers who wished to inculcate the doctrine that all things return to their first elements, and narrators desirous of framing one of the numerous stories involving a problem or puzzle capable of various solutions. The leading idea has been better preserved in the following modern Greek folk-tale:

There was once a childless wife, who used to lament, saying, "If only I had a child, were it but a laurel-berry!" And Heaven sent her a golden laurel-berry, but its value was not recognized, and it was thrown away. From it sprang a laurel-tree which gleamed with golden twigs. At it a prince, while following the chase, wondered greatly. And determining to return to it, he ordered his cook to prepare a dinner for him beneath its shade. He was obeyed. But during the temporary absence of the cook, the tree opened, and forth came a fair maiden, who strewed a handful of salt over the viands, and then returned into the tree, which immediately closed upon her. The prince returned and scolded the cook for oversalting the dinner. The cook declared his innocence, but in vain. The next day just the same occurred. So on the third day the prince kept watch. The

tree opened, and the maiden came forth. But before she could return into the tree, the prince caught hold of her and carried her off. After a time she escaped from him, ran back to the tree, and called upon it to open. But it remained shut. So she had to return to the prince. And after a while he deserted her. It was not till after long wandering that she found him again, and became his royal consort.²

Hahn thinks this story is founded on the Hellenic belief in Dryads; but it belongs to an earlier mythological family than the Hellenic, though the Dryad and the Laurel-maiden are undoubtedly kinswomen. Long before the Dryads and Oreads had received from the sculpturesque Greek mind their perfection of human form and face, trees were credited with woman-like inhabitants capable of doing good and ill, and with powers of their own, apart from those possessed by their supernatural tenants, of banning and blessing. Therefore was it that they were worshiped, and that recourse was had to them for the strengthening of certain rites. Similar ideas and practices still prevail in Asia; survivals of them may yet be found in Europe. To this day, for instance, one of the features of a Russian marriage is the thrice-repeated walk of the bride and bridegroom around a part of the church. This ceremony is accounted for by reasons in accordance with Christian ideas, but in reality it seems to be connected with the Indian marriage-ceremony of making the bride and bridegroom walk several times round a tree, a rite of which the following story gives a most remarkable form:

A certain thief, having been caught, was impaled. After dark, a woman, who had gone out to fetch water, happened to pass by his place of torture, and accidentally touched his foot, thereby giving him great pain. Grieved thereat, she asked if she could make up for her awkwardness by rendering him any service. "You can," he replied. "It is impossible for me to die comfortably while I am unmarried. You have an unmarried daughter. Marry her to me, and I will pay handsomely for the temporary accommodation." So she went swiftly home, and brought her daughter, and married her to the dying thief—by making her walk four times round the stake on which he was impaled.³

I have told these three tales, chiefly because they are among the few important tree-stories

¹ For the Indian originals of the story, see Benfey's "Panchatantra," i., 489; for the Persian variant, the "Tuti-Nameh or Parrot-Book;" and for a third, in which various additional incidents are given, the Turkish version of the "Tuti-Nameh." The story seems never to have become domesticated in Western Europe.

² Hahn. No. 21. Cf. Basile's "Pentamerone," No. 23; Schott's "Walachische Märchen," No. 24; "Russian Folk-Tales," p. 15.

³ "Baitál Pachisi," No. 18.

which I have not found quoted in the exhaustive work on "Ancient Cults of Forest and Field,"¹ recently published by one of the most painstaking and judicious of living comparative mythologists, Dr. Wilhelm Mannhardt, of Dantzie. To it may be safely referred all serious students of the subjects on which it throws a copious and steady light. It is a work which no mythologist's library should be without. But as the two volumes comprise more than a thousand pages of stiff reading, they are not likely (although provided, according to Dr. Mannhardt's most laudable custom, with copious indexes) to become familiar to the general reader. It may be worth while, therefore, to give a summary of their contents, a rapid survey of the great field of thought over which they range. But first a few words about the author.

As a child (he tells us in a charming sketch of his intellectual life, prefixed to the second volume of the present work), long confinement to a couch gave him the leisure of reading such works as introduced him to the land of classic fable and "the fair humanities of old religion." Later on in healthier boyhood, during long hours spent in the greenwood or by the resounding shore, he became rapt in the study of Milton, Ossian, and the Northern Sagas and Eddas. Then came the eager perusal of Griim's "German Mythology," and the fate of his life was decided. Becoming in 1851 a student in the University of Berlin, he flung himself into the study of mythology. The best-known result of his labors is his "Germanic Myths," a most valuable work, although he now frankly admits that many of its doctrines are erroneous; for he is not now so enthusiastic a disciple of the "storm-myth" school of Kuhn and Schwartz as he then was. Neither does he altogether agree with the "solar-myth" school; having been led, by long and patient study, to the wise conclusion that it is useless to attempt to find any single "Key to all the Mythologies." After filling for some time a professorial chair at Berlin, he was compelled, by a return of bad health, to give up lecturing, and to retire to the secluded post of city librarian at Dantzie. Thence he has followed with unchanging interest the discoveries in Assyrian and Accadian mythology, which have thrown so much light upon the early stages of

Hellenic religious thought. At the same time his residence on the shores of the Baltic has enabled him to study, under exceptionally advantageous circumstances, the remains of ancient Lettish and Lithuanian mythology; a fact to which some of the most interesting portions of his present work bear witness, as well as the valuable but little-known volume he not long ago published on "The Lettish Sun-Myth." In travels also to Holland, Sweden, and the Baltic provinces of Russia, he has collected much information; and, during the wars with Denmark, Austria, and France, he had frequent opportunities of talking with prisoners successively sent from many parts of Europe to Dantzie, and of obtaining from them many a curious custom, legend, or song. Of late years his studies have chiefly been directed to all that illustrates ancient faiths in spirits connected with the growth of herbs, corn, and trees. Some time ago he published, as specimens of his work, a small book on "The Corn-Wolf," and another on "Corn-Demons."¹ But they were received by "a quite death-like silence on the part of the native press—merely a few kindly words from abroad, and the sympathy shown by the Universities of Berlin and Vienna, encouraged him to proceed. Even the first volume of the present work was received in the same discouraging manner in Prussia. Let us trust that the reception of the completed work may be one more in keeping with its great merits.

From the earliest times of which we know anything, men have been inclined to find resemblances between human and tree life. In many cosmogonies these are closely connected, as in the Iranian account of how the first human pair grew up as a single tree, the fingers or twigs of each one folded over the other's ears, till the time came when they were separated, and infused by Ahuramazda with distinct human souls. By the inhabitants of almost every land, trees were supposed to be sentient beings, and survivals of that belief linger on at the present day. Thus in some places trees are informed when their owner dies, in others wood-cutters beg a sound tree's pardon before they fell it. Not only did and does a belief prevail that spirits dwell between the tree-stem and its bark, and that therefore the barking as well as the felling of a tree may dislodge demons capable of doing mischief, but there was a widely-spread belief that trees

¹ "Wald- und Feldkulte," 2 vols. Berlin, 1875-77 (Gründer Bornträger). Ed. Eggers. The volumes are published separately. Vol. i. is entitled "Der Baumkultus," etc., and vol. ii., "Antike Wald- und Feldkulte, aus Nordeuropäischer Ueberlieferung erläutert."

¹ The *Roggenwolf* and *Kornämonen*. The latter word sounds better than its English equivalent, which is open to misapprehension.

had souls of their own; that either a demon lived within the stem, or that human souls, after death, might take up their residence within it. The life of a tree, also, might be linked with that of a man, and the man's health and fortunes might be affected by an action done to the tree. Thus the tremulousness of a shrew-ash might be connected with a man's ague; and the disease might be cured by immuring a living shrew-mouse in the tree, which was then supposed to take back its communicated malady; and thus, according to a widely-spread German belief, if an invalid is passed through a split tree, which is then bound up, the man and the tree enter into sympathetic relations with each other. If the tree flourishes, so will the man; if it withers, he will die. But if he dies while the tree lives on, his soul will inhabit it. If the tree, says Rugen tradition, is afterward cut down, and used for ship-building, the dead man's ghost becomes the haunting patron of the ship. Under these circumstances it is not wonderful that trees should sometimes bleed when wounded. Thus, on one occasion, when a musician cut a piece of wood from a tree, into which a girl had been metamorphosed by her angry mother, blood flowed from the wound. And when he had shaped it into a fiddle-bow, and played with it upon his fiddle before her mother, such a sad wail made itself heard that the mother repented of her hasty deed. As trees are often emblems of, and are connected with, a human being's life and fortunes, they were often introduced into birth and marriage feasts. In Sweden many families took their names from their sacred and thus associated trees. The three families of Linnæus (or Linné), Lindelius, and Tiliander, were all called after the same tree, an ancient linden or lime which grew at Jonsboda Lindergård. When the Lindelius family died out, one of the old lime's chief boughs withered; after the death of the daughter of the great Linnæus, the second main bough bore leaves no more; and, when the last of the Tiliander family expired, the tree's active life came to an end, though the dead trunk still exists, and is highly honored.¹

Sometimes travelers, when starting on a journey, linked their existence with that of a tree, just as Satu, in the oldest of tales, the Egyptian story of the Two Brothers, left his heart behind him in an acacia. For trees were often supposed to exercise a beneficial influence on human

life. As Vård-träd, Guardian-trees, they were the homes of a spirit or genius, who led and guarded the men over whom they kept watch. In the Sailors' Quarter of Copenhagen, according to H. Steffens, each house has its protecting elder-tree, which is religiously guarded and watched; and similar trees have for centuries been connected with Lettish homes. In one Livonian parish, a certain Pastor Carlbon is said to have hewn down eighty such guardian-trees in a single fortnight of the year 1836. It was a tree of this kind which a poor Tyrolese peasant (a story tells) revered so much that he refused to sell it. At length there came a storm which blew it down; and amid its roots the reverent proprietor found a rich treasure. Similar to the Watch-tree was also the Boträ, or Abode-tree, a holy tree honored by sacrifices, and tenanted by elves. Sometimes these are tiny beings, whose linen may be seen, in fine weather, hanging out on the branches to dry. Sometimes they are of the ordinary human dimensions. One of the latter kind, says a Czech story, was a nymph who appeared by day among men, but always went back to her willow by night. She married a mortal, bare him children, and lived happily with him, till at length he cut down her willow-tree; that moment his wife died. Out of the willow was made a cradle which had the power of instantly lulling to sleep the babe she had left behind her; and, when the babe became a child, it was able to hold converse with its dead mother by means of a pipe, cut from the twigs growing on the stump which once had been that mother's home.

From the idea that trees had their peculiar spirits seems to have arisen, Dr. Mannhardt thinks, a belief in wood-spirits in general. Each copse, or wood, or forest, was supposed to have its own denizens, sometimes green of hue and mossy of hide, at other times capable of passing muster as mortal men and women. These female spirits were usually supposed to lead joyous lives, but some of them were liable to be chased and slain by the terrible Wild Huntsman, who, on stormy nights, might be heard tearing at full gallop through the forest. A further generalization may have led to the belief in a genius of tree-life, and of all vegetable life; a genius who was closely connected with growth and fertility, and to whom, therefore, reverence was to be paid, especially at the times when foliage, and flowers, and fruits, are most impressive to the mind of man. With those seasons are connected many surviving rites of time-honored descent. In many of these the genius of vegetation is symbolized under the form

¹ Dr. Mannhardt quotes, as his authorities for this statement, Hyltén-Cavallius, "Värend," i., 144; "Pasarge," "Schweden," p. 217.

of a tree. In the blithe spring-time, when the plant-world has awakened from its winter sleep, the May-tree, the head of the family to which our May-pole belongs, is sought for in the forest all over Northern Europe, is carted away in triumph, and, decked with ribbons and other bravery, is solemnly planted on the village green, or beside the peasant's house. With the summer heats come other feasts, in which trees play a leading part, and, when autumn gilds the fields, the last harvest-wagon is adorned with a tree gayly decked and religiously honored. When a house is finished, a similar tree is placed upon the roof; when a wedding takes place, another is set up before the door of the newly-married couple. And when the short winter day begins to lengthen, the Christmas-tree plays its cheery part—a tree which, Dr. Mannhardt observes, has now become an especially German institution, and follows German emigrants over land and sea to the New World, but which, at the beginning of the present century, was known but to, comparatively speaking, few Germans; just as it remained till about 1830 all but unknown to Hungary, and was unfamiliar later still to England and France, till its observance received an impulse in those countries from the loving hands of Prince Albert and the Duchess Helen of Orleans. Its origin is plainly heathenish, though it has been claimed for the Christian Church, on the ground that the 24th of December is consecrated to Adam and Eve; and a well-known legend relates how Adam brought from paradise a fruit or slip from the Tree of Knowledge, from which eventually sprang the tree from which the cross was made; while another states that a branch from the Tree of Life was planted above Adam's grave, and became the tree from which Christ plucked the fruits of Redemption.

But it was not only under the forms of trees or plants that the human mind symbolized the Spirit of Growth or Vegetation, the genius of spring-tide and harvest-tide. A natural tendency toward imagining that supernatural beings are of like forms to our own led to such spirits being represented under human shapes. Of these, many still survive, though many others have perished. Sometimes these figures were single; sometimes they went in pairs. Of the single figures, the best known to ourselves is the Jack-in-the-Green—our chief representative of the numerous beings who, in various lands, when spring-tide comes, are robed in dresses made of herbs and boughs. Of the coupled symbols of this kind, the most familiar to English minds, not long ago, were the King and Queen of May. For in Old England the May-

King played a prominent part in May revels, though now we are generally accustomed to think only of the May-Queen. But in foreign countries there still exist all sorts of May-kings and May-counts, and the *Mairitt* is still kept up in Germany, though among ourselves the good old English custom of "going a-Maying" has fallen into disrepute, and has been handed over to chimney-sweeps, or, still worse, to negrominstrels.¹ With these May-ridings, and with the somewhat similar midsummer fire-festivals, are connected a number of customs. Most remarkable among them is that of carrying out to the forest a figure made of wood, straw, or some other like material, which is solemnly destroyed either by water or by fire. Similar puppets are thus drowned or burned at various seasons of the year. That which is thus destroyed in spring seems, at least in Slavonic lands, to be a personification of the winter. But in that which is burned at midsummer, Dr. Mannhardt is inclined to see an image of the summer vegetation, parching under the blazing sun. The flinging of a puppet into water may be a rite connected with rain-producing spells, especially as in times of drought the peasants in many Slavonic lands are in the habit of leading about through their villages a youth or girl robed in flowers and foliage, who is afterward solemnly stripped and sluiced with abundant water.

Among the most remarkable features of this rite of destroying a straw-man or other puppet—a rite to which an historical air has been given among us by our burning of Guy Fawkes, a religious meaning among the southern Catholics by their hanging of Judas Iscariot—are the traces which they retain in some lands of an ancient custom of human sacrifice. To this day, in remote districts, especially in Russia, not only are fruits and flowers destroyed along with the figure which seems to be an effigy of either the genius or the enemy of vegetation, but living creatures also are put to death. Thus, in olden days, the Parisians were diverted by the screams of a score of cats, which were burned to death in the midsummer St. John's fire on the Place de Grève. And thus, at the present day, the inhabitants of Luchon, in the Pyrenees, extract great delight from the wriggings of the snakes which, on St. John's Eve, they throw into a fire which is lighted under the auspices of the clergy.² For the clergy

¹ The blackening of faces at May-tide was an ancient custom, much older than the story of the aristocratic young sweep.

² See an account quoted by Dr. Mannhardt (whom nothing seems to escape) from the *Athenæum* of July 24, 1869.

have, in many lands, given their sanction to what is really an old heathenish custom, connected with the ancient Baal or Moloch fires of Asia, the Palilia fires of the old Romans, and the *Not-feuer* or plague-staying Need-fire of our Teutonic and Keltic ancestors. There seems to be good reason for supposing that into these fires, in very ancient times, human beings also were flung. In some places the straw-man, or other figure representing a human being of ordinary size, was replaced by a gigantic wicker-work form. Such a figure as this, six yards high, made of osier-twigs, used to be burned every July in the Rue des Ours at Paris, after having been led in procession through the whole city. This custom, which lasted till 1743, was popularly supposed to date back to the burning of a blasphemous soldier on the same spot in 1418. But that was a perversion of history.¹ Just as figures of the Guy Fawkes kind are yearly burned in lands which never heard of a Gunpowder Plot, so were similar figures to "the Giant of the Rue des Ours" yearly given to the flames in other places. Thus in Brie (Isle de France), *un mannequin d'osier* is said to be burned every 23d of June. Very interesting is it to compare this osier-twig figure with that in which the ancient Britons are said to have burned human beings to death. According to the testimony of Cæsar, Strabo, and Diodorus, the Druids used to construct huge figures of twigs, which they filled with human beings, and then consumed with fire. Thieves and murderers were preferred as sacrifices, but if there were not enough of them forthcoming, innocent persons also had to suffer. Cæsar's gigantic figures, *contexta viminibus*, seem very like the osier-twig giant of the Rue des Ours and his monstrous kin. And there appears to be good reason for supposing that the human sacrifices thus offered up by the Britons were intended to accompany some such rites as those with which the inhabitants of a great part of Europe still hail the advent of spring or midsummer, or attempt to ward off pestilence from their fields and homes. Within the last few years, at least one Russian peasant has been known to sacrifice a poor relation in the hopes of staying an epidemic.

More pleasant than these sacrificial associations are the customs springing from the idea of a bridal pair as a representative of the genius of fertility. From it arose the custom of "May-weddings," still prevalent in many parts of Eu-

rope. There is an ancient and widely-spread prejudice against marrying in May, but the weddings in question are only fictitious and temporary alliances. In honor of the supposed union of the imaginary male and female representatives of the fertilizing powers of Nature, it was, and in many parts of Germany still is, the custom for village lads and lasses to be sportively betrothed to each other at May-time for a year. The ceremony often takes place beside a bonfire lighted for the purpose. The girls thus temporarily bound are known as their lads' May-wives or *Maifrauen*. So in England might similar couples be linked for a year as Valentines, in Germany as *Liebchen* or *Vielliebchen*, in France as *Philippe* and *Philippine*.¹

With all these spring and midsummer festivals in honor of the awakening, after his winter sleep, of the Genius of Vegetation, are closely linked those which take place in the autumn, when the harvest is gathered in. Nearly allied to the Tree-spirits, according to primitive ideas, were the Corn-spirits which haunted and protected the green or yellow fields. But by the popular fancy they were often symbolized under the form of wolves or of "buck-men," goat-legged creatures similar to the classic Satyrs. When the wind bows the long grass or waving grain, German peasants still say, "the Grass-wolf" or "the Corn-wolf is abroad;" in many places the last sheaf of rye is left afield as a shelter for the *Roggenwolf* or Rye-wolf during the winter's cold, and in many a summer or autumn festive rite that being is represented by a rustic, who assumes a wolf-like appearance. The Corn-spirit, however, was often symbolized under a human form. "Corn-mothers" pass over German fields when the grain waves; a "Kirnbaby" is, or was, supposed to dwell in the ears of English wheat; and by Russian eyes Rye-spirits are often seen, tall as the highest corn before harvest-time, short as the cut stems afterward. Many a memory of the Corn-spirit is still preserved in the ceremonies of the harvest-home. All over Europe honor is shown to him in the reception of the last wain-load from a field, in the last sheaf left out in his behalf amid the deserted stubble.

Thus far does Dr. Mannhardt carry his readers in his first volume. His chief aim in it is to show how there seem to have arisen, in the minds of primitive men, a series of ideas respect-

¹ In technical language, an etiological explanation of a custom based on an anthropomorphic form of a Nature-myth.

¹ Valentine has nothing to do, etymologically, with St. Valentine, but comes from *Galantins*, a Norman word for a lover. *Philippine* is a corruption of *Vielliebchen*.

ing the fertilizing and fruit-bearing powers of Nature. At first, he thinks, arose the belief that each tree or plant possesses spiritual as well as physical life, being tenanted either by semi-divine spirits or by the ghosts of the dead. Then came, he supposes, a generalization of this idea, according to which plants or trees collectively, the grassy meadow and the leafy wood, were credited with peculiar inhabitants. And from this a still higher generalization led to a belief in a genius of plant-life or forest-life, or, higher still, a genius of growth or fertility in general. This universal genius of growth was symbolized by a bush or tree, brought in triumph from the forest, gayly decked, and solemnly planted near the homestead or in the village, or by the effigy of a human being, or by a human being dressed in or adorned with foliage and flowers, or by a pair of similar human beings, male and female, who were at times supposed to be a wedded couple. And all these ideas, he clearly shows, prevailed as well in relation to the field as to the forest, especially to the life-supporting cornfield. His second volume is chiefly devoted to a comparison of old Greek and Roman ideas about the semi-divine inhabitants of the meadow and the grove with those prevalent among the inhabitants of the north of Europe, and of the ceremonies which in the north and south sprang out of them.

Very closely connected with the forest and field spirits of the ancient Teutons, Slavs, and Kelts, were the "wild folk" of classic lore. The tree-haunting Dryads of Hellenic times, as well as their successors, the Nereids of modern Greece, were clearly cousins of the northern tree-nymphs. And near relations of the Teutonic and Slavonic Buck-men and Corn-demons must have been the Fauns and Satyrs of ancient days. The similarity between the legends relating to these spirits of the north and south is well illustrated by the following Tyrolese folk-tale: A peasant once hired a maid-servant of unusual strength and skill, under whose guidance his cattle prospered greatly. But after a time, as his family sat at dinner one day, they heard a voice from without cry, "Salome, come!" The maid sprang up and disappeared. And with her seemed to go the prosperity of the house. Some years later, a butcher was passing through a neighboring forest at midnight, when he heard a voice cry, "When thou comest to such and such a place, call out, 'Salome is dead!'" Coming to the appointed place before daybreak, the butcher did as he had been bid. Then from the mountain recesses arose a cry of wailing and loud lament,

and the butcher continued his journey, full of vague alarm. Compare with this the well-known story which so greatly puzzled the Emperor Tiberius—who, whatever his failings may have been, at least was a genuine lover and investigator of the marvelous, though a little too much given to inquire, if Suetonius is to be trusted, what was the name of Hecuba's mother, what name Achilles bore among the maidens, and what songs the Sirens used to sing. As a ship was sailing from Greece to Italy, a voice from the shore hailed one of the passengers, and bade him call out when he came to a certain spot, "The great Pan is dead!" And when he had done so, a wailing cry, as of many voices, was heard resounding along the shore. Common to all Europe, also, was the idea that it was dangerous to work in the middle of the day, for that those who then labored were liable to the wrath of some evil spirit; just as the Hellenic shepherd believed that Pan slept during the sultry noontide-hour, and therefore refrained at that time from music which might awake and irritate that guardian of flocks.¹ So far as the field-spirits and wood-demons of Greece, Italy, and the barbaric North were concerned, there is a wealth of evidence to show that similar views of the forces of Nature, as manifested in beneficial plant-growth and hostile storm-rage, produced all over Europe almost identical beliefs in supernatural inhabitants of meadow, cornfield, grove, and stream. Only the Centaurs offer a difficulty. Their horsey nature has never been quite satisfactorily explained; whether they be considered as kinsmen of the Vedic Gandharvas, or mere personifications of mountain-cataracts, or as wild pre-Hellenic inhabitants of Pelion, or—from Dr. Mannhardt's point of view—as spirits of the hill and wood, descended either from Ixion, the whirlwind, or from trees, as Cheiron from a lime-tree, Pholos from an ash. Their equine nature, he thinks, must have been thrust upon them by some poet or painter, who too literally accepted a now-lost myth, which compared them to horses or metaphorically bestowed upon them equine attributes. Russia seems to be the only land at any distance from Greece, we may observe, in which the Centaur has become naturalized in folk-lore. But his appearance there, under the name of Polkan,² is probably due to the Byzan-

¹ The herdsman's special friend; supposing his name not to be connected with *παν* = all, nor to be derived from a root *pu* = to cleanse, but to spring from a root *pi* = to guard, to pasture, etc., with which are connected *πῶα*, grass, *ποιμην*, a herdsman; cf. *pas-cere*, *pa-nis*, etc. ² *Pol* = half, *kon* = horse.

time traditions, which exercised for centuries so great an influence on early Russian thought and art.

Not only did similar ideas produce a similar mythological population in the woods and fields of Northern and Southern Europe, but they led also to very similar festivals and religious rites. Thus a ceremony is familiar to the west of Germany and the greater part of France, of bringing home on the last harvest-wain a gayly-decorated tree or bough, which is received with all respect by the master, and planted on or near the house, to remain there till the next harvest brings its successor. And some rite of this sort seems to have prevailed all over the north of Europe. So in the autumnal harvest thanksgiving-feast at Athens, it was customary to carry in sacred procession an olive-branch wrapped in wool, called *Eiresiōne*, to the temple of Apollo, and there to leave it; and, in addition to this, a similar bough was solemnly placed beside the house-door of every Athenian who was engaged in agriculture or fruit-culture, there to remain until replaced by a similar successor twelve months later.¹ The ceremonies with which this Athenian counterpart, as Dr. Mannhardt considers it, of the Teutonic *Erntemai*, was attended to its destination, were singularly like those which still survive in Northern Europe as part of the rustic harvest-home rite. In Athens, many of them were supposed to refer to the mythical expedition of Theseus to Crete; but it was a common practice in olden time to combine the harvest thanksgiving with religious rites in commemoration of some historical or traditional deliverance. Another interesting parallel is supplied by the spring-tide rites, celebrated at Rome every March, and certain spring and summer festivals common to the Teutons and Slavs. To this day, in Germany and Russia, as has already been stated, it is customary, either in the early spring or at midsummer, to carry out in procession, to a spot where water flows, some type of the winter which has passed away, or the spring which has reappeared, or the genius of growth and vegetation, dead or slumbering, or brisk and full of life, and there solemnly to lave in the stream, or to fling into it from a bridge, the living Jack-in-the-Green, or the puppet made of straw or leafy boughs; or else (at the midsummer festivals) to pass them through fire, and next day immerse them in running water. At Rome, in olden times, there existed twenty-four

chapels, called *Argei* or *Argeorum Sacra*, solemnly visited by the faithful on the 16th and 17th of March. And under the name of *Argei* were known the twenty-four puppets, fashioned in human shape out of straw or rushes, and clothed and gayly decked, which, on the 13th of May, were carried in procession to the Pons Sublicius, and from it were flung into the Tiber by the Vestal Virgins. An old tradition declared that, originally, human victims were thus flung into the stream as an offering to Saturnus (Kronos) and Dispatēr (Hades); but that, as time passed by, and manners became milder, in place of the men more than sixty years old, who used to be chosen for the purpose, were substituted types in the shape of *Scirpei Quirites*, puppets made of straw or reeds. The sacrifice was supposed to be of an expiatory nature, likely to keep off misfortune and pestilence from the city. It is possible, says Dr. Mannhardt, that at an early period the twenty four *Argei* or puppets may have been carried in March to the chapels which bore the same name, and left there till the time came for their being carried away to the bridge, and thence flung into the river. At all events, the puppets were no doubt closely connected with the chapels, as they seem to be also with the figures formed of or robed in foliage, which were, and still are, flung into northern streams. In the same way interesting parallels are supplied by Teutonic and Slavonic spring and summer festivals to the ancient rites commemorating the death of Adonis or Tammuz. In those ancient Asiatic customs, Dr. Mannhardt sees an embodiment of a prehistoric myth referring to the temporary death of the spring-tide vegetation. The spring itself, or the plant-life it vivifies, was personified as a comely youth, beloved by the goddess of fertility, and united with her during the spring. In the summer heats he leaves her and disappears, but lives on in the unseen world of the dead. He is represented by a figure which is supposed to be dead, and which is mourned over, and laved with or flung into water. At length comes the spring, and with it returns the godlike youth, who is received with joyous rites, his reunion with his divine spouse being typified by temporary unions entered into by their worshippers. So in the north of Europe, the genius of vegetation is still personified under the shape of a living *Laubmann*, or a Jack-in-the-Green, or a *Père-Mai*, and other figures of the same kind, or under the form of a leafy puppet, or a gayly-decked tree. And this is received in spring with a joyous greeting. But at midsummer the Russian peasant, with wailing cries such as attend a corpse,

¹ According to Liddell and Scott, the *Eiresiōne* (*eiros* = wool) was a wool-bound wreath, adorned with fruits.

lays in a coffin a puppet, or flings into a stream a straw-figure, loudly lamenting it as one dead. But when the spring comes back, the typified genius of vegetation is again hailed with mirth and revel, and to the German "May-bridegroom" is given a "May-bride," and lads and lasses in many a European land enter into a kind of fictitious union, lasting for a year, as Valentines and Vielleibchen, and the like.

Lastly may be considered the fires which from time immemorial have blazed at midsummer. Just as the winter solstice has from the earliest times been honored by what are now our Christmas revels, so has the summer solstice been for countless ages celebrated by its fires. The night which precedes St. John's or Midsummer-Day is still rendered brilliant in many a European land by flames, through which spring, not only young people, but also men and women carrying their little ones in their arms. For the flames are supposed to possess a purifying, evil-averting influence. In like manner blazed of old the Phœnician fires in honor of Baal, and the Moloch-fires through which children were passed in order to secure them against evil influences, and the Purim fires into which Haman's effigy was annually flung, the Babylonish demon of dearth having been confused by the Jews with their enemy Haman, just as some similar demon is now represented by a Judas Iscariot or a Guy Fawkes. In like manner do the women of modern Greece spring through a fire on midsummer-eve, crying, "I leave my sins!" So in the early days of Rome, at the spring-tide festival of Palilia, when it was the custom, among other things, for men to spring through fires lighted by sparks obtained from flints: all these bonfires being closely connected also with the "need-fires," employed on special occasions to drive away evil spirits, or avert plagues, fires in which even at the present day birds and beasts are frequently offered in sacrifice; just as in older times human sacrifices were offered up, whether such criminals or unfortunates as Cæsar mentions were burned alive in England, or other human beings were given to the flames, as Manetho asserts, in Egypt, their bodies being consumed, and their ashes scattered to the winds, during the dog-days, in honor of Typhon. One interesting feature of some of these fire-feasts was the running of the initiated barefoot over glowing coals. This was a feat annually performed in honor of the corn-goddess Feronia, at Soracte, by the men who called themselves *Hirpi* or wolves, and who were known as the *Hirpi Sorani*. In them Dr. Mannhardt is inclined to see a personification of the same idea

as that which in the north of Europe has given rise to the belief in corn-wolves; a species of the corn-demon genus. With their barefoot performances he compares the similar feat performed every other harvest-tide by certain Brahmans for the edification of the Badagas in the South-Highlands of Mysore. A missionary relates how one of these Brahmans once came to him to ask for some salve for his feet, which had been burned by the glowing ashes on which he had walked rather longer than was usual or prudent.

There is one feature of Dr. Mannhardt's work to which it is well to call special attention: the rich contribution, namely, which he has made to our knowledge of Lithuanian and Lettish mythology, superstitions, and folk-lore. But very little is known by us of those strange races, now slowly dying out, who, in the northeast of Europe, in Prussia and Russia, feebly represent the once fierce and warlike inhabitants of the grand-duchy of Lithuania, the land which so long clung to its heathenism; the land which for so many centuries, before and after its incorporation with Poland, was a constant source of danger to the growing power of the Grand-Princes of Moscow, afterward the Czars of Russia. Very few scholars are acquainted with the language spoken either by the Letts or by the Lithuanians, a language to which may almost be applied the expression so amusingly misapplied by a popular novelist in reference to Basque, that of its being a kind of "bastard Sanskrit." And still fewer know anything, except through the medium of Nesselmann's German translations, of the rich stores of songs and stories which exist in the memories of the Lettish and Lithuanian people. In spite of what Dr. Mannhardt has already done, especially in his excellent monograph on "The Lettish Sun-Myth," and of what has been done by Dr. W. Pierson and others, but few scholars are in a position to use the copious materials which have been recently laid up at Wilna and other Lithuanian cities. But now that he has placed upon record in his present work so much that is valuable of Lithuanian and Lettish evidence, there no longer exists any excuse for Western ignorance of the subject. All through the two volumes of the "*Wald- und Feldkulte*" are scattered numerous references to the customs, songs, and folk-tales, of the Letts and Lithuanians, people whom Dr. Mannhardt, from his watch-tower at Dantzic, has had peculiar opportunities of observing. It will be sufficient at present to call attention to a few of the most characteristic among their number. For this purpose may be selected the account given in the second volume of a Lith-

uanian harvest-feast, and of a means of averting pestilence. The first is taken from the original MS. of the work (edited by Dr. W. Pierson in 1871) on Lithuanian tradition and folk-lore, compiled during the latter half of the seventeenth century, by Matthias Prätorius and other Lutheran clergymen in Prussian Lithuania, and completed, but not published, in 1703. In it Prätorius describes, among other things, the Lithuanian Samborios or grain-feast. In the early part of December, he says, when the peasants begin thrashing their corn, each husbandman takes nine handfuls of every kind of seed-bearing plant which he cultivates—corn, beans, etc.—and divides each handful into three parts. He then collects the twenty-seven small sheaves thus made into one large heap, and, from part of the grain and other seeds thrashed out of it, bakes a small loaf for each member of his household, mixes the rest with the other materials necessary, and therewith brews beer. The first draught of this beer is reserved for himself, his wife, and his children; the second for the rest of the household and any stranger who may, though uninvited, accidentally be present. When the beer is ready, the father of the family, at eventide, kneels down before the cask, and utters a prayer, commencing with the words, "O fruit-bearing Earth,¹ let our rye and barley and all our grain bear fruit." Then he returns, beer-laden, to the room in which his wife and children await him, together with a cock and hen which lie pinioned on the floor. The father kneels down, holding in his hand the beer-can, and prays for a blessing on his farm and homestead. Then all lift up their hands and say, "O God, and thou, O Earth, we offer to thee this cock and hen; receive them as freely-offered gifts." Then he kills the fowls with a wooden ladle, and hands them over to a maid to be plucked. The housewife then sends away the servants and laborers, and cooks the fowls in an unused pan. When ready, they are placed on a large corn-measure, which is covered with a table-cloth, along with the above-mentioned little cakes, and round this species of altar kneel all the family. The father then utters the Creed and the Ten Commandments, prays for a blessing on the coming year, and three times empties a cup of beer. Then all the others drink in turn, and the cakes and fowls are eaten. All that is eatable must be consumed. The bones

must be gnawed clean by the house-dog before the master's eyes, and afterward reverently buried in the cow-house or stable. During the whole of the day the servants and laborers must be addressed only in kindly terms.

It was not till the year 1386 that the Lithuanians accepted Christianity. Until then heathenism prevailed all over the country, except in a few towns, such as Wilna, where there were many members of the Greek Church, including the reigning family. But in that year Yagello, Grand-Duke of Lithuania, married Jadwiga, Queen of Poland, passed from the Greek to the Latin Church, and made Christianity the religion of his country. The heathen Lithuanians were baptized in troops, the sacred groves were felled, the holy fires were extinguished, and an end was put to the snakes and lizards which till then had been revered if not worshiped. Heathenism, however, though scotched, was not killed, and in the gloomy recesses of Lithuanian forests it long lived on, and was represented for centuries by such feasts as that of "the Thrice-nine" which has just been mentioned, and by such other rites as the following Lettish ceremony whereby to keep off pestilence. It is described in the work published at Riga, in 1636, by a Lutheran superintendent named Einhorn, under the title of "Reformatio gentis Letticæ in Ducatu Curlandiæ." "When a cattle-plague is dreaded," he says, "the peasants hold a solemn feast, which they call *Sobar*. Having contributed a coin apiece, they purchase an ox or other horned beast, which they slay and cook. Each man, also, brings a certain amount of grain, from which they bake cakes and brew beer. Then, all having met together, they call upon God to avert the plague from them, and afterward consume the victuals and drink. This was done," he goes on to say, "in 1602 and 1625, years of murrain and pestilence. But it had to be done secretly, being strictly prohibited by law. Many men have told me," he adds, "that they were warned in dreams, by the spectres which at such times show themselves, to avert a coming plague by a *Sobar*." To this day, the Russian peasants in out-of-the-way places attempt by equally heathenish rites to keep off the dreaded cattle-plague from their herds. On an appointed evening the men are all confined to their homes. The women, wearing nothing but smocks, go outside the village, yoke one of their number to a plough, and follow her, singing the wildest of songs, while she draws the plough round the homesteads which are to be secured against pesti-

¹ *Zeminele*: in Russian *zemlyà*. "Bless us, O Zeminele, bless our cornfields, bless the woods and pastures, too," runs a song, printed for the first time by Dr. Mannhardt, who obtained it from a witness who heard it sung by a peasant in 1866.

lence. Across the magic circle thus traced, they believe that the hostile spirit, the antagonist of the genius of growth and fertility, will not be able to pass. Should any male person be rash enough to intrude upon the rites which are being solemnized by the women, he is attacked and subjected to nearly as severe treatment as Orpheus received at the hands of his countrywomen. This strange kind of plough-driving used to be known in many lands. Akin to it was the old English custom of "ledying of the ploughe aboute the fire as for gode begynnynge of the yere, that they shulde fare the better all the yere followynge." Later on it was partially preserved in the ceremonies still peculiar to "Plough-Monday." Still nearer to it came the German custom described by Naogeorgus in his "Regnum Papisticum," published in 1553. The lads used to pull the lasses out of their houses on Ash-Wednesday, and harness them to a plough, which was then driven from street to street, and from market-place to market-place. On the plough sat a man who played and sang. Behind it went another, who, with the gestures of a sower, strewed sand and ashes behind him. Finally, the plough was driven into a brook, and the girls, after being ducked, were invited to a feast and a dance. In Leipsic a similar rite was solemnized on Shrove-Tuesday, when masked and otherwise disguised youths used to compel every girl they met to help in dragging the plough, by way of a punishment for her not having become married yet. In the year 1499, as a lad was pressing a strong-minded young woman into this compulsory plough-service, she stabbed him, and excused herself before the magistrates on the plea that what she had struck was not a man but "a spectre." To this day the custom has survived, in a mitigated form, at Hollstadt, near Neustadt, where a plough-festival is held once every seven years, in February, one of the features of which is a plough drawn by six of the fairest maidens who can be found, all arrayed in the local costume.

But it is time to stop. Of course it would be absurd to see, in every myth or fable with which the heathen world has edified or amused itself, a reference to vegetation spirits and their foes. To do this would be merely to repeat, with a slight variation, the error of those explorers who, having gazed too earnestly at the glorious sun, can see nothing but solar myths whatever way they turn; or who, blinded by the lightning's flash and deafened by the thunder's roar, recog-

nize a storm-myth in every creation of popular fancy. Such unwise supporters of theories which are sound enough in themselves, and which will carry the investigator safely if he does not lay unfair stress upon them, merely bring into discredit what is really well worthy of credit. The solar myth, for instance, has done right good service while judiciously worked by such a scholar as Prof. Max Müller. But some of his followers have made it ridiculous by such imaginings as that of one of their number, who suggests that the idea of Polyphemos being blinded by a heated stake may have sprung into the mind of some seer, who saw a fir-tree stand out in bold relief against the setting sun. Such reasoners as these do infinite harm to the cause which they support. For, discussing sound truths, they arrive at conclusions which are "reductions to absurdity." And so the ideas which, under Dr. Mannhart's generally judicious guidance, have in these two most valuable volumes of his borne good fruit, worthy of being carefully gathered and garnered, may, in the forcing-house of some too eager and not sufficiently experienced cultivator, bring forth nothing but a kind of mythological Dead Sea apples, neither savory nor nutritious. To him, however, the greatest credit is due. With admirable patience he has gathered from literary treasure-houses, requiring for their ransacking the aid of very many linguistic keys, an immense mass of rich material, and he has arranged and classified and—no small merit—indexed it, in a manner deserving of all praise. Never before have been so clearly detailed the ideas with regard to the field and forest, and their connection with the unseen universe, possibly or probably entertained by the primitive man and his prehistoric descendants—commencing with the comparison of human life with that of the plant-world, and the inclination on the man's part to attribute a soul like unto his own to the sturdy oak, or the clinging ivy, or the daisy's opening bud; the herb or tree being sometimes looked upon as the temporary home or husk of a human soul, torn by a violent death from its fleshy mansion, or reduced to plant-life by the action of a curse or spell, at others being supposed to be the chosen habitation of some kind of demon or haunting spirit, whose good-will was to be propitiated, his ill-will deprecated by prayer and sacrifice—rising from these conceptions about the individual grass, or shrub, or tree, to views with regard to spirits collectively haunting plains, and hills, and woods, whether in the shape of ravenous wolves, or hirsute satyrs, or tricky elves, or divinely beautiful

Oreads and other nymphs; and finally reaching the highest stage of this spiritual development in the imagining of such general spirits of vegetation or growth as have been variously personified by popular fancy under the form of a rustic Jack-in-the-Green or May-Queen, or a princely Adonis, or divine Pan. And, certainly, never have all the

thousand changing aspects, under which these ideas have been represented by popular mythology, been so clearly defined and rendered intelligible as in Dr. Mannhardt's latest contribution to our knowledge of the mystic law of the corn-field, the meadow, and the forest.—*Contemporary Review*.

THE ROMANCE OF ACCIDENT.

MANY of our most important inventions and discoveries owe their origin to the most trivial circumstances; from the simplest causes the most important effects have ensued. The following are a few culled at random for the amusement of our readers:

The trial of two robbers before the Court of Assizes of the Basses-Pyrénées accidentally led to a most interesting archæological discovery. The accused, Rivas a shoemaker, and Bellier a weaver, by armed attacks on the highways and frequent burglaries, had spread terror around the neighborhood of Sisteron. The evidence against them was clear; but no traces could be obtained of the plunder, until one of the men gave a clue to the mystery. Rivas in his youth had been a shepherd-boy near that place, and knew the legend of the Trou d'Argent, a cavern on one of the mountains with sides so precipitous as to be almost inaccessible, and which no one was ever known to have reached. The commissary of police of Sisteron, after extraordinary labor, succeeded in scaling the mountain, and penetrated to the mysterious grotto, where he discovered an enormous quantity of plunder of every description. The way having been once found, the vast cavern was afterward explored by *savants*; and their researches brought to light a number of Roman medals of the third century, flint hatchets, ornamented pottery, and the remains of ruminants of enormous size. These interesting discoveries, however, obtained no indulgence for the accused (inadvertent) pioneers of science, who were sentenced to twenty years' hard labor.

The discovery of gold in Nevada was made by some Mormon immigrants in 1850. Adventurers crossed the Sierras and set up their sluice-boxes in the cañons; but it was gold they were after, and they never suspected the existence of

silver, nor knew it when they saw it. The bluish stuff which was so abundant, and which was silver-ore, interfered with their operations and gave them the greatest annoyance. Two brothers named Grosch possessed more intelligence than their fellow-workers, and were the real discoverers of the Comstock lode; but one of them died from a pickaxe-wound in the foot, and the other was frozen to death in the mountains. Their secret died with them. When at last, in the early part of 1859, the surface croppings of the lode were found, they were worked for the gold they contained, and the silver was thrown out as being worthless. Yet this lode since 1860 has yielded a large proportion of all the silver produced throughout the world. The silver-mines of Potosi were discovered through the trivial circumstance of an Indian accidentally pulling up a shrub, to the roots of which were attached some particles of the precious metal.

During the Thirty Years' War in Germany, the little village of Coserow in the island of Usedom, on the Prussian border of the Baltic, was sacked by the contending armies, the villagers escaping to the hills to save their lives. Among them was a simple pastor named Schwerdler, and his pretty daughter Mary. When the danger was over, the villagers found themselves without houses, food, or money. One day, we are told, Mary went up the Streckelberg to gather blackberries; but soon afterward she ran back joyous and breathless to her father, with two shining pieces of amber each of very great size. She told her father that near the shore the wind had blown away the sand from a vein of amber; that she straightway broke off these pieces with a stick; that there was an ample store of the precious substance; and that she had covered it over to conceal her secret. The amber brought money, food, clothing, and comfort; but those

were superstitious times, and a legend goes that poor Mary was burned for witchcraft. At the village of Stümen, amber was first accidentally found by a rustic who was fortunate enough to turn some up with his plough.

Accidents have prevented as well as caused the working of mines. At the moment that workmen were about to commence operations on a rich gold-mine in the Japanese province of Tskungo, a violent storm of thunder and lightning burst over them, and the miners were obliged to seek shelter elsewhere. These superstitious people, imagining that the tutelar god and protector of the spot, unwilling to have the bowels of the earth thus rifled, had raised the storm to make them sensible of his displeasure, desisted from all further attempts to work the mine.

A cooper in Carniola having one evening placed a new tub under a dropping spring, in order to try if it would hold water, when he came in the morning found it so heavy that he could hardly move it. At first, the superstitious notions that are apt to possess the minds of the ignorant made him suspect that his tub was bewitched; but at last perceiving a shining fluid at the bottom, he went to Laubach, and showed it to an apothecary, who immediately dismissed him with a small gratuity, and bade him bring some more of the same stuff whenever he could meet with it. This the poor cooper frequently did, being highly pleased with his good fortune; till at length the affair being made public, several persons formed themselves into a society in order to search farther into the quicksilver deposits, thus so unexpectedly discovered, and which were destined to become the richest of their kind in Europe.

Curious discoveries by ploughmen, quarrymen, and others, of caves, coins, urns, and other interesting things, would fill volumes. Many valuable literary relics have been preserved by curious accidents, often turning up just in time to save them from crumbling to pieces. Not only mineral but literary treasures have been brought to light when excavating mother earth. For instance, in the foundations of an old house, Luther's "Table-Talk" was discovered "lying in a deep, obscure hole, wrapped in strong linen cloth, which was waxed all over with beeswax within and without." There it had remained hidden ever since its suppression by Pope Gregory XIII. The poems of Propertius, a Roman poet, long lurked unsuspected in the darkness of a wine-cellar, whence they were at length unearthed by accident, just in time to preserve them from de-

struction by rats and mildew. Not only from beneath our feet but from above our heads may chance reveal the hiding-places of treasure-trove. The sudden falling in of a ceiling, for example, of some chambers in Lincoln's Inn, revealed the secret depository of the Thurloe state papers. Other literary treasures have turned up in an equally curious manner. Milton's essay on the "Doctrines of Christianity" was discovered in a bundle of old dispatches; a monk found the only manuscript of Tacitus accidentally in Westphalia; the letters of Lady Mary Montagu were brought to light from the recesses of an old trunk; the manuscripts of Dr. Dee from the secret drawer of an old chest; and it is said that one of the cantos of Dante's great poem was found, after being long mislaid, hidden away beneath a window-sill.

It is curious to trace how the origin of some famous work has been suggested apparently by the merest accident. We need but remind the reader how Lady Austen's suggestion of "the sofa" as a subject for blank verse was the beginning of "The Task," a poem which grew to formidable proportions under Cowper's facile pen. Another example of—

"What great events from trivial causes spring,"

is furnished by Lockhart's account of the gradual growth of "The Lay of the Last Minstrel." The lovely Countess of Dalkeith hears a wild legend of border *diablerie*, and sportively asks Scott to make it the subject of a ballad. The poet's accidental confinement in the midst of a yeomanry camp gave him leisure to meditate his theme to the sound of a bugle; suddenly there flashes on him the idea of extending his simple outline so as to embrace a vivid panorama of that old border-life of war and tumult. A friend's suggestion led to the arrangement and framework of the "Lay" and the conception of the ancient harper. Thus step by step grew the poem that first made its author famous. The manuscript of "Waverley" lay hidden away in an old cabinet for years before the public were aware of its existence. In the words of the Great Unknown: "I had written the greater part of the first volume and sketched other passages, when I mislaid the manuscript; and only found it by the merest accident, as I was rummaging the drawer of an old cabinet; and I took the fancy of finishing it."

Charlotte Brontë's chance discovery of a manuscript volume of verses in her sister Emily's handwriting led, from a mutual confession of the *furor poeticus*, to the joint publication of their

poems, which, though adding little to their subsequent fame, at least gives us another instance of how much of what is called chance has often to do with the carrying out of literary projects. It was the burning of Drury Lane Theatre that led to the production of "The Rejected Addresses," the success of which, says one of the authors, "decided him to embark in that literary career, which the favor of the novel-reading world rendered both pleasant and profitable to him." Most of us know how that famous fairy tale "Alice in Wonderland" came to be written. The characters in "Oliver Twist" of Fagin, Sikes, and Nancy, were suggested by some sketches of Cruikshank, who long had a design to show the life of a London thief by a series of drawings. Dickens, while paying Cruikshank a visit, happened to turn over some sketches in a portfolio. When he came to that one which represents Fagin in the condemned cell, he studied it for half an hour, and told his friend that he was tempted to change the whole plot of his story—not to carry Oliver through adventures in the country, but to take him up into the thieves' den in London, show what this life was, and bring Oliver through it without sin or shame. Cruikshank consented to let Dickens write up to as many of the drawings as he thought would suit his purpose. So the story as it now runs resulted in a great measure from that chance inspection of the artist's portfolio. The remarkable picture of the Jew malefactor in the condemned cell, biting his nails in the torture of remorse, is associated with a happy accident. The artist had been laboring at the subject for several days, and thought the task hopeless; when sitting up in his bed one morning with his hand on his chin and his fingers in his mouth, the whole attitude expressive of despair, he saw his face in the cheval glass. "That's it!" he exclaimed; "that's the expression I want." And he soon finished the picture.

The sudden prosperity of many a famous painter has resulted from some fortunate accident. Anthony Watteau, when a nameless, struggling artist, timidly offered a painting to a rich picture-dealer for six francs, and was on the eve of being scornfully rejected, had not a stranger who happened to be in the shop, come forward, and seeing some talent in the work, spoke encouragingly to the youth, and offered him one hundred and fifty francs for the picture; nor was this all, for he became Watteau's patron and instructor. One day a little shepherd-boy was seated near the road-side on the way from Vespiignano to Florence drawing upon a polished

stone, his only pencil another polished stone which he held in his tiny fingers. A richly-dressed stranger, who had descended from a conveyance that was following him, chanced to pass, and, looking over the boy's shoulder, saw that he had just sketched with wonderful truth and correctness a sheep and its twin lambs. Surprised and pleased, he examined the face of the young artist. Certainly it was not its beauty that attracted him. The child looked up, but with such a marvelous light in his dark eyes, that the stranger exclaimed: "My child, you must come with me; I will be your master and your father: it is some good angel that has led me here." The stranger was Cimabue, the most celebrated painter of that day; and his pupil and *protégé* became the famous painter, sculptor, and architect, Giotto, the friend and admiration of Dante and Petrarch.

How the fortunes of painters may hinge upon the most trifling circumstances has another example in that of Ribera or Spagnoletto, which was determined by a very simple incident. He went to reside with his father-in-law, whose house, it so happened, stood in the vast square, one side of which was occupied by the palace of the Spanish viceroy. It was the custom in Italy, as formerly among the Greeks, that whenever an artist had completed any great work, he should expose it in some street or thoroughfare, for the public to pass judgment on it. In compliance with this usage, Ribera's father-in-law placed in his balcony the "Martyrdom of St. Bartholomew" as soon as it was finished. The people flocked in crowds to see it, and testified their admiration by deafening shouts of applause. These acclamations reached the ears of the viceroy, who imagined that a fresh revolt had broken out, and rushed in complete armor to the spot. There he beheld in the painting the cause of so much tumult. The viceroy desired to see the man who had distinguished himself by so marvelous a production; and his interest in the painter was not lessened on discovering that he was, like himself, a Spaniard. He immediately attached Spagnoletto to his person, gave him an apartment in his palace, and proved a generous patron ever afterward.

Lanfranco, the wealthy and munificent artist, on his way from the church Il Gesù, happened to observe an oil-painting hanging outside a picture-broker's shop. Lanfranco stopped his carriage, and desired the picture to be brought to him. Wiping the thick dust from the canvas, the delighted broker brought it, with many bows and apologies, to the great master, who on nearer in-

spection saw that his first glance had been correct. The picture was labeled "Hagar and her Son Ishmael dying of Thirst," and the subject was treated in a new and powerful manner. Lanfranco looked for the name of the painter, and detecting the word Salvatoriello modestly set in a corner of the picture, he gave instructions to his pupils to buy up every work of Salvatoriello they could find in Naples. To this accident Salvator owed the sudden demand for his pictures, which changed his poverty and depression into comparative ease and satisfaction.

More than one famous singer might probably never have been heard of but for some discriminating patron chancing to hear a beautiful voice, perhaps exercised in the streets for the pence of the compassionate. Some happy stage-bits have resulted from or originated in accidents. The odd hop skip and jump so effective in the delineation of Dundreary, says an American interviewer of Mr. Sothern, was brought about in this way. In the words of the actor: "It was a mere accident. I have naturally an elastic disposition, and during a rehearsal one cold morning I was hopping at the back of the stage, when Miss Keene sarcastically inquired if I was going to introduce that into Dundreary. The actors and actresses standing around laughed; and taking the cue, I replied: 'Yes, Miss Keene; that's my view of the character.' Having said this, I was bound to stick to it; and as I progressed with the rehearsal,

I found that the whole company, including scene-shifters and property-men, were roaring with laughter at my infernal nonsense. When I saw that the public accepted the satire, I toned down what was a broad caricature to what can be seen at the present day by any one who has a quick sense of the absurd."

An excellent landscape of Salvator Rosa's exhibited at the British Institution in 1823 came to be painted in a curious way. The painter happened one day to be amusing himself tuning an old harpsichord; some one observed that he was surprised he could take so much trouble with an instrument that was not worth a crown. "I bet you I make it worth a thousand before I have done with it!" cried Rosa. The bet was taken; and Salvator painted on the harpsichord a landscape that not only sold for a thousand crowns, but was esteemed a first-rate painting. Chemistry and pathology are indebted to what has often seemed the merest chance for many an important discovery. A French paper says it has been accidentally discovered that in cases of epileptic fits, a black-silk handkerchief thrown over the afflicted persons will restore them immediately. Advances in science and art, and sudden success in professions, have often more to do with the romance of accident than most people imagine; but, as we may have occasion again to take up the subject, we quit it for the present.—*Chambers's Journal.*

WASTE SUBSTANCES.

CIGAR-ENDS.

PROBABLY few people in this country are aware that that usually wasted substance, a cigar-end, is utilized in Germany to a large extent, and with even beneficent results.

We can imagine many of our readers wondering what can be the object of collecting these small ends; and we will therefore briefly explain that they are sold for the purpose of being made into snuff, and that the proceeds of such sales are devoted to charitable purposes. There is in Berlin a society called the "Verein der Sammler von Cigarren-Abschnitten," or the Society of Collectors of Cigar-Cuttings," which has been in existence some ten years, and has done much good.

Every Christmas the proceeds of the cigar ends collected by this society and its friends are applied to the purchase of clothes for some poor orphan children. In 1876 about thirty children were clothed by this society, each child being provided with a shirt, a pair of good leather boots, a pair of woolen stockings, a warm dress, and a pocket-handkerchief. In addition to this, a large, well-decorated Christmas-tree is given for their entertainment, and each child is sent home with a good supply of fruit and sweetmeats. Altogether more than two hundred poor orphan children have been clothed by this society simply by the proceeds of such small things as cigar-ends.

The success of the society at Berlin has induced further enterprise in the same direction,

and it is now proposed to erect a building, to be called the "Deutsches Reichs-Waisenhaus" (Imperial German Orphan-Home), where orphans who are left unprovided for may be properly cared for, clothed, and instructed. The site proposed for this institution is at Lahr, in Baden, where there are a number of snuff-manufactories, and it is therefore well adapted to the scheme, which we can only hope may be successfully carried out. Although the directors of this Home propose to have a plan prepared for a large building, only a small part of it will at first be erected, to which each year or two more rooms may be added, in accordance with the original plan, in proportion to the success which is found to attend the undertaking. It will be readily understood that a good many difficulties beset this scheme, for it requires the most perfect coöperation of the smoking community and some assistance also from the non-smokers; but much can be done by friends who will undertake the duty of collecting, and some of the most energetic of these are not unfrequently of the fair sex.

The system of collection, which is extended over a large part of Germany, is generally undertaken by one or two ladies or gentlemen in each town, who collect now and then from their smoking friends the ends which they have been saving up. These collectors either send on the cigar-ends to the central society, or sell them on the spot and transmit the proceeds. This latter plan, when it can be worked, is preferable, as saving expenses in carriage and packing. It is proposed that the number of children which each town shall have the privilege of sending to

the Home shall be regulated according to the amount which they have contributed to the society.

To insure the success of this institution, it will be absolutely necessary for all to unite and work together; each one must not leave it for his neighbor, thinking that one more or less can make no difference. To show, however, what might be accomplished by a thorough unity in this matter, let us say that there are at least some 10,000,000 smokers in Germany; or, to be very much within the mark, we will take only 5,000,000 smokers, who will give themselves the trouble, if such it is, of saving up their cigar-ends; and, assuming that the cigar-ends of each person during one week are worth only a quarter *Pfennig* (10 *Pfennig* = 1 penny English), we have a total revenue for the year of 650,000 marks, or £32,500. Now, these £32,500, which, as a rule, are thrown away and wasted, can be used to provide a home for at least 13,000 poor orphan children. Further, if the 5,000,000 smokers would contribute but once a year the value only of a single cigar, say in Germany one penny, this would make an additional 500,000 marks, or £25,000, which would clothe another 10,000 children.

Now we ask, is it not worth while to be careful in small things, and to save up these usually wasted cigar-ends, when we see what great things might result? We can only conclude by wishing success to this remarkable institution, which has taken for its motto the most appropriate words, "Viele Wenig machen ein Viel;" or, in the words of the old Scottish proverb, "Many a little makes a mickle."—*Chambers's Journal*.

BRIEF NOTES.

Comparative Illuminating Power of Gas and Electric Lights.—The Electric Light Company of Paris has erected a large frame building for the purpose of exhibiting the illuminating power of Jablonskoff's electric candle, and comparing its results with those of coal-gas. A correspondent of the *American Manufacturer*, having attended an exhibition, gives in that journal a very good account of his observations. The hall in which the experiments are made is, he says, about 60 feet long, 40 wide, and 25 high. The walls and ceilings are white. From the latter were suspended three chandeliers, the central one having three "opalized" glass globes about one and a half foot in diameter—each surrounding an elec-

tric candle. The other two chandeliers were ordinary gas lustres, each with 60 bat-wing burners. The latter alone were lighted when the correspondent entered the hall, but they amply sufficed to illuminate it. Soon the gas was suddenly turned off, and six electric candles were lighted. Of these three were on the central chandelier, and the others on three pillars in different parts of the room. Although all these lights were surrounded by large "opalized" globes, the difference between the two illuminations was remarkable. These six candles gave a light much more intense and "whiter" than the 120 naked gas-jets. The eye experienced but little more fatigue in regarding the globes sifting the electric light,

than it does in looking at the ground-glass globes of single gas-burners. On one of the walls of the illuminated hall was a series of silk specimens of all colors and tints, some of the shades being very delicate. Near by was the notice, "The electric light does not alter colors." This statement seemed to be verified by the experiments. At any rate, the smallest differences of tints were easily distinguished. After a time the gas was relighted, but, notwithstanding its great brilliancy at first, its light now seemed quite feeble, and of a dirty-yellow color, as compared with the electric illumination.

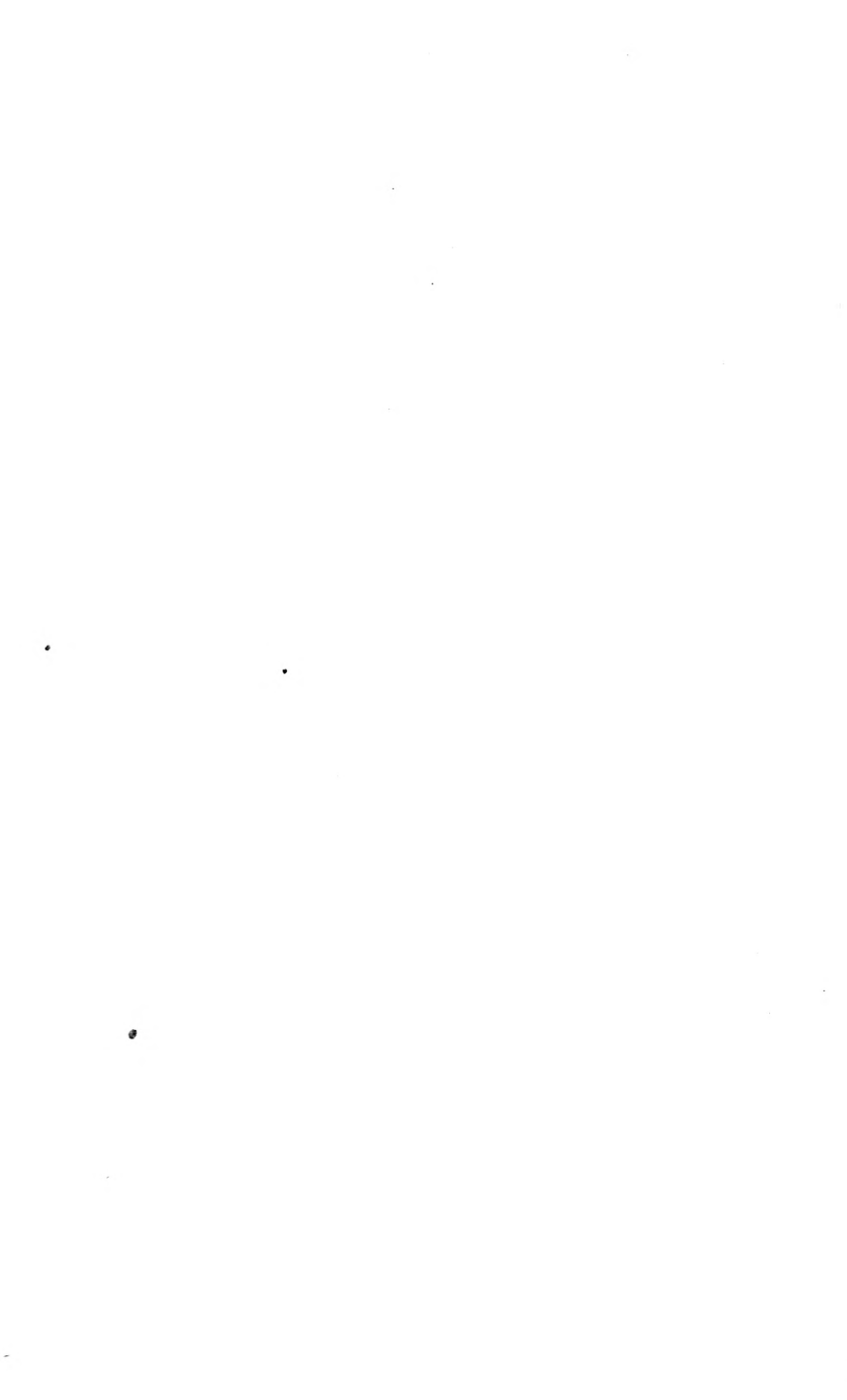
The cost of electrical illumination is estimated at from one-half to one-third the price of gas, for equal quantities of light.

THE anti-malarial action of the eucalyptus-tree is called in question by Mr. Arthur Nichols, who, writing in *Nature*, says that in Queensland, in the very heart of a forest extending for many miles in every direction, and composed mainly of eucalyptus of every variety, he has himself suffered from malaria, and has known many instances of febrile attacks among shepherds and stockmen in the locality. On inquiry, he learned that these attacks were not confined to any particular year, but that every year some cases might be expected. Again, it has been asserted that, wherever the eucalyptus had been introduced on a considerable scale in Algeria, the mosquitoes all disappeared. But this correspondent, writing of Australia, says that he has found these pests so intolerable on high land, where almost the only variety of tree to be found was one variety or another of eucalyptus, and sometimes all, that sleep was impossible while camping out at night, life a burden during the day, by reason of these insects.

The anti-malarial properties of the *Eucalyptus globulus* are commonly supposed to depend exclusively on the emanations from the leaves; but Mr. A. W. Bennett thinks it most probable that the chief effect is produced by the action of the roots on the soil. Writing of this subject in *Nature*, he remarks that the effect of the planting of forests in increasing the rainfall is often erroneously reputed to be due to the "attractive force of the trees" on the moisture in the air, similar to that exerted by a range of mountains; but this supposition he regards as untenable. The mode in which trees mainly act is, he says, by their roots arresting the rainfall which would otherwise escape by the natural drainage of the country; the combined forces of capillarity, osmosis, and transpiration, then cause the ascent through the tissues of the tree of the water thus

arrested, and the larger portion is eventually given off into the air through the stomata of the leaves. In this way a forest-tree will in a very short time give off into the air its own weight of water, which is again deposited as rain or dew. It is quite possible, however, that the effect of the planting of trees may be apparently the reverse of this in swampy regions without natural drainage. The water then accumulates in the soil; and if the country is bare of timber-trees and the sun powerful, a rapid decomposition takes place of the herbaceous vegetation, with consequent emanation of malarial vapors. If trees be planted, the effect is to supply natural drainage; the accumulation of water in the soil, and the consequent noxious effluvia, will be diminished and finally prevented, and the atmosphere rendered, if not drier, at least more wholesome.

Needed Inventions.—Under the title of "Room for Invention," the *Polytechnic Review* points out a number of mechanical problems, the solution of which would be of inestimable service to the human race. The writer of the article, while acknowledging the great benefit conferred by the invention of reaping and mowing machines, calls attention to the need which exists of machines for gathering root-crops and fruit. Sundry fibres that ought to be available in textile art, as ramie, are still intractable. The gorgeous aniline colors fade with a summer's sun. Household fires—once the very emblems of health and cheerfulness—now poison us insidiously but surely. "Our sewers and drains," the author goes on to say, "are confounded in name and use, and both of them are poisonous. Our chimneys breathe forth smoke which is unconsumed fuel, and hence wasteful. Our steam-boilers, with partly-consumed fuel, supply our engines with wet steam, and the engines (whose cylinders have to be supplied with oil, through faulty design and workmanship) waste part of the remainder. Our horses, shod with no regard to humanity or for tractive effect, draw wagons or cars which rattle our teeth out, on roads or rails which rattle the vehicle to pieces. The explosives which long ago were constrained to throw hurtful missiles for miles, have but in one instance—blasting—been employed in peaceful work; if we may except the gunpowder pile-driver, the precursor of a long line of explosive motors yet to come. There is yet no ice-machine which will satisfactorily and economically compete with Nature in supplying a commodity now so great a necessity. For these and hundreds of other evils, inventive genius must provide the remedy."





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