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THE MONIST

THE PRINCIPLES OF MATHEMATICAL PHYSICS.[1]

WHAT is the actual state of mathematical physics? What are the problems it is led to set itself? What is its future? Is its orientation on the point of modifying itself?

Will the aim and the methods of this science appear in ten years to our immediate successors in the same light as to ourselves; or, on the contrary, are we about to witness a profound transformation? Such are the questions we are forced to raise in entering to-day upon our investigation.

If it is easy to propound them, to answer is dfficult.

If we feel ourselves tempted to risk a prognostication, we have, to resist this temptation, only to think of all the stupidities the most eminent savants of a hundred years ago would have uttered, if one had asked them what the science of the nineteenth century would be. They would have believed themselves bold in their predictions, and after the event, how very timid we should have found them.

Do not, therefore, expect of me any prophecy; if I had known what one will discover to-morrow, I would long ago have published it to secure me the priority.

But if, like all prudent physicians, I shun giving a prognosis, nevertheless I cannot dispense with a little diagnostic; well, yes, there are indications of a serious crisis, as if we should expect an approaching transformation.

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[1]An address delivered before the International Congress or Arts and Science, St. Louis, September, 1904. Translated by George Bruce Halsted.

We are assured that the patient will not die of it, and even we can hope that this crisis will be salutary, that it was even necessary for his development. This the history of the past seems to guarantee us.

This crisis in fact is not the first, and for its comprehension it is important to recall those which have preceded it.

Mathematical physics, we know, was born of celestial mechanics, which engendered it at the end of the eighteenth century, at the moment when it itself attained its complete development. During its first years especially, the infant resembled in a striking way its mother.

The astronomic universe is formed of masses, very great without doubt, but separated by intervals so immense, that they appear to us only as material points. These points attract each other in the inverse ratio of the square of the distances, and this attraction is the sole force which influences their movements. But if our senses were sufficiently subtle to show us all the details of the bodies which the physicist studies, the spectacle we should there discover would scarcely differ from what the astronomer contemplates. There also we should see material points, separated one from another by intervals, enormous in relation to their dimensions, and describing orbits following regular laws.

These infinitesimal stars are the atoms. Like the stars properly so called, they attract or repel each other, and this attraction or this repulsion directed following the straight line which joins them, depends only on the distance. The law according to which this force varies as function of the distance is perhaps not the law of Newton, but it is an analogous law; in place of the exponent -2, we have probably a different exponent, and it is from this change of exponent that springs all the diversity of physical phenomena, the variety of qualities and of sensations, all the world colored and sonorous which surrounds us, in a word, all nature.

Such is the primitive conception in all its purity. It only remains to seek in the different cases what value should be given to this exponent in order to explain all the facts. It is on this model that Laplace, for example, constructed his beautiful theory of capil-

larity: he regards it only as a particular case of attraction, or as he says of universal gravitation, and no one is astonished to find it in the middle of one of the five volumes of the *Mécanique céleste*.

More recently Briot believed he had penetrated the final secret of optics in demonstrating that the atoms of ether attract each other in the inverse ratio of the sixth power of the distance; and Maxwell, Maxwell himself, does he not say somewhere that the atoms of gases repel each other in the inverse ratio of the fifth power of the distance? We have the exponent -6, or -5 in place of the exponent -2, but it is always an exponent.

Among the theories of this epoch, one alone is an exception, that of Fourier; in it are indeed atoms, acting at a distance one upon the other; they mutually transmit heat, but they do not attract, they never budge. From this point of view, the theory of Fourier must have appeared to the eyes of his contemporaries, to those of Fourier himself, as imperfect and provisional.

This conception was not without grandeur; it was seductive, and many among us have not finally renounced it; they know that one will attain the ultimate elements of things only by patiently disentangling the complicated skein that our senses give us; that it is necessary to advance step by step, neglecting no intermediary; that our fathers were wrong in wishing to skip stations; but they believe that when one shall have arrived at these ultimate elements, there again will be found the majestic simplicity of celestial mechanics.

Neither has this conception been useless; it has rendered us an inestimable service, since it has contributed to make precise in us the fundamental notion of the physical law.

I will explain myself; how did the ancients understand law? It was for them an internal harmony, static, so to say, and immutable; or it was like a model that nature constrained herself to imitate. A law for us is no more that at all; it is a constant relation between the phenomenon of to-day and that of to-morrow; in a word, it is a differential equation.

Behold the ideal form of physical law; well, it is the law of Newton which first covered it; and then how has one acclimated

this form in physics; precisely in copying as much as possible this law of Newton, that is in imitating celestial mechanics.

Nevertheless, a day arrived when the conception of central forces no longer appeared sufficient, and this is the first of those crises of which I just now spoke.

What did one do then? One gave up trying to penetrate into the detail of the structure of the universe, to isolate the pieces of this vast mechanism, to analyse one by one the forces which put them in motion, and was content to take as guides certain general principles which have precisely for object to spare us this minute study.

How so? Suppose that we have before us any machine; the initial wheel work and the final wheel work alone are visible, but the transmission, the intermediary wheels by which the movement is communicated from one to the other are hidden in the interior and escape our view; we do not know whether the communication is made by gearing or by belts, by connecting-rods or by other dispositives.

Do we say that it is impossible for us to understand anything about this machine so long as we are not permitted to take it to pieces? You know well we do not, and that the principle of the conservation of energy suffices to determine for us the most interesting point. We easily ascertain that the final wheel turns ten times less quickly than the initial wheel, since these two wheels are visible; we are able thence to conclude that a couple applied to the one will be balanced by a couple ten times greater applied to the other. For that there is no need to penetrate the mechanism of this equilibrium and to know how the forces compensate each other in the interior of the machine; it suffices to be assured that this compensation cannot fail to occur.

Well, in regard to the universe, the principle of the conservation of energy is able to render us the same service. This is also a machine, much more complicated than all those of industry, and of which almost all the parts are profoundly hidden from us; but in observing the movement of those that we can see, we are able, aiding ourselves by this principle, to draw conclusions which remain

true whatever may be the details of the invisible mechanism which animates them.

The principle of the conservation of energy, or the principle of Mayer, is certainly the most important, but it is not the only one; there are others from which we are able to draw the same advantage. These are:

The principle of Carnot, or the principle of the degradation of energy.

The principle of Newton, or the principle of the equality of action and reaction.

The principle of relativity, according to which the laws of physical phenomena should be the same, whether for an observer fixed, or for an observer carried along in a uniform movement of translation; so that we have not and could not have any means of discerning whether or not we are carried along in such a motion.

The principle of the conservation of mass, or principle of Lavoisier.

I would add the principle of least action.

The application of these five or six general principles to the different physical phenomena is sufficient for our learning of them what we could reasonably hope to know of them.

The most remarkable example of this new mathematical physics is, beyond contradiction, Maxwell's electro-magnetic theory of light.

We know nothing as to what is the ether, how its molecules are disposed, whether they attract or repel each other; but we know that this medium transmits at the same time the optical perturbations and the electrical perturbations; we know that this transmission should be made conformably to the general principles of mechanics and that suffices us for the establishment of the equations of the electro-magnetic field.

These principles are results of experiments boldly generalised; but they seem to derive from their generality itself an eminent degree of certitude.

In fact the more general they are, the more frequently one has

the occasion to check them, and the verifications, in multiplying themselves, in taking forms the most varied and the most unexpected, finish by leaving no longer place for doubt.

Such is the second phase of the history of mathematical physics and we have not yet emerged from it.

Do we say that the first has been useless? that during fifty years science went the wrong way, and that there is nothing left but to forget so many accumulated efforts that a vicious conception condemned in advance to non-success?

Not the least in the world.

Do you believe that the second phase could have come into existence without the first?

The hypothesis of central forces contained all the principles; it involved them as necessary consequences; it involved both the conservation of energy and that of masses, and the equality of action and reaction; and the law of least action, which would appear, it is true, not as experimental verities, but as theorems and of which the enunciation would have at the same time a something more precise and less general than under their actual form.

It is the mathematical physics of our fathers which has familiarised us little by little with these divers principles; which has habituated us to recognise them under the different vestments in which they disguise themselves. One has compared them to the data of experience, or has seen how it was necessary to modify their enunciation to adapt them to these data; thereby they have been enlarged and consolidated.

So one has been led to regard them as experimental verities; the conception of central forces became then a useless support, or rather an embarrassment, since it made the principles partake of its hypothetical character.

The frames have not therefore broken, because they were elastic; but they have enlarged; our fathers, who established them, did not work in vain, and we recognise in the science of to-day the general traits of the sketch which they traced.

Are we about to enter now upon the eve of a second crisis? These principles on which we have built all are they about to

crumble away in their turn? Since some time, this may well be asked.

In hearing me speak thus, you think without doubt of radium, that grand revolutionist of the present time, and in fact I will come back to it presently; but there is something else.

It is not alone the conservation of energy which is in question; all the other principles are equally in danger, as we shall see in passing them successively in review.

Let us commence with the principle of Carnot. This is the only one which does not present itself as an immediate consequence of the hypothesis of central forces; more than that, it seems if not to directly contradict that hypothesis, at least not to be reconciled with it without a certain effort.

If physical phenomena were due exclusively to the movements of atoms whose mutual attraction depended only on the distance, it seems that all these phenomena should be reversible; if all the initial velocities were reversed, these atoms, always subjected to the same forces, ought to go over their trajectories in the contrary sense, just as the earth would describe in the retrograde sense this same elliptic orbit which it describes in the direct sense, if the initial conditions of its movement had been reversed. On this account, if a physical phenomenon is possible, the inverse phenomenon should be equally so, and one should be able to reascend the course of time.

But it is not so in nature, and this is precisely what the principle of Carnot teaches us; heat can pass from the warm body to the cold body; it is impossible afterwards to make it reascend the inverse way and re-establish differences of temperature which have been effaced.

Motion can be wholly dissipated and transformed into heat by friction; the contrary transformation can never be made except in a partial manner.

We have striven to reconcile this apparent contradiction. If the world tends toward uniformity, this is not because its ultimate parts, at first unlike, tend to become less and less different, it is because, shifting at hazard, they end by blending. For an eye which

should distinguish all the elements, the variety would remain always as great, each grain of this dust preserves its originality and does not model itself on its neighbors; but as the blend becomes more and more intimate, our gross senses perceive no more than the uniformity. Behold why, for example, temperatures tend to a level, without the possibility of turning backwards.

A drop of wine falls into a glass of water; whatever may be the law of the internal movements of the liquid, we soon see it colored of a uniform rosy tint and from this moment, one may well shake the vase, the wine and the water do not seem able any more to separate. See, thus, what would be the type of the reversible physical phenomenon: to hide a grain of barley in a cup of wheat, this is easy; afterwards to find it again and get it out, this is practically impossible.

All this Maxwell and Boltzmann have explained; the one who has seen it most clearly, in a book too little read because it is a little difficult to read, is Gibbs, in his *Elemetary Principles of Statistical Mechanics*.

For those who take this point of view, the principle of Carnot is only an imperfect principle, a sort of concession to the infirmity of our senses; it is because our eyes are too gross that we do not distinguish the elements of the blend; it is because our hands are too gross that we cannot force them to separate; the imaginary demon of Maxwell, who is able to sort the molecules one by one, could well constrain the world to return backward. Can it return of itself? That is not impossible; that is only infinitely improbable.

The chances are that we should long await the concourse of circumstances which would permit a retrogradation, but soon or late, they would be realised, after years whose number it would take millions of figures to write.

These reservations, however, all remained theoretic and were not very disquieting, and the principle of Carnot retained all its practical value.

But here the scene changes.

The biologist, armed with his microscope, long ago noticed in his preparations disorderly movements of little particles in suspen-

sion: this is the Brownian movement; he first thought this was a vital phenomenon, but soon he saw that the inanimate bodies danced with no less ardor than the others; then he turned the matter over to the physicists. Unhappily, the physicists remained long uninterested in this question; one concentrates the light to illuminate the microscopic preparation, thought they; with light goes heat; thence inequalities of temperature and in the liquid interior currents which produce the movements of which we speak.

M. Gouy had the idea to look more closely, and he saw or thought he saw that this explanation is untenable, that the movements become more brisk as the particles are smaller, but that they are not influenced by the mode of illumination.

If then these movements never cease, or rather are reborn without cease, without borrowing anything from an external source of energy, what ought we to believe? To be sure, we should not renounce our belief in the conservation of energy, but we see under our eyes now motion transformed into heat by friction, now heat changed inversely into motion, and that without loss since the movement lasts forever. This is the contrary of the principle of Carnot.

If this be so, to see the world return backward, we no longer have need of the infinitely subtle eye of Maxwell's demon; our microscope suffices us. Bodies too large, those, for example, which are a tenth of a millimeter, are hit from all sides by moving atoms, but they do not budge, because these shocks are very numerous and the law of chance makes them compensate each other: but the smaller particles receive too few shocks for this compensation to take place with certainty and are incessantly knocked about. And behold already one of our principles in peril.

We come to the principle of relativity: this not only is confirmed by daily experience, not only is it a necessary consequence of the hypothesis of central forces, but it is imposed in an irresistible way upon our good sense, and yet it also is battered.

Consider two electrified bodies; though they seem to us at rest, they are both carried along by the motion of the earth; an electric charge in motion, Rowland has taught us, is equivalent to a current; these two charged bodies are, therefore, equivalent to two parallel

currents of the same sense and these two currents should attract each other. In measuring this attraction, we measure the velocity of the earth; not its velocity in relation to the sun or the fixed stars, but its absolute velocity.

I well know what one will say, it is not its absolute velocity that is measured, it is its velocity in relation to the ether. How unsatisfactory that is! Is it not evident that from the principle so understood we could no longer get anything? It could no longer tell us anything just because it would no longer fear any contradiction.

If we succeed in measuring anything, we would always be free to say that this is not the absolute velocity in relation to the ether, it might always be the velocity in relation to some new unknown fluid with which we might fill space.

Indeed, experience has taken on itself to ruin this interpretation of the principle of relativity; all attempts to measure the velocity of the earth in relation to the ether have led to negative results. This time experimental physics has been more faithful to the principle than mathematical physics; the theorists, to put in accord their other general views, would not have spared it; but experiment has been stubborn in confirming it.

The means have been varied in a thousand ways and finally Michelson has pushed precision to its last limits; nothing has come of it. It is precisely to explain this obstinacy that the mathematicians are forced to-day to employ all their ingenuity.

Their task was not easy, and if Lorentz has gotten through it, it is only by accumulating hypotheses. The most ingenious idea has been that of local time.

Imagine two observers who wish to adjust their watches by optical signals; they exchange signals, but as they know that the transmission of light is not instantaneous, they take care to cross them.

When the station B perceives the signal from the station A, its clock should not mark the same hour as that of the station A at the moment of sending the signal, but this hour augmented by a constant representing the duration of the transmission. Suppose, for

example, that the station A sends its signal when its clock marks the hour o, and that the station B perceives it when its clock marks the hour t. The clocks are adjusted if the slowness equal to t represents the duration of the transmission, and to verify it, the station B sends in its turn a signal when its clock marks o; then the station A should perceive it when its clock marks t. The time-pieces are then adjusted. And in fact, they mark the same hour at the same physical instant, but on one condition, which is that the two stations are fixed. In the contrary case the duration of the transmission will not be the same in the two senses, since the station A, for example, moves forward to meet the optical perturbation emanating from B, while the station B flies away before the perturbation emanating from A. The watches adjusted in that manner do not mark, therefore, the true time, they mark what one may call the *local time,* so that one of them goes slow on the other. It matters little since we have no means of perceiving it. All the phenomena which happen at A, for example, will be late, but all will be equally so, and the observer who ascertains them will not perceive it since his watch is slow; so as the principle of relativity would have it, he will have no means of knowing whether he is at rest or in absolute motion.

Unhappily, that does not suffice, and complemetary hypotheses are necessary; it is necessary to admit that bodies in motion undergo a uniform contraction in the sense of the motion. One of the diameters of the earth, for example, is shrunk by $\frac{1}{200\,000\,000}$ in consequence of the motion of our planet, while the other diameter retains its normal length. Thus, the last little differences find themselves compensated. And, then, there still is the hypothesis about forces. Forces, whatever be their origin, gravity as well as elasticity, would be reduced in a certain proportion in a world animated by a unform translation; or, rather, this would happen for the components perpendicular to the translation; the components parallel would not change.

Resume, then, our example of two electrified bodies; these bodies repel each other, but at the same time if all is carried along in a uniform translation, they are equivalent to two parallel currents of the same sense which attract each other. This electro-dynamic

attraction diminishes, therefore, the electro-static repulsion, and the total repulsion is more feeble than if the two bodies were at rest. But since to measure this repulsion we must balance it by another force, and all these other forces are reduced in the same proportion, we perceive nothing.

Thus, all is arranged, but are all the doubts dissipated?

What would happen if one could communicate by non-luminous signals whose velocity of propagation differed from that of light? If, after having adjusted the watches by the optical procedure, one wished to verify the adjustment by the aid of these new signals, then would appear divergences which would render evident the common translation of the two stations. And are such signals inconceivable, if we admit with Laplace that universal gravitation is transmitted a million times more rapidly than light?

Thus, the principle of relativity has been valiantly defended in these latter times, but the very energy of the defence proves how serious was the attack.

Let us speak now of the principle of Newton, on the equality of action and reaction.

This is intimately bound up with the preceding, and it seems indeed that the fall of the one would involve that of the other. Thus we should not be astonished to find here the same difficulties.

Electrical phenomena, we think, are due to the displacements of little charged particles, called electrons, immersed in the medium that we call ether. The movements of these electrons produce perturbations in the neighboring ether; these perturbations propagate themselves in every direction with the velocity of light, and in turn other electrons, originally at rest, are made to vibrate when the perturbation reaches the parts of the ether which touch them.

The electrons, therefore, act on one another, but this action is not direct, it is accomplished through the ether as intermediary.

Under these conditions can there be compensation between action and reaction, at least for an observer who should take account only of the movements of matter, that is to say, of the electrons, and who should be ignorant of those of the ether that he could not see? Evidently not. Even if the compensation should be exact, it could

not be simultaneous. The perturbation is propagated with a finite velocity; it, therefore, reaches the second electron only when the first has long ago entered upon its rest.

This second electron, therefore, will undergo, after a delay, the action of the first, but certainly it will not react on this, since around this first electron nothing any longer budges.

The analysis of the facts permits us to be still more precise. Imagine, for example, a Hertzian generator, like those employed in wireless telegraphy; it sends out energy in every direction; but we can provide it with a parabolic mirror, as Hertz did with his smallest generators, so as to send all the energy produced in a single direction.

What happens then according to the theory? It is that the apparatus recoils as if it were a gun and as if the energy it has projected were a bullet; and that is contrary to the principle of Newton, since our projectile here has no mass, it is not matter, it is energy.

It is still the same, moreover, with a beacon light provided with a reflector, since light is nothing but a perturbation of the electromagnetic field. This beacon light should recoil as if the light it sends out were a projectile. What is the force that this recoil should produce? It is what one has called the Maxwell-Bartholdi pressure. It is very minute, and it has been difficult to put it into evidence even with the most sensitive radiometers; but it suffices that it exists.

If all the energy issuing from our generator falls on a receiver, this will act as if it had received a mechanical shock, which will represent in a sense the compensation of the recoil of the generator; the reaction will be equal to the action, but it will not be simultaneous; the receiver will move on but not at the moment when the generator recoils. If the energy propagates itself indefinitely without encountering a receiver, the compensation will never be made.

Does one say that the space which separates the generator from the receiver and which the perturbation must pass over in going from the one to the other is not void, that it is full not only of ether, but of air; or even in the interplanetary spaces of some fluid subtle but

still ponderable; that this matter undergoes the shock like the receiver at the moment when the energy reaches it, and recoils in its turn when the perturbation quits it? That would save the principle of Newton, but that is not true.

If energy in its diffusion remained always attached to some material substratum, then matter in motion would carry along light with it, and Fizeau has demonstrated that it does nothing of the sort, at least for air. This is what Michelson and Morley have since confirmed.

One may suppose also that the movements of matter, properly so called, are exactly compensated by those of the ether; but that would lead us to the same reflections as just now. The principle so extended would explain everything, since whatever might be the visible movements, we would always have the power of imagining hypothetical movements which compensated them.

But if it is able to explain everything, this is because it does not permit us to foresee anything; it does not enable us to decide between different possible hypotheses, since it explains everything beforehand. It therefore becomes useless.

And then the suppositions that it would be necessary to make on the movements of the ether are not very satisfactory.

If the electric charges double, it would be natural to imagine that the velocities of the divers atoms of ether double also, and for the compensation, it would be necessary that the mean velocity of the ether quadruple.

This is why I have long thought that these consequences of theory, contrary to the principle of Newton, would end some day by being abandoned, and yet the recent experiments on the movements of the electrons issuing from radium seem rather to confirm them.

I arrive at the principle of Lavoisier on the conservation of masses: certes, this is one not to be touched without unsettling all mechanics.

And now certain persons think that it seems true to us only because one considers in mechanics merely moderate velocities, but that it would cease to be true for bodies animated by velocities com-

parable to that of light. Now these velocities, it is believed at present, they have been realised; the cathode rays or those of radium may be formed of very minute particles or of electrons which are displaced with velocities smaller no doubt than that of light, but which might be its one-tenth or one-third.

These rays can be deflected, whether by an electric field, or by a magnetic field, and we are able by comparing these deflections, to measure at the same time the velocity of the electrons and their mass (or rather the relation of their mass to their charge). But when it was seen that these velocities approached that of light, it was decided that a correction was necessary.

These molecules, being electrified, could not be displaced without agitating the ether; to put them in motion it is necessary to overcome a double inertia, that of the molecule itself and that of the ether. The total or apparent mass that one measures is composed, therefore, of two parts: the real or mechanical mass of the molecule and the electro-dynamic mass representing the inertia of the ether.

The calculations of Abraham and the experiments of Kaufmann have then shown that the mechanical mass, properly so called, is null, and that the mass of the electrons, or, at least, of the negative electrons, is of exclusively electro-dynamic origin. This forces us to change the definition of mass; we cannot any longer distinguish mechanical mass and electro-dynamic mass, since then the first would vanish; there is no mass other than electro-dynamic inertia. But, in this case the mass can no longer be constant, it augments with the velocity, and it even depends on the direction, and a body animated by a notable velocity will not oppose the same inertia to the forces which tend to deflect it from its route, as to those which tend to accelerate or to retard its progress.

There is still a resource; the ultimate elements of bodies are electrons, some charged negatively, the others charged positively. The negative electrons have no mass, this is understood; but the positive electrons, from the little we know of them, seem much greater. Perhaps, they have, besides their electro-dynamic mass, a true mechanical mass. The veritable mass of a body would, then,

be the sum of the mechanical masses of its positive electrons, the negative electrons not counting; mass so defined could still be constant.

Alas, this resource also evades us. Recall what we have said of the principle of relativity and of the efforts made to save it. And it is not merely a principle which it is a question of saving, such are the indubitable results of the experiments of Michelson.

Lorentz has been obliged to suppose that all the forces, whatever be their origin, were affected with a coefficient in a medium animated by a uniform translation; this is not sufficient, it is still necessary, says he, that *the masses of all the particles be influenced by a translation to the same degree as the electro-magnetic masses of the electrons.*

So the mechanical masses will vary in accordance with the same laws as the electro-dynamic masses; they cannot, therefore, be constant.

Need I point out that the fall of the principle of Lavoisier involves that of the principle of Newton? This latter signifies that the center of gravity of an isolated system moves in a straight line; but if there is no longer a constant mass, there is no longer a center of gravity, we no longer know even what this is. This is why I said above that the experiments on the cathode rays appeared to justify the doubts of Lorentz on the subject of the principle of Newton.

From all these results, if they are confirmed, would arise an entirely new mechanics, which would be, above all, characterised by this fact, that no velocity could surpass that of light, any more than any temperature could fall below the zero absolute, because bodies would oppose an increasing inertia to the causes, which would tend to accelerate their motion; and this inertia would become infinite when one approached the velocity of light.

No more for an observer carried along himself in a translation he did not suspect could any apparent velocity surpass that of light; and this would be then a contradiction, if we recall that this observer would not use the same clocks as a fixed observer, but, indeed, clocks marking "local time."

Here we are then facing a question I content myself with stating. If there is no longer any mass, what becomes of the law of Newton?

Mass has two aspects, it is at the same time a coefficient of inertia and an attracting mass entering as factor into Newtonian attraction. If the coefficient of inertia is not constant, can the attracting mass be? That is the question.

At least, the principle of the conservation of energy yet remains to us, and this seems more solid. Shall I recall to you how it was in its turn thrown into discredit? This event has made more noise than the preceding and it is in all the memoirs.

From the first works of Becquerel, and, above all, when the Curies had discovered radium, one saw that every radio-active body was an inexhaustible source of radiations. Its activity would seem to subsist without alteration throughout the months and the years. This was already a strain on the principles: these radiations were in fact energy, and from the same morsel of radium this issued and forever issued. But these quantities of energy were too slight to be measured; at least one believed so and was not much disquieted.

The scene changed when Curie bethought himself to put radium in a calorimeter; one saw, then, that the quantity of heat incessantly created was very notable.

The explanations proposed were numerous; but in such case we cannot say, "store is no sore."

In so far as no one of them has prevailed over the others, we cannot be sure there is a good one among them.

Sir W. Ramsay has striven to show that radium is in process of transformation, that it contains a store of energy enormous but not inexhaustible.

The transformation of radium then would produce a million times more of heat than all known transformations; radium would wear itself out in 1250 years; you see that we are at least certain to be settled on this point some hundreds of years from now. While waiting our doubts remain.

In the midst of so many ruins what remains standing? The principle of least action is hitherto intact, and Larmor appears to

believe that it will long survive the others; in reality, it is still more vague and more general.

In presence of this general ruin of the principles, what attitude will mathematical physics take?

And first, before too much excitement, it is proper to ask if all that is really true. All these derogations to the principles are encountered only among infinitesimals; the microscope is necessary to see the Brownian movement; electrons are very light; radium is very rare, and one never has more than some milligrams of it at a time.

And, then, it may be asked if, beside the infinitesimal seen, there be not another infinitesimal unseen counterpoise to the first.

So, there is an interlocutory question, and, as it seems, only experiment can solve it. We have, therefore, only to hand over the matter to the experimenters, and while waiting for them to finally decide the debate, not to preoccupy ourselves with these disquieting problems, and to tranquilly continue our work, as if the principles were still uncontested. Certes, we have much to do without leaving the domain where they may be applied in all security; we have enough to employ our activity during this period of doubts.

And as to these doubts, is it indeed true that we can do nothing to disembarrass science of them? It may be said, it is not alone experimental physics that has given birth to them; mathematical physics has well contributed. It is the experimenters who have seen radium throw out energy, but it is the theorists who have put in evidence all the difficulties raised by the propagation of light across a medium in motion; but for these it is probable we should not have become conscious of them. Well, then, if they have done their best to put us into this embarrassment, it is proper also that they help us to get out of it.

They must subject to critical examination all these new views I have just outlined before you, and abandon the principles only after having made a loyal effort to save them.

What can they do in this sense? That is what I will try to explain.

Among the most interesting problems of mathematical physics, it is proper to give a special place to those relating to the kinetic

theory of gases. Much has already been done in this direction, but much still remains to be done. This theory is an eternal paradox. We have reversibility in the premises and irreversibility in the conclusions; and between the two an abyss. Statistic considerations, the law of great numbers, do they suffice to fill it? Many points still remain obscure to which it is necessary to return, and doubtless many times. In clearing them up, we will undersand better the sense of the principle of Carnot and its place in the ensemble of dynamics, and we will be better armed to properly interpret the curious experiment of Gouy, of which I spoke above.

Should we not also endeavor to obtain a more satisfactory theory of the electro-dynamics of bodies in motion? It is there especially, as I have sufficiently shown above, that difficulties acumulate. Evidently we must heap up hypotheses, we cannot satisfy all the principles at once; heretofore, one has succeeded in safeguarding some only on condition of sacrificing the others; but all hope of obtaining better results is not yet lost. Let us take, therefore, the theory of Lorentz, turn it in all senses, modify it little by little, and perhaps everything will arrange itself.

Thus in place of supposing that bodies in motion undergo a contraction in the sense of the motion, and that this contraction is the same whatever be the nature of these bodies and the forces to which they are otherwise submitted, could we not make an hypothesis more simple and more natural?

We might imagine, for example, that it is the ether which is modified when it is in relative motion in reference to the material medium which it penetrates, that when it is thus modified, it no longer transmits perturbations with the same velocity in every direction. It might transmit more rapidly those which are propagated parallel to the medium, whether in the same sense or in the opposite sense, and less rapidly those which are propagated perpendicularly. The wave surfaces would no longer be spheres, but ellipsoids, and we could dispense with that extraordinary contraction of all bodies.

I cite that only as an example, since the modifications, one might essay, would be evidently susceptible of infinite variation.

It is possible also that astronomy may some day furnish us data

on this point; she it was in the main who raised the question in making us acquainted with the phenomenon of the aberration of light. If we make crudely the theory of aberration, we reach a very curious result. The apparent positions of the stars differ from their real positions because of the motion of the earth, and as this motion is variable, these apparent positions vary. The real position we cannot know, but we can observe the variations of the apparent position. The observations of the aberration show us, therefore, not the movement of the earth, but the variations of this movement; they cannot, therefore, give us information about the absolute motion of the earth. At least this is true in first approximation, but it would be no longer the same if we could appreciate the thousandths of a second. Then it would be seen that the amplitude of the oscillation depends not alone on the variation of the motion, variation which is well known, since it is the motion of our globe on its elliptic orbit, but on the mean value of this motion; so that the constant of aberration would not be altogether the same for all the stars, and the differences would tell us the absolute motion of the earth in space.

This, then, would be, under another form, the ruin of the principle of relativity. We are far, it is true, from appreciating the thousandths of a second, but after all, say some, the total absolute velocity of the earth may be much greater than its relative velocity with respect to the sun. If, for example, it were 300 kilometers per second in place of 30, this would suffice to make the phenomena observable.

I believe that in reasoning thus one admits a too simple theory of aberration. Michelson has shown us, I have told you, that the physical procedures are powerless to put in evidence absolute motion; I am persuaded that the same will be true of the astronomic procedures, however far one pushes precision.

However that may be, the data astronomy will furnish us in this regard will some day be precious to the physicist. While waiting, I believe, the theorists, recalling the experience of Michelson, may anticipate a negative result, and that they would accomplish a

useful work in constructing a theory of aberration which would explain this in advance.

But let us come back to the earth. There also we may aid the experimenters. We can, for example, prepare the ground by studying profoundly the dynamics of electrons; not be it understood in starting from a single hypothesis, but in multiplying hypotheses as much as possible. It will be then for the physicists to utilise our work in seeking the crucial experiment to decide between these different hypotheses.

This dynamics of electrons can be approached from many sides, but among the ways leading thither is one which has been somewhat neglected, and yet this is one of those which promise us most of surprises. It is the movements of the electrons which produce the line of the emission spectra; this is proved by the phenomenon of Zeemann; in an incandescent body, what vibrates is sensitive to the magnet, therefore electrified. This is a very important first point, but no one has gone farther; why are the lines of the spectrum distributed in accordance with a regular law?

These laws have been studied by the experimenters in their least details; they are very precise and relatively simple. The first study of these distributions recalled the harmonics encountered in acoustics; but the difference is great. Not only the numbers of vibrations are not the successive multiples of one same number, but even we do not find anything analogous to the roots of those transcendental equations to which so many problems of mathematical physics conduct us: that of the vibrations of an elastic body of any form, that of the Hertzian oscillations in a generator of any form, the problem of Fourier for the cooling of a solid body.

The laws are simpler, but they are of wholly other nature, and to cite only one of these differences, for the harmonics of high order the number of vibrations tends toward a finite limit, instead of increasing indefinitely.

That has not yet been accounted for, and I believe that there we have one of the most important secrets of nature. Lindemann has made a praiseworthy attempt, but, to my mind, without success; this attempt should be renewed. Thus we will penetrate, so to say, into

the inmost recess of matter. And from the particular point of view which we to-day occupy, when we know why the vibrations of incandescent bodies differ from ordinary elastic vibrations, why the electrons do not behave themselves like the matter which is familiar to us, we will better comprehend the dynamics of electrons and it will be perhaps more easy for us to reconcile it with the principles.

Suppose, now, that all these efforts fail, and after all I do not believe they will, what must be done? Will it be necessary to seek to mend the brdken principles in giving what we French call a *coup de pouce?* That is evidently always possible, and I retract nothing I have formerly said.

Have you not written, you might say if you wished to seek a quarrel with me, have you not written that the principles, though of experimental origin, are now unassailable by experiment because they have become conventions? And now you have just told us the most recent conquests of experiment put these principles in danger. Well, formerly I was right and to-day I am not wrong.

Formerly I was right, and what is now happening is a new proof of it. Take for example the calorimeter experiment of Curie on radium. Is it possible to reconcile that with the principle of the conservation of energy?

It has been attempted in many ways; but there is among them one I should like you to notice.

It has been conjectured that radium was only an intermediary, that it only stored radiations of unknown nature which flashed through space in every direction, traversing all bodies, save radium, without being altered by this passage and without exercising any action upon them. Radium alone took from them a little of their energy and afterward gave it out to us in divers forms.

What an advantageous explanation, and how convenient! First, it is unverifiable and thus irrefutable. Then again it will serve to account for any derogation whatever to the principle of Mayer; it responds in advance not only to the objection of Curie, but to all the objections that future experimenters might accumulate. This energy new and unknown would serve for everything. This is just

what I have said, and therewith we are shown that our principle is unassailable by experiment.

And after all, what have we gained by this *coup de pouce?*

The principle is intact, but thenceforth of what use is it?

It permitted us to foresee that in such or such circumstance we could count on such a total quantity of energy; it limited us; but now that one puts at our disposition this indefinite provision of new energy, we are limited by nothing; and, as I have written also, if a principle ceases to be fecund, experiment without contradicting it directy, will however have condemned it.

This, therefore, is not what would have to be done, it would be necessary to rebuild anew.

If we were cornered down to this necessity, we should moreover console ourselves. It would not be necessary thence to conclude that science can weave only a Penelope's web, that it can build only ephemeral constructions, which it is soon forced to demolish from top to bottom with its own hands.

As I have said, we have already passed through a like crisis. I have shown you that in the second mathematical physics, that of the principles, we find traces of the first, that of the central forces; it will be just the same if we must learn a third.

Of such an animal as exuviates, as breaks its too narrow carapace and makes itself a fresh one, under the new envelop we easily recognise the essential traits of the organism which have subsisted.

We cannot foresee in what way we are about to expand; perhaps it is the kinetic theory of gases which is about to undergo development and serve as model to the others. Then, the facts which first appeared to us as simple, thereafter will be merely results of a very great number of elementary facts which only the laws of chance make co-operate for a common end. Physical law will then take an entirely new aspect; it will no longer be solely a differential equation, it will take the character of a statistical law.

Perhaps likewise, we should construct a whole new mechanics, that we only succeed in catching a glimpse of, where inertia increasing with the velocity, the velocity of light would become an impassable limit.

The ordinary mechanics, more simple, would remain a first approximation, since it would be true for velocities not too great, so that one would still find the old dynamics under the new.

We should not have to regret having believed in the principles, and even, since velocities too great for the old formulas would always be only exceptional, the surest way in practice would be still to act as if we continued to believe in them. They are so useful, it would be necessary to keep a place for them. To determine to exclude them altogether, would be to deprive oneself of a precious weapon. I hasten to say in conclusion we are not yet there, and as yet nothing proves that the principles will not come forth from the combat victorious and intact.

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MEANING OF THE EPITHET NAZOREAN (NAZARENE).[1]

I.

(Read before the Section of New Testament, Congress of Arts and Science, St. Louis, September 23, 1904.)

"BEING warned (of God) in a dream, he withdrew into the parts of Galilee, and came and dwelt in a city called Nazareth: that it might be fulfilled which was spoken through the prophets, that he should be called Nazorean." (Matt. ii. 22b, 23.)

The unhistoricity of the Matthean no less than of the Lucan prehistory is conceded in critical circles. Thus, even Zahn says: (*Das Evang. des Matth.*, p. 109): "Not the silence of Josephus.... but the narrative of Luke (ii. 21, 22, 39), which appears to exclude the total content of Matt. ii, can arouse serious scruples," and these he makes no attempt to lay. All the more firmly is the birth, or at least the early residence, in Nazareth everywhere upheld, if not assumed, as beyond question. So too the correctness of Matthew's etymology, "Nazorean" from Nazareth. But here difficulties begin to gather.

1. The reason assigned seems unreal. Nowhere is it spoken through the prophets, "He shall be called Nazorean," nor anything nearly equivalent. Zahn exposes the emptiness of all other explanations but Hofmann's, which he adopts in piety only, though itself

[1] In the transcription of Greek, Hebrew, and other alphabets:
ch stands for the guttural *h*, frequently transcribed as an underdotted *h* or *kh*, to be pronounced like the German *ch* in *acht*.
sh is nearest to the English sound *sh*.
ʒ denotes the German *z*, a sharp sibilant pronounced *ts*, sometimes transcribed by underdotted *s*. EDITOR.

the emptiest of all, namely: that it was spoken by the prophets that he should be misunderstood and lowly, which Matthew would express by the term *Nazorean.* But the bald fact is that He was called (*the*) *Nazorean* without any even remote allusion to lowliness or misunderstanding, and this single fact it is that Matthew would explain by early residence in Nazareth. The inevitable suggestion then is this: The Jesus was called (*Ho*) *Nazōraios.* Since this fact was most important, the Evangelist thought it must be spoken by the prophets, who had foretold all things of the Messiah. Moreover, it had to be explained some way, and the least objectionable way was to derive it from a place of early residence. Accordingly, this datum of childhood in Nazareth would take its place side by side with other data of the prehistory, as the visit of magi, the massacre of infants, the flight into Egypt. All are in fact of a piece; why should one be taken, and the other left?

2. The "city called Nazareth" seems to be a geographical imagination; it is unmentioned in the Old Testament, in the Talmud,[2] in Josephus, in Apocrypha. The first notice of it is in Eusebius, quoting professedly from Julius Africanus; the next, in Jerome, is worse than none at all; next Epiphanius speaks of it along with several Galilean places as inhabited down to Constantine exclusively by Jews (no Pagans, no Samaritans, no Christians). These mentions signify nothing as to the pre-Christian reality of Nazareth. For they are all perfunctory. Themselves believing, of course, in the actuality of the city, the writers could hardly fail to mention it in such connections, whether or not it was bodily there. Again, even if there was a so-named village there in the third or fourth century, nothing would follow as to it or its name before the first. After the notion of the early life of Jesus in "a city called Nazareth" had been firmly established, we may be sure that the city itself would not long be wanting. Two or three centuries would be quite long enough for its genesis or new-naming. The silence of contemporary and earlier history is of course not conclusive, but it is the strongest negative evidence possible. We cannot expect the

[2] Which names 63 cities of Galilee.

unprophetic historian to say: "In this region 'a city called Nazareth' does not exist."

3. Nazareth cuts no figure at all in the tradition concerning Jesus. Not Nazareth but Chephar Nachum is called "his city." So all the moderns, with Chrysostom and common sense,—against Jerome. There he was "at home," according to Mark ii. 1. There was the scene of his first preaching, and triumphs, and friendships. This could hardly have been, if Nazareth had been his home. True, both Matthew and Mark tell of his going into his *patris*, but they do *not* (against Graetz, Frankel's *Monatsschrift,* 29, 482) say what was the *patris, a strange omission! Why did they not say Nazareth,* if they meant it? This pericope (Matt. xiii 53-58, Mark vi. 1-6) it seems, is meant merely to visualise the proverb, "A prophet is not without honor save in his *patris*" (Judea? Judaism?): it testifies not for, but against, the geographic entity of Nazareth. Luke, indeed, is explicit. He mentions Nazareth and tells how they led him to the "brow of the hill," in order to throw him down (iv. 16-30),—all this at the beginning of his ministry, against the earlier report in Matthew and Mark! But this Lucan form is plainly a much later elaboration, and testifies to nothing but the hand of the reviser (See Keim, *Jesus von Nazara,* II, p. 19 f., 425). So, too, the phrase, "he from Nazareth," is simply a later variation of "the Nazorean," just as our English versions say "this Jesus of Nazareth," where the Greek says "this Jesus the Nazorean" (Acts vi. 14).

Similarly, of Nathanael's question, "Can ought good come out of Nazareth?" (J. i. 47). The deep symbolism of this whole section we make no attempt here to sound. Enough that it is clearly symbolism, and not history, and bears no witness worth mention to a topographical Nazareth. (Nathanael, otherwise unknown, seems to be the notable pre-Christian Gnostic, Dositheus.)

4. But if the testimony of the New Testament is thus hesitating and indecisive concerning "the city," and appears only in the *later* strata of tradition, being entirely absent from the *earlier,* an exceedingly strong negative indication, the same can not be said of the epithet (*the*) *Nazorean.* This occurs repeatedly in apparently the oldest layers of the Gospel story, without any suggestion of tend-

ency, especially in Acts, and more than all, it is used in the plural as the name of the new religionists (xxiv. 5): Tertullus describes Paul as a ringleader of the heresy of "the Nazoreans." It seems impossible that this name should have become their vulgar designation, unless it had been a very early and important designation. Moreover, we know that it was used in the Talmud and Koran, and is still used by the Oriental Christians. In Mark the epithet is so distinctive that it is put into the mouth of the maid as *the* name of the arrested one: "Thou also wast with *the Nazarene* (the Jesus)" (xiv. 67). All this indicates that this epithet was from the start highly distinctive and familiar, a name in itself, which would be passing strange, if it was indeed derived from a most obscure village otherwise unknown. This comes out clearly in the Hebrew-speaking voice to Paul: "I am Jesus the Nazorean" (A. xxii. 8). The epithet is quite unnecessary for identification, in two of the three reports it is omitted: its presence in this one shows that it was originally an integral part of the whole name, and as such it must have had important meaning and have pointed to something else than a wholly indifferent early residence in Nazareth.

5. The name "the Nazoreans" occurs in the Talmud unmistakably denoting the Christians (b. Taan. 27b). " 'Why did they not fast on the day after the Sabbath?' Rabbi Jochanan replied: '*Because of the Nazoreans*'" (*Mipnê ha-Nôẓrîm*). Now this word Nôẓrîm was perfectly familiar to the Hebrew and had been for hundreds of years. It occurs repeatedly in the Old Testament, as in 2 K. xvii. 9, xviii. 8, Jer. xxxi. 6, and always in the one sense of *guards, watchers.* The root *naẓar* is one of the best known in the Semitic languages, and its meaning is perfectly definite and well ascertained: to watch, observe, keep, guard, defend, preserve. In this sense it is constant in the Old Testament, occurring 63 times, the desibilated form *natar* 10 times. But it is much older than the Hebrew Scriptures. It is frequent in the Cuneiform inscriptions. Thus, V. R., 8: 65-67, "and Abiyati, son of Ti-i-i-ri, not meditated good, not kept oath (*la na-ẓir ma-mit*) of gods mighty"; and V. R. 1. 115, "Guards (*Maẓarati*) upon those of days before"; in the Code of CHammurabi (2250 B. C.) it occurs 7 times, as 23, 66 and 24, 6,

"in case watchful was she and. . . ." (*shum-ma na-aẓ-ra-at-ma. . . .*), as in 30, 47, "estate they shall preserve" (*bîtam i-na-ẓa-ru*). The popularity and familiarity of the word are attested by the regular use of its imperative (*uẓur* for *nuẓur*) in forming proper names, as *Nabu-kudurri-uẓur* (Nabu, landmark mine defend), Bel-shar-*uẓur* (God save the King), etc.—also in such phrases as *bît ni-ẓir-ti* = house of treasure. The use of the segholate *neẓer* in the sense of *sprout, shoot, branch,* is only occasional, thrice in Isaiah, once in Daniel, and may here be left out of account, since it could not yield the plural *nôẓrîm* and has naught to do with the matter in hand. Now, since *ha-Nôẓrîm* was thus the perfectly familiar term for *the Guards, the Preservers,* it follows that when the term was used, or its Greek equivalent, *Hoi Nazōraioi,* the suggestion of the well-known meaning was inevitable. Even if the name had actually been derived from the hamlet of Nazareth, no one would have thought so, every one would have turned to the household meaning, instantly and irresistibly. If a class of persons were called the Preservers, every one would understand it so, as *they that preserve;* no one would dream of deriving their name from the unknown village of *Preserveth.* We insist upon this, because it seems decisive.

6. But what of the singular, *Ho Nazoraios* or *Ha-Nôẓrî*? This is the single point, not so much of difficulty as of *uncertainty,* for several possibilities lie open. The Old Testament singular of *Nôẓrîm* is *Nôẓēr,* the participle of *naẓar,* frequently occurring. The termination ־י is generally used to designate local derivations, but not uniformly; it is added to other nouns than those of place, to adjectives also, and even to prepositions, sometimes apparently for emphasis, with little change in meaning, as is noted by Green, Stade, and other Hebraists; similarly in Syriac Nöldeke speaks of its frequent parasitic presence (*Kurzgefasste Syrische Grammatik*). Among many examples the nearest parallel seems to be נכר. The root combines queerly enough the opposite ideas of *knowing* and *not knowing.* From the latter comes נֵכָר = *stranger* used thirty-five times in the Old Testament; also נָכְרָה = *strange,* used once; also נֵכֶר = *stranger,* once; but נָכְרִי = *stranger,* forty-five times.

There is no reason, then, why *nôẓrî may* not be formed from *nôẓēr* without real change of meaning.

Secondly, *nôẓrî* may very well be a Rabbinic disguise for *nôẓēr*. Possibly the Talmudists wished to deform the name slightly, as often the names they disliked. Thus, the appellative of the rationalistic Bible critic, CHivi, they changed from *al-Balkhi* to *al-Kalbi* (JBL XXIII, 6), and Evangelion they turned into *Avon-* or *Aven-giljon* (b. Shabb. 116a). Possibly they formed *Ha-Nôẓrî* on the basis of a Christian Evangelic tradition that Jesus was of Naẓara. The form *Nôẓrî* cannot indeed come from Naẓara, but requires a Noẓera as the town-name, as Herford perceives. He thinks *noẓera* may have been the local Galilean pronunciation. More likely that the Talmudists slightly bent the name *nôẓēr,* as if it were *nôẓrî* from *noẓera.* Possibly the ' was added, as in a good many cases, to personalise more sharply the participle, somewhat as we say the *guard* and also the *guardian.*

Still another possibility, however, and an extremely attractive one, is this: the ' may be a fragment representing the divine name YHVH.[3] If so, then the full primitive appellative was *Nazōraios* for NZRYH, *Watch of Jehovah,* or *Jehovah the Keeper.* This suggestion is strongly recommended by this fact: In the "name of the Restitution" of Marcus we find the form Ἰησοῦ Ναζαρία. Marcus is supposed to have been a second-century heretic, but he was certainly a *most* important one, to judge from Irenæus and Hippolytus, and his "name of the Restitution": "Anointed and redeemed am I from Soul and from all judgment by Yah (dyh); redeem (my) soul, O Jesu Nazaria," seems to be extremely old; it is given in Syriac but not understood by Irenæus (I. xiv. 2). Such a formula would very naturally and probably harken back to the highest antiquity. We note, further, that the redemption is in the name of Yah, and Jesus is invoked as Nazar-Ya'. This latter is the only Syriac form, as appears from the Peshito and from Payne Smith's *Thesaurus Syriacus.* (The latter of course assumes the derivation of *Naẓar-ya'* from Nazareth, but makes no attempt to justify the assumption.)

[3] As in נַחְבִי (*Naᶜhbi*) = "Comforter is Yah," Num. xiii. 14.

All of which points to this latter as the *very oldest* form of the appellative and as involving the divine name Yah or Yahveh, precisely as Zacharyah and the multitude of names ending in *iah*.

It must be remembered that the Syriac termination *Ya'* is exactly the same in *Nazar-ya'* as, e. g., in *Z'char-ya' bar B'rach-ya'* (Mt. XXIII. 35), and regularly represents the יָהּ (*Yah*) of the Hebrew. It would be very strange if this termination had an altogether unique gentilicial reference in *Nazar-ya'*. Moreover, it is at once perceived that in the formula of Marcus any local derivative is utterly out of place; the epithet, *Nazar-ya'*, must be charged with weighty meaning. Similarly, in the trilingual inscription on the Cross (J. xix. 19), it seems impossible that the epithet Nazorean (*Nazar-ya'*) should mean "of Nazareth," a village in Galilee over which Pilate had no jurisdiction.[4] It must tell not of the home but of the nature, the character, the personality.

Be this as it may, it seems reasonably certain that Nazōraios had originally nothing to do with the imaginary village Nazareth; that it was a *descriptive appellative,* like others so commonly appended to divine names, both classic and Semitic (cp. Zeus Xenios, Hermes Psychopompos, Dionysos Hypokolpios, Apollo Pythios, and the like); that it designated some *divine* power in the aspect, character, or person of Guardian, Preserver, being nearly identical in meaning with ὁ Ἰησοῦς, the Saviour, and the pure Greek term preferred by the Gnostics but disowned by the Old Catholics, ὁ Σωτήρ. It must be remarked that this salvation was especially from demons and from sin, the work of demons. Hence the title, ὁ Ἰησοῦς, was the name that was specially and exclusively invoked in casting out demons and in primitive baptism, which was primarily the washing away of spiritual uncleanness due to demons.

It should be added that both Neubauer (*La Géographie du Talmud,* 190) and Grätz (*l. c.*) think to find Nazareth in the Talmud. and both with the same unreason. In Josh. xix. 15 are enumerated as belonging to Zebulun the cities: "And Kattath, and Nahallal, and Shimron, and Idalah, and Beth-lehem: twelve cities and their vil-

[4] As Dr. Paul Carus acutely suggests.

lages." The Talmud (Megilla 70a) repeats this list in slightly varied form, preserving the name Beth-lehem but adding Zeryëh (ביתלחם צרייה). Now Neubauer and Grätz insert the letter נ before צ and vocalise the result into Nozeryyah, which is not *wholly* unlike Nazareth! Hence Neubauer thinks we should translate the Talmudic passage thus: *Bethlehem near Nazareth,* according to which the utterly obscure village of Nazareth was so much more important than the ancient historic city of Bethlehem that the latter had to be defined by reference to the former! Grätz perceives the improbability and hence translates his conjectural text thus: *Bethlehem of Nazareth,* understanding Nazareth as a post-exilic name for Galilee, in direct contradiction of the Evangelic phrase "Nazareth *of* Galilee," and this conjecture is adopted by Cheyne, to whom belongs the credit of explicitly stamping the "city called Nazareth" as a fiction (*Enc. Bibl.*, Art. "Nazareth"). But if Nazareth was such a familiar name of Galilee as to make *Nazorean* preferred to *Galilean* as a gentilicium, *assuredly we should have heard of it.* The fact is that Neubauer and Grätz have found Nazareth in the Talmud only because they sought it there. He who seeks shall find. But the word is *not* there, and neither scholar offers any reason for inserting the נ. Closer inspection shows, first, that the Masoretic text of Joshua is maimed, since only five cities are named, not twelve, and the Septuagint omits the final clause; secondly, that the Zeryëh is most likely derived from the oft-recurring, very similarly written וְחַצְרֵיהֶן (*vchaẓrêhen*) = " and their villages," only four words below. Certainly the nearest-lying supposition is that the Talmudic text or its source, like the defective Masoretic text, meant to say something about the cities *and their villages.* Hence the ingenious conjectures of Neubauer, Grätz, and Cheyne, not to mention Halévy and Wellhausen, appear both needless and unwarranted. Neither do they nearly touch the heart of the matter, which is that by every token *Naẓar-ya'* was primarily like ὁ Ἰησοῦς and ὁ Σωτήρ, an *appellative of a god.*[5]

[5] That נֵצֶר was at some time felt to involve a Messianic reference, seems hinted in the large נ with which it is written in Ex. xxxiv. 7, as Zuschlag has observed.

The question remains, whence the Marcan form Nazarene (Ναζαρηνός)? It is commonly derived from Nazara, as Magdalene from Magdala; but, in spite of Keim and his learned note, this form Nazara is too feebly attested. In reality the form Ναζαρηνός explains itself when we recall that in Aramæan, according to Dalman (*Aramäisch-neuhebräisches Wörterbuch,* page 257), the word *Natrôna'* (נטרונא) means "defender" (*Beschützer*), which at once yields *Nazarene,* the Aramaic *t* (ט) corresponding to the Hebrew *ts* (צ). *Nazar-ya'* remains in all likelihood the most primitive form, since the Marcosian "name of restitution" far antedates any manuscript of our second Gospel.

Since the foregoing was written, we have lit upon a most decisive confirmation. In the Paris Papyrus, at line 3119-20, we read: .... ὁρκίζω σε κατὰ τοῦ θεοῦ τῶν Ἑβραίων Ἰησοῦ ιαβαιαη .... and other meaningless alphabetic combinations apparently to be sung (these latter seem to be documentary specimens of the "speech in tongues" of Acts and first Corinthians). "I adjure thee by the God of the Hebrews, Jesus." This "Logos" is declared to be "Hebraic," it is full of the Old Testament, it is assigned by the Papyrus editor, Dieterich, positively to the Essenes or Therapeutæ, who were certainly pre-Christian, and it itself is surely *not* post-Christian. There is in the whole "Logos" not a trace of Christian influence. That "Jesus" is herein called "the God of the Hebrews," of itself implies that the document is at least as old as the beginning of our era. At this date, therefore, we find that "Jesus" was the name used in conjurations for "the God of the Hebrews"—a fact whose importance it seems impossible to overrate.[6]

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[6] It must not be supposed that the results attained exclude the possibility that there arose in some minds at some time a confusion of the terms and the notions נצר and נָזִיר (*nāzîr,* Nazirite), especially as the LXX rendered ז by ζ and צ generally by σ, but not always, sometimes by ζ, thus עוץ = οὐζ (Gen. x. 23). It is *possible* that the writer of Mt. ii. 23 remembered Ju. xiii. 5 (he shall be a Nazir of God etc.), and so was emboldened to use the phrase, "through the prophets." But of these and other minor points lack of time forbids discussion.

II.

It did not fall within the scope of the foregoing investigation to discuss the heresiographic testimony, in particular of Epiphanius, touching the primitive sect of the "Nazaraioi." That investigation was in its conception almost purely philologic, and its design was to establish whatever conclusions seemed recommended, as at least highly probable, on the sole basis of certain linguistic facts. In accordance with the critical method already exemplified by the writer in a series of New Testament studies, it was intended to elicit the full evidence of these facts uncomplicated with any suggestions or modifications that might proceed from the consideration of any other foreign body of facts however closely related to the matter in hand. But this accomplished, it now becomes our duty to fix our attention on this other body of testimony and to interpret it naturally and so far as possible in utter forgetfulness of the results already attained. If such interpretation confirms these results, well and good,—by the mouths of two independent witnesses our conclusions have been established; but if there be any serious discrepance between the two sets of results, then there has been some error in our work, which must be detected and corrected. We may state in advance that this testimony, found in the *Panarion* of Epiphanius,[7] proves to be very elaborate and explicit, and while not free from obscurity and even contradiction (*"den confusen Angaben des Epiphanius,"* Harnack, *D G*3, I. 288), it is none the less unambiguous and conclusive as to the main issue, it is in fact the end of controversy.

After describing briefly the heresy of the Daily Bathers (Hemerobaptists), Epiphanius sets himself "to expound that of the Nazaraioi, who are Jews by race, taking their start from Galaaditis and Basinitis and the (regions) beyond the Jordan, as the report that has reached us comprehends, which, being of Israel itself, Judaises in all things, thinking scarcely aught beyond the aforementioned (sects). For circumcision exactly so it possessed, Sab-

[7] Hæres. XVIII., Κατα Ναζαραιων and XXIX., Καατ Ναζωραιων.

bath the same it kept, feasts the same it persevered in, not however (the notion of) destiny it introduced, nor astronomy. And (the) Fathers it received, those in the Pentateuch from Adam to Moses, those that were conspicuous by virtue of godliness,—I mean Adam, and Seth, and Enoch, and Methuselah, and Noah, and Abraham, and Isaac, and Jacob, Levi too, and Aaron, and Jesus the son of Nun. But it did not receive the Pentateuch itself, however it confesses Moses, and believed what he received (as) legislation; not this, it says, but another. Whence all the (customs) of Jews they keep, being Jews (themselves), but sacrifice they did not sacrifice, nor partake of animates; but it was unlawful with them to partake of their flesh or to sacrifice them. For they assert that these books were fabricated and that none of them proceeded from the Fathers. This was the distinction of the Nazaraioi from the others."

The remaining (second and third) sections are devoted after the manner of Epiphanius to a refutation of these heretics, which however does not concern us.

We observe that these Nazaraioi are Jews, that they are localised east of the Jordan, are vegetarians, are heterodox in rejecting the inspiration and authority of the Hebrew Scriptures. There is no suggestion of Christianity about them. Neither are they Nazirites (Naziraioi), whom Epiphanius mentions hereafter; in no particular do they resemble these latter, they are rather antipodal, their practice being directly counter to that prescribed for the Nazir (Num. vi.). Petavius then errs as widely as possible in writing "Nazaræi veteres נזירים proprie vocati, quasi *sancti,* et *separati;*" but these words are extremely interesting as the counsel of desperation. It appears then that both the name Nazaraioi and they that bore it were before Christianity and independent of Christianity. Hence the name can not be derived from any early residence of Jesus in Nazareth, nor indeed with the least probability from Nazareth at all. It is next to impossible that a sect located beyond the Jordan should take its name from an insignificant village on this side of the Jordan.

What evasions are possible? It can not be that Epiphanius is speaking of a sect that arose after Christ, else he would have

dropped some hint to that effect; moreover, and this is decisive, he afterwards declares explicitly (XXIX. 6) that the Naṣaraioi were "before Christ."

The name here used is Nazaraioi, whereas the form commonly used, as in the New Testament and elsewhere by Epiphanius himself, is Nazōraioi. But no one is likely to claim that this is more than a difference in spelling of the same word. The irritating confusion of the vowels *a* and *o* is one of the first things to repel the student of Syriac. Both forms present themselves in New Testament manuscripts, as at Mk. x. 47, L. xviii. 37, xxiv. 19, so that no one can say with certainty which of the vowels α, ο, ω is to be preferred. Perhaps all have nearly equal justification.

Can it be that Epiphanius did not know what he was talking about? Impossible. His antiquarian learning and industry are universally admitted. Petavius indeed says dubiously, "I do not know whether any other besides Epiphanius has mentioned such a heresy of Jewish name." To be sure! There was every reason why Christian writers at least should *not* mention them. The wonder is that Epiphanius has constated their existence. But there is no reason whatever for doubting his testimony that they were, whether or not his account of them be quite accurate. It is only their name and the fact of their being that bear on our argument.

However, this is by no means the full deposition of the Bishop of Constantia. Among Christian heresies, having treated of the Cerinthians he proceeds (XXIX.) Κατα Ναζωραιων:

"Nazōraioi follow these next in order, being along with them, whether before them or with them or after them, nevertheless contemporary; for not more accurately can I declare who succeeded whom. For just as I said, they were contemporary with one another, and similar the opinions they cherished. For these applied to themselves the name not indeed of Christ, nor even the name of the Jesus, but of Nazōraioi. And all Christians then were likewise called Nazōraioi. But it happened for a little time they were called Jessaioi, before the disciples began to be called Christians at Antioch. And they were called Jessaioi on account of Jesse, I think." There follows a very prolix dissertation on the royalty and the priest-

hood, in elaboration of this idea, none of which has any bearing on our inquiry. Epiphanius concludes it finally and proceeds:

"And there is much to say about this. But, nevertheless, since I have come to that point, to say for what cause they were called Jessaioi, before being called Christians, they that had believed on Christ, (it was) for this reason, we said, that Jesse was the father of David. And either from Jesse or from the name of Jesus our Lord they were called Jessaioi, on account of their starting from Jesus, being his disciples, or on account of the etymology of the name of the Lord. For Jesus in the Hebrew dialect is called (signifies) *curator* (*θεραπευτής*), that is, Physician and Saviour. Anyway, with this name, before their being called Christians, they were dubbed as a surname. But from Antioch, as we have noted above, as is the basis of the truth, began the disciples and all the Church of God to be called Christian."—Epiphanius then proceeds to identify these extremely interesting Jessaioi with the subjects of the well-known writings of Philo, supposed to deal with the Essaioi or Essēnoi, whether correctly or incorrectly we cannot here discuss. He then continues:

"As accordingly they were then called Jessaioi, for a little time after the ascension of the Saviour, and Marcus' having preached in the land of the Ægyptians, about those times some went out again, followers indeed of the apostles, I mean those there appear to me evidently Nazōraioi, being Jews by race and adhering to the Law, and practicing circumcision; but as persons beholding a fire from a lookout, and not thinking for what cause they had kindled this fire, or what useful purpose, do it, whether preparing the provisions of their life for eating by means of the fire, or for getting rid of some inflammable sticks or twigs such as are wont to be consumed by fire,—so also they themselves, imitating, lighting up a fire, burned themselves. For having heard only Jesus' name and having beheld the divine signs wrought by the hands of the apostles, they themselves also believe on Jesus. And knowing him as of Nazaret, conceived in womb, and brought up in Joseph's house, and therefore in the Gospel called Jesus the Nazōraios, as also the apostles say, "Jesus the Nazōraios, a man approved both by signs and wonders,"

and so forth, this name they impose upon themselves, to be called Nazōraioi, but not Naziraioi, which is interpreted "sanctified." For this was of old the prerogative (ἀξίωμα) of the first-born, and those consecrated to God, one of whom was Sampson, and others after him and before him many. Yea, John the Baptist also was himself one of these same vanguards of God, and wine and fermented liquor he did not drink. For this was the policy appointed for such men as befitting their dignity (ἀξίωμα).

"But others called themselves Nasaraioi. For the heresy of the Nasaraioi was before Christ and knew not Christ. But all men called the Christians Nazōraioi, as I said before, as say accusers of Paul the Apostle: 'This man we found pestilent and perverting the people, being ringleader too of the heresy of the Nazōraioi.' And the holy Apostle denies not the name, not confessing the heresy of these, but gladly accepting the name imposed upon him, by the malignity of the gainsayers on account of the Christ. For he says on the bema: 'Neither in the temple found they me disputing against any one, nor making any riot of the crowd, nor of what things they accuse me have I done aught. But I confess thee this, that according to the way which these call heresy, do I worship, believing all that is in the Law and the Prophets.' And no wonder that the Apostle confesses himself Nazōraios, (as) all (were) then calling the Christians by this name, on account of Nazaret the city, there being no other use for the name at the time, so as for men to call those that had believed in the Christ, about whom it has been written, 'that he shall be called Nazōraios.' For men even now by the same name call all the heresies Christian, I mean both Manicheans and Marcionists, both Gnostics and others, that are not Christians; and yet each heresy, although called otherwise, receives this (name) rejoicing, because by the name it is adorned. For they think to be magnified by the name of the Christ, not indeed by the faith and the works. So also the holy disciples of the Christ called themselves then disciples of Jesus, as indeed they also were; but hearing themselves (called) of others Nazōraioi, they did not disclaim, seeing the aim of those calling them this, because they called them (so) on account of Christ; since also the Lord Jesus himself was called Nazō-

raios,as the Gospels have it, and the Acts of the Apostles; on account of his having been brought up in the city of Nazaret, which however is now a village, in Joseph's house, having been generated according to flesh in Bethlehem from Mary the ever-virginal, the betrothed to Joseph the immigrant in the same Nazaret, after, having changed from Bethlehem, he had settled down in Galilee.

"But these the afore-mentioned heretics, about whom we are here making our narration, passing by the name of the Jesus, neither called themselves Jessaioi, nor retained the name of the Jews, nor surnamed themselves Christians, but Nazōraioi, plainly from the surname of the place, the Nazaret. But in all regards they are Jews, and nothing other. And these use not only (the) New Covenant but also (the) Old, just as also the Jews. For there have not been renounced among them Law, and Prophets, and Scriptures, these called Biblia (Hagiographa) among Jews, as among the aforementioned; nor aught else do these think but according to the preaching of the Law, and as the Jews all things exactly they confess, except indeed the having believed on Christ. For among them also resurrection of (the) dead is confessed, and that the universe has been generated from God. And God they proclaim as One, and his child Jesus Christ. And in Hebrew dialect accurately they are versed. For among them all the Law, and the Prophets, and the Hagiographa (so-)called, I mean the Sticherē, and the Kings and Paralipomena, and Esther, and all the others are read in Hebrew, as of course also among Jews. In this alone they differ from Jews and Christians, not according with Jews on account of (their) believing on Christ, and not agreeing with Christians on account of their being still fettered by Law, both circumcision and Sabbath and the rest. But concerning Christ I cannot say whether they too, weighed down by the wickedness of the aforementioned disciples (*περί*) of Cerinthus and Merinthus, deem (him) mere man; or, as the truth is, firmly hold him to have been generated through the Holy Spirit from Mary. And this the heresy of the Nazōraioi is in Berœa, about Cœle-Syria, and in Decapolis, about the regions of Pella, and in Basinitis that is called Kokabe but in Hebrew Chochabe. For thence the beginning arose, after the

migration from Jerusalem of all the disciples that settled in Pella, Christ having told them to abandon Jerusalem and to depart, since it was going to suffer a siege. And on such a basis having settled in Peræa, there, as I said, they passed the time. Thence the heresy of the Nazōraioi had its origin."

With the next section, an argument about circumcision, we have no concern. Epiphanius then continues: "Altogether hateful are these to the Jews. For not only do the children of the Jews cherish hatred towards these, but on arising at dawn,[8] and at midday, and at eventide, thrice a day, when they perform devotions in their synagogues, they curse them and anathematise saying that 'Accurse doth God the Nazōraioi.' For against these they lay it up more especially that being themselves of the Jews they preach Jesus to be Christ, which is counter to those that are still Jews, that have not received Christ. And they have the Gospel according to Matthew most complete in Hebrew. For among them undoubtedly this, just as from the beginning it was written in Hebrew letters, is preserved. But I know not whether the genealogies, those from Abraham to Christ, they took away. Well, having detected this (heresy) as a dull and, on account of the poison, pain-producing cell of wasps, and having crushed it down with the words of truth, let us go on to the next, my dearest ones, asking from God His help."

Here follows the chapter Κατα Εβιωναιων.

We have reproduced so much of Epiphanius in a translation so slavishly literal, because his writings are not very accessible, and to show as clearly as possible his style of thought and expression, as well as to avoid taking any liberties of interpretation. The whole passage is one of exceeding importance. With its glaring contradictions, due perhaps in large measure to interpolation, we have nothing to do, except as noted below. The great central fact is this: Epiphanius testifies unequivocally that the Nasaraioi were "before Christ" and "knew not Christ." On this point it is impossible that he should be mistaken. For he was unquestionably learned, and

[8] We read here ἐωθεν for ἐσωθεν.

laborious, and inquisitive, however shortsighted, fanatical, and intolerant. Hilgenfeld bears repeated witness to his "richer knowledge," "exacter knowledge," independent research, and the like. That he should have invented these pre-Christian Nasaraioi is quite incredible. For they were evidently a most painful and venomous thorn in his flesh. Their existence was a vexatious mystery, which he toils desperately and pitiably to explain. How wearisomely he reiterates that the name was taken from Nazaret, as if reiteration might finally make it so! He mentions these sectarians merely because he must, he cudgels his brains cruelly to make out what they can mean, he involves himself in hopeless contradictions in trying to solve the riddle, and at last he cuts the Gordian knot by dating them from the siege of Jerusalem (A. D. 68), though they were pre-Christian, and Paul was one of them nearly twenty years before! It is clear as noon from the painstaking, the repetitions, the discrepancies, and especially from the closing sentence, that the task was not a grateful one to Epiphanius, and that he would gladly have forgone it if he could.

The dumbness of other heresiologists (except Philaster, who also mentions the Jewish sect of the Nazareans) now becomes more expressive than their speech. It was just because they had wit enough to perceive the danger of discussing these Nasaraioi, that they maintained a prudent but ominous silence, broken only by harmless allusions to their heretical doctrines. But the valor of Epiphanius got the better of his discretion. In the providence of God the foolishness of the Bishop has availed far more for the truth than the wisdom of his predecessors and contemporaries, and even of his successors in modern times. These latter give this original and universal designation of the Christians but the scantiest recognition. A careful search through all accessible authorities discovers hardly anything that is pertinent and worth quoting. Petavius contents himself with a few notes and skeptical phrases, none of which throw light on the subject. Hilgenfeld names the *Nazaräer* and *Nasaräer* repeatedly in his standard *Ketzergeschichte,* regarding them apparently as the "remnant of the primitive Jewish-Christian congregation," but the important question he does not mention. In

his *Die Entstehung der altkatholischen Kirche* (Dutch translation [1868], p. 148 ff.) Ritschl discusses "the Nazaräer and the Pharasaic Ebionites," regarding the former as the original apostolic Christians, but neither he nor Tübingen, old or new, approaches the heart of the matter, the pre-Christian existence of the "heresy."

We have no space to treat the vexed question of the Ebionites and the Essenes, but we must press the query as to the Nasaraioi, for there is the pivot of controversy. We note that our author cautiously shuts up and locks the natural door of escape, by distinguishing his sectaries expressly from the Naziraioi, or *sanctified,* with whom Petavius would identify them.[9] We observe further that he says of those who were "before Christ," they "called themselves Nasaraioi." This is important. For such is the exact transliteration of the older form preserved in the Syriac (both Peshito and Sinaitic), Naẓarya. Here then our expectations are met precisely. For the natural and almost, though not quite, uniform transliteration of ע is σ and not ζ. Again, the name of the pure Jewish sect is given always as Ναζαραῖοι, never as Ναζωραῖοι. Here then is a notable gradation: Νασαραιοι, Ναζαραιοι, Ναζωραιοι, finally Ναζαρηνοι. Only the first conforms strictly to the Syriac prototype, Naẓarya. We venture to suspect that the change was not quite accidental, that there was intention to lead away the term from the original telltale form. Be this as it may, it seems indisputable that the sect of the Nasaraioi existed "before Christ."

Possibly, however, some one may plead that the *name* Nasaraioi (or at least Nazōraioi) was not assumed till after Christ. Epiphanius seems to hint as much, though not affirming it expressly. He says that the Jessaioi, to him evident Nazōraioi, having merely heard the name of Jesus and witnessed the apostolic wonders, believed on Jesus and applied to themselves the name Nazōraioi, knowing him as of Nazaret. Perhaps no one would take this seriously or expect us to waste words in exposing such an absurdity.

[9] In Josephus we find two allusions to Nazirites: Ant. IV. 4, 4, and XIX. 6, 1. In the one the form is Ναζιραίων, in the other it is Ναζαραῖοι. But this latter is found in a parenthesis that needs no critic's eye to detect it as the explanatory insertion of a later hand.

That these sectarians, scattered over a wide region, were at once converted and changed their name in any such manner is absolutely unbelievable and preposterous. Besides, it offers no explanation of the fact that the Nazaraioi were a Jewish sect, already treated as such by Epiphanius himself (see *supra*), and under the name Nasaraioi certainly pre-Christian. We do not of course deny that Nazōraioi may be a later Christian modification of the earlier name. Amid all the nebulosity then of this testimony, one fact shines out clear and unmistakable, the pre-Christian name and existence of a sect that gave the common designation to the earliest Christians, a name that Paul himself did not repudiate, and that still denotes them in the land of their origin.

Surely, no one will contend that these trans-Jordanic sectaries derive their name from the unknown "city called Nazareth," in Zebulun. They are never in any way associated with Nazareth. It is equally clear, as already shown, that they were "not Nazirites," the sanctified. Whatever they were, their early existence explodes the etymology of Nazarean as inhabitant of Nazareth.

None the less the question recurs, Whence their name? The only answer we can imagine is the one already given, which derives the epithet from the Root N-ʒ-R (preserve), but leaves the exact force of the termination undetermined. For the Epiphanian derivation of Jessaioi from Jesse perhaps none will contend; far more likely the Epiphanian alternative, which relates it to *Jesus*. The two Hebrew words ישי and ישו would yield the Greek **Ιεσσαιοι** with almost equal readiness. For the double σ we may remember **Μεσσιας** (J. i. 42, iv. 25) for (א)משיח. However, this and kindred topics we do not broach at present but hold in reserve. It cannot escape observation that the notions of Saviour (Jesus) and Preserver are very close kin, so that the antecedent probability seems very high that the Jessaioi and the Nasaraioi were nearly identical,—the terms Jesus and Naʒaraios seem almost equivalent.

It must be added that what we know of the Gospel of the Nazareans, from the fragments edited by Hilgenfeld, is consistent with the notion that they worshipped originally not a man but an aspect or person of the Godhead. The account of the conception and birth

is wanting, and, what is most important, the Holy Spirit is made the mother of Jesus—in perfect accordance with Hebrew modes of thought, or at least forms of speech, for רוּחַ is feminine, only rarely masculine: "Just now my mother the Holy Spirit took me by one of my hairs[10] and bore me up to the great mountain Tabor," quoted twice by Origen (in Ioan. Tom. II. 6, in Jerem. XV. 4) and twice by Jerome (in Mich. VII. 6, in Is. XL. 12). Hereby the human birth and nature appear to be positively excluded. Similarly the nearly related Ebiōnaioi, at least some of them, declared "the Christ to be Adam, the first fashioned and inspired by the inbreathing of God; but others among them declare him sprung from above, a spirit created before all, both above angels and lording over all, and called Christ, who by lot held the Æon yonder. And that he comes hither when he will, as also he came in Adam, and appeared to the patriarchs, clothed with the body; and having come to Abraham and Isaac and Jacob, the same came in the last days, and put on the same body of Adam, and appeared man, and was crucified, and rose up, and ascended. And again, when they will, they say, No! but into him came the Spirit, which is the Christ, and put on him that is called the Jesus." (Ep. XXX. 3.)

There is much more like the preceding, but so much is enough to show that these very earliest and even pre-Christian sectaries thought of the Christ and the Jesus as supernal and superhuman beings, as deities or phases of deity. These also used apparently the same "Gospel according to Hebrews," written in "Hebrew" and more or less resembling our Matthew, but without the first chapters. Epiphanius has further information that they have also the Johannine Gospel, and even Acts, "translated into Hebrew" and preserved in the treasure-houses at Tiberias—more likely that they had parts of these scriptures in Aramæan originals. Harnack himself declares (DG [4]I. 293), "these gnostic Ebionites have preserved very archaic matter."

[10] The idea may seem grotesque to us, but not to the Oriental. Compare Ez. viii. 3, the fire-form "took me by a lock of mine head; and the spirit lifted me up...."; Bel and the Dragon, v. 36; other transports by the spirit are most probably to be conceived as effected similarly: Ac. viii. 39, Herm. Vis. I. 1, 3, II. 1, 1-4, Asc. Is. vi. 14, 1 K. xviii. 12, 2 K. ii. 16.

Look at it then under what angle we will, there is one momentous fact that confronts us:

The name Nasarean antedates our era and attaches itself both in form and meaning to the Old-Semitic stem NaʒaR (preserve).

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TULANE UNIVERSITY, 25th October, 1904.

ADDENDUM.

Further examination of the great Paris *Zauberpapyrus,* as edited by C. Wessely, discovers the epithet in question embedded in a mass of glossolalian galimatias, at line 1548:

"ορκιζω σε κατα του
μαρπαρκουριθ· νασαα
ρι· ναιεμαρεπαιπαρι
. . . . . ."

That νασααρι is our Ναζαρια hardly admits of reasonable doubt in the mind of a student of this extraordinary document.

Wessely dates the manuscript, along with Parthey's first Berlin Papyrus, from nearer 300 than 400 A. D. But he recognises, of course, that "the text of our papyrus is not original." All the phenomena, both of matter and of form, point to *ein höheres Alter,* where the adjective will bear an acute accent. Some of the text is avowedly transcribed from "the very old papyrus," the abundant scribal errors imply "a rather long written tradition," and the general atmosphere is one of antiquity.

That the glossolalian passages stand closely related to the "Tongue-talking" of New Testament times, is a proposition that we hope to establish in another connection. W. B. S.

TULANE UNIVERSITY, 22d December, 1904.

THE PASSING OF SCIENTIFIC MATERIALISM.

ATOMISM AND THE ETHER.

FROM the earliest historic times, thoughtful minds have addressed themselves to the problem of the composition and the ultimate nature of the external world. When the phenomena of experience have been thought as inhering in substance and the attributes by which substance is known are projected outward as objective, not only to *myself*, but also to absolute subjectivity, that is, when the objective phenomena are regarded as having an independent external existence, the next step is their unification into an objective world. This dualism between an absolute subject and a universal object is one that pervades all thinking, simply because it is the first product of thinking.

Practically, we know the external world as a succession of phenomena appearing as different modes in extension. These three categories of our knowledge, time, space, and mode, are necessary forms of our thought. The process of cognition is a process of integration, the final extreme of which is the production of an external unity to correspond with the internal unity of self.

As certain phenomena are affirmed as attributes of a substance, all attributes are integrated as a totality of substance in a unity, which is our world of experience. This we philosophically construe as the universe. Just as the few and disconnected points of irritation in the retina are blended into a field of view without breaks or lacunæ, when reflected on the consciousness, so the paltry, scattered reactions upon the *sensorium commune* that make up our individual experience are reported in our thinking as a continuous

extended world. There are no breaks in it. Nature, our nature, abhors a vacuum.

This thought of an external continuum may be derived from a peculiar and very "fortunate" limitation of our knowledge. There is, e. g., no mechanism for perceiving an hiatus in inner experience. Temporal relations are all dynamic. Rip Van Winkle might extend his sleep twice ten thousand times its reported length, but, on awakening, he could know nothing from inner testimony. Inner experience is, and must be, a continuum. Outer experience is reported in the same terms.

Again, space is constructed out of temporal (successive) elements by psychical geometry. The angular deviation of eyes, recorded as muscular sensations of accomodation and similar movements correlated with successive experiences related to these sensations, are connected with the formation of space conceptions, whatever the intuitional school may postulate as something prior to this creation. Space becomes a continuum; therefore, it is a geometric and not an arithmetical construction.

In the case of mode, the idea of a continuum is later in arising. for black is contrasted to white as distinct from, or even opposite to, the latter; and it is only later that we arrive at the apparently paradoxical result that all white is more or less black, and black is somewhat white, and that intervening colors express in their own way a sliding scale of intervening values.

This last analogy is misleading, for it is in the series of excitations and not in the sensations that we find a continuum. The two fundamental forms of mode are identity and unlikeness or dissimilarity. Mode is our reaction to the filling of our forms of space and time,—the latter directly, the former as reflected in objectivisation.

In the long run, therefore, all of these necessary categories of our thinking help us to form an external unity or world, after which metaphysics postulates it as a universe or sets upon it the seal of the absolute.

Science sets forth with the utmost confidence to make conquest of this external world, but only, so far, to return to the stronghold

of individualistic experience, humiliated and baffled. We do not know, and can make no adequate expression for, the reality which constitutes this world of ours. Three characteristics are, indeed, given by the necessities of constructive thinking: the world is unitary, it is continuous, it is dynamic.

All attempts to evaluate the world of experience may be said to fall in one or other of three classes, as follows:

1. *Atomism.* Some minds are arithmetical. All quanitative relations are thought as numerical. All wholes are conceived as made up of units. A world must for them be the sum of all the units of experience, and these must correspond to external units. Such units, since we detect in them relations of "more and less," must be divisible into smaller units; but there will be no point at which they will disappear, but there must be a lower limit of divisibility. By such reasoning, we arrive at indivisible units or atoms, in which inhere all the properties or attributes of the world as a whole, or of various things in particular.

2. *Plenism.* Other minds are geometric and conceive of quantity as continuous. Units are artificial measures of quantities, which increase or decrease by infinitessimal amounts, that is, by continuous activity. The qualities or attributes of the world or of things in particular are only explicable as inhering in a universal substance, co-extensive with the universe and capable of manifold forms of expression.

This interpretation finds many fatal defects in atomism and points out that atoms acting across empty spaces violate the necessities they were invented to satisfy. If acting requires to inhere in a substance, what becomes of activity when passing through a vacuum from one atom to another? In vain, atomism borrows ether from the plenists to fill the chinks between the atoms. The geometrical school states that a plenum or universal substance fills all space and that activity resides in it and is propagated through it. It is even possible to invent mathematical expressions for the individualised manifestations of the activity in the plenum, such as may be studied in the discussion of the vortex atom.

3. *Energism or Spontaneity.* The two schools already named

have shared the honors and divided the field of physics between them. No other possibility has been recognised till lately by modern physicists. These two schools have in common a philosophical postulate, which is not supposed to require proof—and this is very fortunate indeed, for it could never secure it. This postulate is that all activities or attributes must reside in something which is not active. This matter is the physical substitute for the philosophical or psychological construct, "substance." It is by nature unknowable, for it could only be known by its properties or activities. But we do not know them as properties of *it,* but create *it* to explain the continuance or reappearance or relations of the activities.[1]

Activities are discovered to occur in my mind in certain relations, and these relations are the basis for a postulate called "matter." So fixed is the idea that attributes inhere in something, of which they are attributes that language almost refuses to describe any other possibility. But the energist or advocate of spontaneity demurs to this conception as irrelevant. Why should we postulate the unknown to explain the known? True, "standing in relation" is the most important thing about activities. Activities cohere in relations of sequence and similarity, but why invent a matter, entirely unlike the activity and unthinkable apart from the activity, as its ground?

The efforts of physicists have so far failed to afford a consistent and rational explanation of, or expression for, either atom or plenum. The nearest approach to such expression, mathematically, is inconsistent with either and would apply better to activity freed from the limitation of plurality and discreetness imposed by atomism, on one hand, and the impossible combination of imponderability and elasticity, on the other. When the plenists ask us to conceive of gravitation as the effect of an ether itself imponderable, we are fain to seek the camp of the atomists, who speak of ponderable points acting on ponderable points through imponderable space—or to abandon both.

[1] Lord Kelvin defines matter as the rotating parts of an inert perfect fluid, which fills all space, but which is, when not rotating, absolutely unperceived by our senses.

The energists claim that there is no need for either conception, but that substantiality is expressed by relation among activities. Activities are positive realities whenever they are shown to belong together. The belonging-together is the substantiality sought, and to seek further is illogical. A relation is a real thing and expresses a law of organisation. The organisation is the organism. We talk about cold *iron* and hot *iron,* because, of the group of properties we connote under the word "iron," certain ones are observed to vary, and others are, relative to our means of observation, constant. Strictly, however, we should say hot-iron, cold-iron, and cold-hard-black-smooth-iron and hot-softer-grey-rough-iron, etc., as our knowledge of the variables grows. What, after all, makes "iron" a species by itself as against other aggregates of properties called copper, etc., is an organic coherence or belonging-together.

To the spontaneity school have usually belonged philosophical minds who have refused or been unable to attempt an application in detail of their system to the practical needs of human science. Even the practical men who recognised the philosophical correctness of this standpoint, were constrained *in praxis* to use the language of practical physics and chemistry. Hegel's ideas and Schopenhauer's *World as Will and Idea* have never found a place among the symbols of the chemist or the formulæ of the physicist.

After the few introductory words, we may take up the teachings of the three schools more in detail.

THE ATOMIC HYPOTHESIS.

The most complete account of the opinions of the ancient atomists is to be found in the works of the Roman poet Lucretius. Democritus was the founder of the atomic theory as we know it, though it is probable that the two ideas of nature as a plenum and of an infinity of indivisible parts had existed in the philosophical systems of Egypt and India at a much earlier date. Whether we regard the atomic theory as a result of an arithmetical way of treating quantity, or as a product of experience in which the divisibility of units into still smaller units is experimentally realised, it has nevertheless appealed to a certain class of minds with irresistible

power in all ages. The atomists made the distinction between matter and space, and regarded the atoms as indivisible particles of matter scattered in space. The physical analogy is a mass of sand, in which the particles may be all alike, at least in some respects. The necessity for voids was a supposed result of the necessity for motion.

"Quapropter locus est intactus, inane, vacansque
Quod si non esset, nulla ratione moveri
Res possent; namque, officinum quod corporis extat,
Officere atque obstare, id in omni tempore adesset
Omnibus: haud igitur quicquam procedere posset,
Precipium credendi nulla daret res."

De Rerum Natura, 335.

The atoms of Heraclitus are indivisible units differing in size, form, and weight. All changes in nature reduce to changes in place or aggregation of atoms. The atoms group themselves in various complexes more or less analogous with the modern molecule, the differences in which result from the diversities in the arrangement of the inherent atoms. Aside from atoms, there is only empty space, but this space has an objective existence, although called the non-existent as contrasted to the atoms as the existent. Democritus himself says that the existent is no more real than the non-existent, a statement which reminds us of the famous Hegelian aphorism that being and non-being are the same. Perhaps, it is to be explained that the agent and the sphere for the activities of the agent are two equal necessities of thought, or that one cannot think of phenomena apart from the limitations that define and make possible the recognition of these phenomena.

The atoms were supposed to be in continuous motion among themselves and to group themselves temporarily in accordance with uniformities or harmonies in such motions. But, as the activities of atoms are, after all, unexplained, a principle is postulated which has generally been termed necessity, ἀνάγχη. This is more like what we have called "ground" and may represent an implied organism—a view that may, perhaps, seem supported by the atheistic tendencies of the atomists.

Anaxagoras supplied the corrective by substituting for necessity the νοῦς or *Nous,* the conscious activity, a teleological principle. This gives to the atom the attribute of spontaneity and forms a link with the energic school. For Anaxagoras the atoms were innumerable, simple, inert bodies in chaotic distribution, until set in activity by the *Nous,* which, accordingly, arranges them into an orderly universe or organism.

In many respects, the monadology of Leibnitz resembles atomism. In making the idea of substance the foundation of his philosophy, Leibnitz resembled Spinoza, but Leibnitz was arithmetical, while his predecessor was geometrical. The substance of Leibnitz, while a living activity, activity being the very nature of substance, finds individual expression in a multiplicity of active monads, each different from the other and each an indivisible point. In this respect they are like Boskovitch's atoms, but, in reply to the objection that no number of unexpected points would make an extended universe, Leibnitz replies that space has no objective reality, it is only a vague subjective concept.

The monad is not only active, it is also living. Each monad is a microcosm and mirrors the universe. It is fundamental to Leibnitz's system that the activities of every monad imply those of all others. These activities, as related to individual monads, are repulsions, but they unitedly form an equilibriated whole. All things are compounds if monads. Matter in the usual sense does not exist. Each monad has a certain mentality in attribute and a certain vague or clear consciousness. The equilibrium of all these conscious activities is the perfect divine reason. While monads do not affect each other directly, they move in a state of equilibrium in which one is reflected in all and all in one,—the pre-established harmony.

Boskovitch, like Leibnitz, regarded atoms as mere centres of force, the result of whose coexistence is that no two atomic centres can approach each other within a certain distance. This approaches to energism, but Boskovitch's atoms have position in space, are capable of motion, in a continuous path, and possess a certain mass, so that a certain amount of force is required to produce a change of motion. The atom is endowed with a potential force, and two atoms

will repel or attract each other, with a force depending on their distance apart, and, for distances greater than about one-thousandth of an inch, this attraction varies inversely as the square of the distance, while the law of repulsive force is not known. The ultimate force is repulsion which increases without limit, as the distance increases without limit, so that no two atoms can ever coincide. All action between bodies is action at a distance. No such thing as contact between bodies occurs in nature.

Swedenborg seems not only to have adopted an atomic hypothesis, but to have anticipated modern stereo-chemistry, by suggesting various geometrical groupings of atoms as causes of the peculiarities of the resulting molecules.

When Boyle and Lavoisier had developed the idea of elements and elementary discreteness, the idea of the atomists, which had been revived by Gassendi, was seized upon by Newton to serve in his physical speculations. The establishment of the fact that for any given portion of matter extension is variable but mass is constant, made the adoption of some form of atomism inevitable.

Bryan and William Higgins developed the atomic hypothesis along theoretical lines. The former, in 1775, recognised seven elements composed of "atoms homogeneal, impenetrable, immutable, in figure inconvertible, and globular." William, a little later, promulgated the idea of the union of atoms to form molecules, though he was unable to formulate the quantitative law for their union.

To Dalton, more than to any single writer, perhaps, we owe the formulation, in acceptable form and with convincing data, of the atomic hypothesis in its modern dress. Dalton was undoubtedly greatly influenced by Newton's corpuscular emanation theory, and his opportunity was due to the work of many others, through whose labors the constancy of matter had been postulated, elements had been differentiated, and the beginnings of pneumatic chemistry made. When studying the diffusion of gases he was impressed with the idea that atoms of different substances must be different in size. Upon applying this hypothesis in chemical problems, he discovered that for each element there is a definite combining value, i. e., that a relative weight of its atom could be assigned. It was

known prior to this time that substances unite in definite proportions. The law of definite proportions found its explanation in the impossibility of dividing atoms, so that the resulting weights of a compound must contain the weights of the uniting atoms as factors.

The atomic theory, as formulated anew by Dalton, which portrayed chemical union as a juxtaposition of atoms, co-ordinated the known relations and gave to chemistry a quantitative basis or law. The tables of Richter and Fischer supplied materials, and the new formulæ of Berzelius assisted to make the new system practicable. Dalton's tables of equivalents were rough approximations, and his own success as an experimenter was limited, but he opened the way and devised the method which, in the hands of Berzelius, who supplied what Dalton lacked, became fruitful, and the new notation grew more complete and was soon generally accepted.

Physicists were, naturally, quite as much interested in the constructions growing out of the atomic hypothesis as chemists, though both were for a while profoundly influenced by the metaphysics of their time. When Gay-Lussac, in 1808, the same year as the publication of Dalton's *System*, showed that combination between gases always took place in simple relations by volume, and that all gaseous densities were proportional either to the combining weights of the several substances or to rational multiples of them, the new era, the era of gaseous physics, had opened. Avagadro generalised the facts and formulated the law that bears his name: "Equal volumes of gases, under like conditions of temperature and pressure, contain an equal number of molecules." The distinction between atoms and molecules (the smallest aggregate of atoms in combination) requires to be constantly in mind, or the mistakes of the earlier chemists and some later physicists may be repeated.

To the above must be added the following: *Boyles Law*: "In a given mass of any gas kept at a constant temperature, the pressure per unit of area upon the containing surface increases in the same proportion as the volume occupied by the gas is diminished." *Charles's Law*: "If the density be constant, the pressure is directly proportional to the temperature measured from the absolute zero, —273 centigrade." *Dalton's Law*: "In a mixture of gases, when

there is an equilibrium, each gas behaves as a vacuum to all the rest."

It was at one time believed that these phenomena could be explained by recourse to mutually repulsive forces acting between the parts of which the gas is composed (molecules and the like); but experimental proof has been offered that not repulsion but attraction exists between molecules. Regnault, for example, by observing deviations from Boyle's law when the density of gases is greatly increased, showed that the pressure is less than that law requires, indicating that the interfering force is attractive. Joule and Thompson conducted experiments on the thermal variations during expansion of gases which also showed that the forces between molecules, though small, were actively attractive.

Such considerations led to the kinetic theory of gases, which explains the intrinsic energy of a gas as not residing in the potential energy of intramolecular forces, but mainly in the kinetic energy of the molecules themselves, which are assumed to be in a state of continual relative velocity. The physical theory of heat compels us to regard the intrinsic energy of any gaseous mass as dependent largely upon temperature, so that it follows that, if this intrinsic energy is found in the form of kinetic energy of the moving molecules, the average kinetic energy of the molecules throughout the mass must be a function of the temperature. When several kinds of molecules are in motion and acting on one another, the mean kinetic energy of a molecule is the same whatever its mass, the molecules of greater mass having smaller mean velocities.

If equal volumes of two gases are at equal pressure, the kinetic energy is the same in each. If they are also at equal temperature the mean kinetic energy of each molecule is the same in each. If, therefore, equal volumes of two gases are at equal temperature and pressures, the number of molecules in each is the same, and, therefore, the masses of the two kinds of molecules are in the same ratio as the density of the gases to which they belong.

It is not necessary to go into the processes by which the size and velocity, as well as the mean path, of the molecule have been calculated. The mean path of a molecule of hydrogen is given at one 10,000th of a millimetre. About two millions of molecules of

hydrogen would form a row a millimetre long. Since the molecules of organised matter are very complex and so much larger than molecules of hydrogen, it has been computed that about two million molecules of organic matter might constitute a fragment visible under a microscope. If these conceptions were true, they would have an important bearing on those theories of heredity that require for their application the existence of pangens, micellæ, ids, or the like. The size of the resulting germs would, upon the above calculations, soon become quite unmanageable and impossible. Of course, we shall see later that, even on the atomic hypothesis, we may be dealing with ultimate particles (electrons) a thousandth the size of the atom, so that the "ids" *et id genus omne* again find a realm for their imagined operations.[2]

When we assume that atoms of every pure (unmixed) substance are all alike among themselves, then Dalton's law of multiple proportions follows of necessity, and all relations of mass in chemical compounds must be regulated by the masses of several atoms. There exists, then, for each element a definite number, which expresses the quantity of that element that may enter into compounds. These numbers for the various elements are relative, or are really ratios. These numbers are the combining weights, or more properly, the combining masses of the elements, and are commonly but incorrectly called the atomic weights.

While, nominally, these atomic weights express the ratio of the combining weight to that of hydrogen, assumed as unity, for practical reasons the assumption is made that oxygen has a weight of 16 as compared to hydrogen, and the comparisons are made direct with oxygen and reduced to a theoretical unity on that basis. As a matter of fact, if O is 16, H is about 1.003 or 1.005.

A very important corollary of the atomic hypothesis was that suggested by Prout in 1815 and elaborated by Meinecke in 1817. Prout believed that there is a fundamental substance or protyle out of which the various atoms are formed by union in various proportions, etc. Hydrogen he at first supposed to be, or to contain, the

[2]An interesting discussion of methods for determining the size of molecules is given in Risteen's *Molecules and Molecular Theories.*

protyle, and, as a consequence, it was assumed that the atomic weights of all elements must be multiples of that of hydrogen or some aliquot part of it, i. e., of the protyle composing it. Thomas Thompson disseminated this idea in England, but, in fact, it is a suggestion which will occur of itself to every thoughtful student of chemical quantities.

Dumas and Stas found errors in the work of Berzelius and showed that the ratio of carbon and hydrogen is as 12 : 1 and that of nitrogen to hydrogen as 14 : 1. This seemed a long step toward experimental proof of the protyle theory. The result of the most careful quantitative work so far does not support the supposition, and Dumas was obliged to divide the weight of hydrogen by 4 in order to secure the desired factor, and this is so small a number as to be quite within the range of experimental error in determining the atomic weights by present methods. It will be seen later that recent results seem to indicate that the factor may be hydrogen divided by 1000, not by 4, so that this difficulty is not so serious as was supposed, provided we accept the electron as the modern representative of the protyle.

However, there is a real approximation to such a relation as Dumas supposed. Out of 67 elements whose atomic weights are fairly well known, 38 are whole numbers or different from a whole number by no more than one tenth. It will be noticed that quite recently the doctrine of the protyle is rendered probable in another form. The so-called electrons, which are supposed to be vastly smaller than atoms, are found, by the best evidence yet available, to have the same mass, whether derived from the atom of one substance or that of another with a different weight. Moreover, there seems to be reason to suppose that atoms or molecules may become so complex that the internal strains cause them to be unstable, as in the case of radium, and that these protyles are given off incessantly without appreciably reducing the mass. If this spontaneous decomposition be assumed and the materials given off are manifoldly smaller than hydrogen atoms, then no experimental verification of the proportional relations of the protyle to the atom

could be expected in the usual channels, and the objections to the hypothesis in the new form disappear.

Another set of corespondences has given rise to what is known as the periodic law. J. B. Richter, as early as 1798, made some suggestions in this line, and soon after the atomic hypothesis was formulated, Doebereimer called attention to a certain regularity in the series of combining weights. Pettenkofer tried to arrange the atomic weights of similar elements in arithmetical series, Lenson hoped to group all weights in triads, and, later, Newlands announced the law of octaves and enjoyed the ridicule that usually attends the premature recognition of a new fact. Finally, Lothar Meyer and Mendeljeff contemporaneously (1869) announced that properties of elements are periodic functions of their atomic weights. In this way, curious analogies in mathematical proportions were brought into relation with similarities in the properties of elements. A very remarkable regularity occurs with respect to the valency of the elements. An indication that the discovered correspondencies have some counterpart in nature is found in the fact that Mendeljeff was able to predict in advance the characters of elements to fill the vacant places in the series; and these predictions were verified to a considerable extent on the discovery of the corresponding substances.

Difficulties in applying the law of Gay-Lussac to compound gases like HCl led eventually to the recognition of the theory that atoms in a gas join to form groups called molecules. Gay-Lussac's law, therefore, runs: "The specific gravities of gases stand to each other in the ratio of their molecular weights."

The molecules in a gas are supposed to be moving in all directions with very different velocities and are continually encountering each other. The molecules will encounter each other less frequently the farther apart they are, and all the more frequently the larger their cross-section. The mean free path is directly proportional to the space alloted to each molecule. J. R. Mayer, in 1842, deduced from apparent loss of heat during expansion of a gas and the fact that this expansion in a vacuum does not occasion such loss, the idea that the heat is converted into energy. When the gas is com-

pressed, the work done is transformed into heat. This led to the doctrine of the conservation of energy.

As already briefly alluded to, considerations connected with specific heat and the kinetic theory of gases seem to show that there is intra-molecular energy, which may be conceived as expended in vector, i.e., rotational motions.

A remarkable character of molecules was laboriously evolved from apparent discrepancies in the results of chemical analyses, which seemed to point to different properties of bodies with the same composition. Franklin, in 1852, discovered that one atom of zinc, arsenic, etc., had its combining tendency satisfied by a definite number of univalent elements or radicals of whatever kind they might be. An atom of carbon, for example, can unite with four other univalent atoms or radicals.

With the law of valence a new vista opened before the molecular student. The valences were also found to form a series corresponding to the periodic law. It will be seen that, putting aside the assumption of materiality as a mysterious conveyor of properties or activities, the atomic hypothesis has been the means of revealing a large series of quantitative ratios or correspondences, the value of which to science is something wholly apart from the significance of the material atoms in which these correspondences are supposed to reside. They are all correspondences in force, or, better, in form or amount of energy.

The fact that there were exceptions to the application of the general law of valency, led to a search for variations in the form of the atom to explain the variation. Van't Hoff, in 1878, advanced such a theory. He assumed that the chemical attraction between molecules is due to gravitation, and that, if the form of the atom were other than spherical, the intensity of attraction at the surface would have a certain number of maxima dependent on the form. If the thermal motion of the atom were rapid, only the strongest maxima would be able to retain their atoms, and valency would be greater at a low than at a high temperature, and this is the case.

Van't Hoff extended his theory by formulating a tridimensional space relation for atoms. He supposes the valencies of the carbon

atom, e. g., to act at the four summits of a tetrahedron. Wislecenus has shown that this theory gives an intelligible explanation of the existence of more isomers among unsaturated compounds than indicated by the ordinary structural formulæ.

Although this theory is of the most hypothetical kind, it has been extended to form the foundation of a complicated stereochemistry, the applications of which have also a bearing on crystallography.

We know of no matter without energy, or rather, we postulate matter only from the energy perceived. Energy is defined as of such a nature that *it is not possible for any masses affected with any kind of energy to exist together.* (It will be noted here that the fact that there are "masses" affected by "energy" is assumed without any shadow of proof.)

Mass is used as though it somehow represented "amount of matter," but, in reality, it is expressed in units of a force, and reasons may be given for using energy instead of mass. It is generally agreed to represent kinetic energy by the formula $\frac{v^2}{m^2}$, when m equals mass and v equals velocity of the moving body. Potential energy will then be represented by fs, where f equals force or measure of striving to change place, and s the space passed over by the point considered in the change of state. The general law that in energy the intensity must have the same value in all parts of the system is interpreted to mean that

For kinetic energy velocity equals intensity,
" potential energy force equals intensity,
" heat energy temperature equals intensity,
" electrical energy electromotive force equals intensity;

and that, whenever the intensity varies in different parts of the system, the latter is in a state of unrest until equilibrium is restored. In all these expressions one factor is quantity and the other is intensity; in electrodynamics, for example, the conception is that the quantity of electricity is the real thing at the bottom of electrical phenomena, and the second or electromagnetic force or tension is an intensity. (Whatever value this analysis may have in providing

an expressive terminology, it must be remembered that the real thing is the electrical energy, and that the separation into two factors is as illusory as the dualism between matter and its properties.)

Clausius was led to conclude that some molecules in electrolytes are decomposed in consequence of their collision, and that these parts, being separated, are available to effect the transport of electricity generated.[8] And it was later decided that solutions of salts and strong acids and bases contain these substances largely disassociated as ions. This theory of electrolytic disassociation has proven quite fruitful.

Up to the time of Boyle, the conception of a chemical element was not that of a substance, but of a property or a plexus of properties, so that the presence of an element in a substance was recognised through the possession by that substance of a certain property, and it may well be that little has been gained philosophically by the new idea that elements are undecomposed residues of natural substances.

From the chemical side, the atomic hypothesis seemed well justified. It became a vast and complicated structure, coherent and serving to join in an intelligible system the wonderfully varied mass of facts accumulated by thousands of workers in this field. The brief summary given will serve to indicate the diversity of the problems and the methods of solution. Like gravitation the theory was "proven" and adopted in all the practical work of chemistry and was taught in all schools as an established dogma, and yet, like the theory of gravitation, it is undoubtedly false in its present form. It is a common charge against science that it is lacking in stability and that the accepted theory of yesterday is discredited today. The criticism indicates an entire misconception of scientific

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[8] By Clausius's formula, the free path of molecules has been calculated as, for example, that of oxygen at .00 000 38 in., of nitrogen at .00 000 36 in., of hydrogen at .00 000 67 in. From data so secured, the average number of collisions per second experienced by molecules of various gases at 0 deg. C. and atmospheric pressure, as follows:

Oxygen, 4 410 000 000 per second,
Nitrogen, 5 021 000 000 per second,
Hydrogen, 10 040 000 000 per second.

method. Every theory which serves to bring disconnected facts into harmonious relation has truth in it, and a rejection of a theory in its definite form, after it has served its purpose, is not to discredit its utility. The relations exist and each new theory serves to exhibit these relations more completely, till the approximation to complete harmony, i. e., explanation, is reached.

It became evident when the attempt was made to apply the atomic theory to physical problems that it was insufficient or incorrect. The emission theory of light proposed by Newton, on the basis of the rectilinear factors in its propagation, proved incapable of explaining the transverse vibrations indicated by the phenomena of polarisation, etc. This and many other insufficiencies led to the necessity of recognising an imponderable ether, which, nevertheless, was obliged to possess many of the characteristics of the homogeneous solid; and thus it came about that two contradictory concepts contrived to occupy the field together, and matter was supposed to occupy the same space with continuous ether and to be acted upon by it, while having none of its properties. A third entity, energy, by which alone ether and matter can be known, was postulated as acting upon and through both. Curiously enough, the very power of acting which is all of energy is impossible without ether and matter; and we have the third absurdity of an agent which cannot act alone, endowed with the power to act, when it comes in contact with matter, in which it immediately develops properties which have no active existence, except as acted upon by energy.

These philosophical absurdities are tolerated by those physicists who clearly recognise them, because of the difficulty of providing a practicable substitute for the elaborate systems, which have grown up in the two allied domains of physics and chemistry within the last few years.

Now, having spent a hundred years in founding and perfecting the atomic hypothesis and bolstering it up with etheric creations of imagination, nothing is more characteristic of scientific spirit than that science should make every effort to destroy or replace it. This is the work of the twentieth century.

Newton was satisfied with the solid singleness of the Lucretian

indivisibles, though he too found the ether a necessary adjunct. The defects in the atomic hypothesis are nowhere more evident than in the characters of the so-called ether invented (one can hardly say discovered) by Faraday and Clerk Maxwell. But even after inventing such a medium, it was not found possible to invent properties for it that would satisfy the conditions. A gas will not execute luminous vibrations and the anomalous solid it was once supposed to resemble could have no stable equilibrium. Material status is denied it, yet without it we are told, there could not be gravitation, and yet weight is fundamental to atoms. Without the ether atoms could not communicate. Matter is not conceivable apart from the medium which transmits its activities. Observe here that the very qualities or attributes, by which alone matter is supposed to be known, are "inconceivable apart from this invented ether which has none of them." This sounds suspiciously like nonsense.

This medium is essentially limitless and universal. It is a short step to the denial of this matter which thus plays hide-and-seek with our reason. This Kelvin did by using Helmholtz's vortex ring phenomena to illustrate a kind of atom composed of ether by the isolation of portions of the ether affected by vector motions. Such vortex atoms were found by mathematical calculation to be capable of permanent separate existence, by virtue of the peculiar form of their activities. Their indispensable matrix is a perfect fluid.

By going a little further, Professor Larmor has urged that atoms are foci of etherial strain. But, putting aside the seductions of this line of thought, whose mathematical abstruseness has hindered its popular acceptance, let us pursue the downward career of the atom.

Lockyer urged consistently from the results of his spectroscopic work, that in the furnaces of the sun, matter exists in a still more elementary condition than the atomic. Through what is called the "Zeeman" effect, magnetic phenomena are made to give confirmatory evidence of this suggestion. But it was a result of the investigations of greatly attenuated matter in Crooke's tubes that the evidence became most convincing. When electrodes are introduced into such a glass tube and the air exhausted, till the pressure is, say, one one-

millionth of an atmosphere, an electric current, in its passage, develops peculiar phenomena. It is now borne across the partial vacuum by a stream of particles from the negative pole, and these particles are invisible until they impinge on the glass, when they become visibly luminous or phosphorescent. It is found that the stream is susceptible to magnetic influence, and, for this reason, it is supposed to be molecular. The discharge tends to describe a circle about the line of magnetic force as an axis.

This "matter" was described by Crookes as being in a fourth state, as it does not perfectly obey the laws of solids, liquids, or gases; it is, in fact the so-called "radiant matter." These "cathode rays" pass freely through thin metallic films and discharge electrified bodies by making the surrounding dielectric temporarily conductive. These rays also affect photographic plates.

Oxygen, at one-sixteenth pressure, is exactly as permeable to cathode rays as is hydrogen at normal pressure; and this fact is very significant.

"Roentgen rays" are also produced by bombardment of walls of vacuum tubes by radiant matter, but are enormously penetrative of many opaque substances. They cannot, however, be diverted from their paths by magnetic influence. For this reason, cathode rays are said to be corpuscular, and Roentgen rays are etherial, movement alone being supposed to be transmitted. Here, however, is a case where the properties of the two things are exceedingly similar and the fundamental distinction between the behavior of material particles and etherial vibrations breaks down. We may be forgiven for doubting the existence of such fundamental distinction, at least in this case.

But, returning to the cathode ray material, it is concluded that it is composed of neither molecules nor atoms. Whatever the kind of gas in which they are produced, their properties are identical. Perhaps we have here the "protyle" or primeval material—the *Urstoff* of earlier speculative physicists.

These infra-atomic elements can only be produced by means of electricity and are always "charged," and this lends plausibility to the description by J. J. Thomson of cathode rays as "convection

currents" of electricity. He adduces reasons for believing that these "corpuscles" are one-thousand times lighter than hydrogen atoms, and that they form "invariable constituents of the atoms or molecules of all gases and presumably of all liquids and solids." If these are ultimate electrical units, the name "electrons" is appropriate for them. A confusion often arises here by employing "ion" for "electron," and physicists speak of "ionising" the air. Gases are 'ionised," when their molecules are broken up into smaller particles or ions, each associated with an electron. The electrons have the power of electrical conduction. Ideas here are as yet very hazy, and the minute discussion of them here would be unprofitable. Perhaps, the tendency represented by Larmor to believe that an atom is an aggregate of electrons in vector motion, that its mass is proportional to the number of these constituents, and that the interatomic forces are electrical, is now in the ascendent.

These suggestions might have been relegated to the limbo of defunct theories, but for the startling and rather disconcerting discoveries, in connection with radiant matter, recently made in uranium compounds and related substances. Uranium, thorium, and radium have the highest of known atomic weights, and this fact suggests that if atomic equilibrium really be unstable, the effects of interference or incipient break-down should be observed in the case of these elements, if anywhere. In fact, the rarity of these metals may be due to the fact that they are unstable and liable to subversion or inorganic decomposition. Radiation, like phosphorescence in animate matter, may be a species of decay.

Electrical tests of radio-activity carried on by Rutherford and Soddy at Montreal promise a quantitative measure of this activity. The ionisation of a given quantity of air was measured by the effect on a constant current, as read by an electrometer. Thus, the leakage of electricity under the influence of the radiations can be measured very accurately and a standard of comparison secured.

Thorium and radium give off continuously three kinds of rays called *alpha* (atomic), *beta* (cathodic), and *gamma* (etherial). The first or alpha rays are believed to be composed of atoms (perhaps of helium) and are charged with positive electricity, and they can be

deflected by a magnet. They move with a velocity of some 16,000 miles per second and are powerful ionising agents. Beta rays, on the other hand, are cathodic, and the particles may be one one-thousandth of the weight of hydrogen atoms. They are positively electric and highly actinic. They are dispersed unequally, forming what has been called a "magnetic spectrum." Gamma rays are believed by Madame Curie to be ultra-luminous vibrations. They are not deflected by a magnet.

Besides the above, the substances above named slowly give off what appear to be gaseous emanations that can be condensed by intense cold. By means of these emanations are explained "induced" radio-activities in objects adjacent to radiantly active materials. These emanations are self-luminous. From experiments so far made, Professor Rutherford inclined to the belief that the alpha rays are really helium atoms and the emanations also behave like this element. It is possible, then, that radium spontaneously decomposes in forming helium at ordinary temperatures.

The production of heat by radium, independent of other source, is a significant fact and has been supposed to show that this element is continually liberating atomic energy.

Hitherto, we have had to do with molecular effects; here it is possibly a case where deeper reservoirs of force residing in the atom have been tapped. If a radium atom contains 258,000 electrons, J. J. Thomson concludes that the diminution of the intrinsic energy of radium atoms by one per cent. would keep up the emission phenomena for a period of 30,000 years. If 3.6 grammes of radium existed in each cubic metre of the sun's volume at the surface, it would be sufficient, according to Wilson, to supply the totality of solar radiation. These guesses serve merely to suggest what a mass of energy may lie concealed, entirely inappreciable to scientific instruments, in the "atomic" structure of the most tenuous gases. A gramme of radium, according to one author, has power enough to raise 500 tons a mile high.

But this fatal quality of dissociation appears to be universal, as Sir William Crookes says. Bewildering as is the mass of new facts and still larger crop of new speculation, it is clear that atoms in the

old sense can no longer be accepted. With the atom, a whole world of varied and enormous activities has been discovered, and the door out has been left ajar so that these forces can no longer be kept sealed. Pandora's box is open and the plague of new speculation is abroad.

The simplest view that can be taken is that the integrity of what we call an atom is in the nature of an equilibrium. Mathematical and physical experience shows that vector motions (rotational energy, etc.) are different from energy in rectilinear or radial translation, and that there may be a high degree of independence between these two sorts of energy, and that two instances of vector motions may mutually influence each other in various phases, depending on their correspondence in time and mode. The solenoid illustrates this point roughly.

Physics is inclined to suggest an electrical force as behind all so-called material phenomena, and the recent results of radium investigation tend to support the suggestion.

Meanwhile, one result is plain: cosmological speculation can profitably go no further than to take the actual data of experience, which gives us only energy in various manifestations, and it is by no means clear that anything will ever be gained by seeking an explanation of the ultimate fact of experience by invented "carriers," "media," postulated to "explain" what is by nature inexplicable. Further discussion may, however, be postponed till we have considered the other material alternative.

"We are acquainted with matter only as that which may have energy communicated to it from other matter. Energy, on the other hand, we know only as that which in all natural phenomena is continually passing from one portion of matter to another."—*Maxwell.*

THE PLENUM.

The defectiveness of any atomic conception of matter appealed to a certain class of minds, from the first. As a mere abstraction, it seemed unthinkable that the continuous translation of force through space could take place if space were but partly filled. Atoms, if capable of independent action at all, required to be separated from

one another by such spaces. Nature, especially as we have said, the nature of the human mind, abhors a vacuum, and it was inevitable that the atomic hypothesis should be substituted for or supplemented by, the concept of a plenum or something filling space completely.

Even Anaximander seems to have had some such idea in his ἀρχὴ or *Urstoff*. This unlimited, undefined, but not immaterial, ground of energy was in so far dynamic, as it possessed the eternal property of motion, but it was not freed from the materialistic tendency of the Ionic school in which it developed. There was a combination of the energic with the plenistic ideas, which were too vaguely expressed to have more than an historic interest.

The plenum of Descartes was something like extension. There are two substances, spirit and matter. The attribute and essence of matter is extension. This dualism was bridged by Malebranche, but there is nothing to explain the nature of the universal plenum. Descartes does explain light as generated by a pressure throughout an infinitely elastic medium filling space. Newton, though advocating a corpuscular theory of light, also taught that heat may be conveyed through a vacuum "by vibrations of a much subtler medium than air," and adds, "is not this medium the same with the medium by which light is refracted and reflected?" He also employs the ether to account for gravitation. Hearing and animal motion he also supposed to be brought about by the vibrations of ether.

The theory of the ether, as now universally taught, results from the necessity felt for a medium to transmit energy from point to point. Light, for example, moves at a finite rate from the source of generation, and, in as much as the phenomena of destructive interference seem to forbid the idea that light is a substance emitted from the luminous body, as held by Newton, the only recourse was to postulate a medium of some kind in which disturbances may be propagated in all directions. We have the analogy of sound. Sound waves are not propagated *in vacuo*. It requires a medium, in this case air or some fluid or solid substance. In like manner, it is supposed, there must be a medium for the light, heat, and electrical vibrations.

Huygens is credited with being the real inventor of the etherial hypothesis in its present form, and it cannot be denied that the doctrine has been most fruitful. The present tendency is perhaps to consider even the phenomena of matter itself as manifestations of energy stored in ether. Potential energy is considered to be energy stored in the ether and may be simply motion of the ether, so that all energy will be found to be, as it theoretically must be, kinetic.

Two properties must be assumed to satisfy the conditions, for which ether was invented, viz., elasticity and density. In the case of a vibrating elastic solid, the energy is half in the form of kinetic energy due to the vibratory motions of the parts of the body, the other half being potential or stored up in the distortion of its parts. It has been found that the vibrations of light are of such a nature as would be impossible to either liquid or gas, so that something analogous to the solid state is required. This state is found by mathematical research to be unstable. It results that the ether has no scientific footing, but has the anomalous status of being something of pure invention, failing to satisfy the conditions which alone led to its invention.

As a matter of fact, all the discussions of wave phenomena would be just as intelligible as they now are, if the idea of ether were eliminated. Or, rather, this would be the case if the mind would disabuse itself of the analogy of water and sound vibrations, which seem to require a medium. Here the more suitable expression is that waves of sound are alternating forms of activity recognised in conditions satisfied when vested in what we call liquid or other matter. It must not be forgotten that the energy involved in sound is not lost, when the sound wave is prevented from proceeding by an interposed vacuum. Its critical point is reached, and it assumes another form. These modes are really expressions of interference of forces, residing, as we are wont to say, in the forms of matter called media for sound waves.

Optics talks of the kinetic energy of a vibrating particle, distribution of energy in the case of a medium disturbed, etc. All of these concepts lose nothing if divorced from the idea of a medium.

A study of electro-magnetic phenomena has been used to fortify the ether hypothesis, and, by a curious fatality, it now seems that its perfection will but serve to complete the overthrow of that theory. The ether about an electrified body is supposed to be affected or thrown into activity. When thus active it is polarised. When the body is discharged the activity ceases or is dissipated. Alternating electrical charges are accompanied by changes of state or vibrations of the ether, and, if the charge be varied periodically and with sufficient frequency, we have a vibration at each point analogous to, and perhaps identical with, what occurs in the propagation of light. Light and heat waves have been reduced to the same category, both being waves of electrical polarisation. Professor Hertz's experiments related to oscillating discharges having a period of about one 30,000,000th of a second, and reflection and interference of electro-magnetic waves are ingeniously brought within the sphere of observation. Reflected waves interfere with direct waves as in the case of sound. Most of the experiments usually carried out with light and heat waves were successfully tried with the electro-magnetic vibrations. From the mode of production, it follows that these vibrations consist of transverse vibrations, and that they are plane-polarised. Without carrying out the comparisons between the electro-magnetic and light vibrations further, we may add that, according to the electro-magnetic theory of light, the vibration is a transverse periodic disturbance attended by electric force in one direction and magnetic force in the perpendicular direction. Comparison of velocities and refractive indices reveal the required harmonies. The original conjecture of Faraday (*Experimental Researches,* 3075) that the electro-magnetic action may be a function of the ether, seems about to be confirmed, except that by the ether we are brought no nearer to a solution of the general problem.

Even if the difficulty involved in the supposition that an elastic or compressible medium must be discontinuous be ignored, and we assume that a medium may be homogeneous and continuous as regards density, and yet may be really heterogeneous by virtue of its motions, as in the case of the vortex atom, in a perfect liquid-solid, still are we no better off with our medium than we would be, if we

substitute energy, instead of mass, in our equations and do away with the material element and medium altogether.[4]

There is an important fact which physical theorists are prone to forget, and, by neglecting it, are led to state hypotheses as proven facts, viz., we cannot know atoms or molecules individually, but, if at all, *only in the aggregate,* and what we infer of their structure must be by observing, experimentally, the gross results of their interaction in masses. For example, according to Avogadro's law, there are simple volumetric relations among gases when they combine. The densities of gases are proportional to their molecular weights. But the statement of Avogadro's law, in the usual way, that "all gases (conditions being the same) contain the same number of molecules per unit of volume," is pure hypothesis, yet it passes in physical literature as "established fact." The question of the nature, nay of the existence of molecules, is begged throughout.

Any theory, molecular or otherwise, which can acceptably *explain* the constitution of the physical universe, must bring into harmony the different facts which pass under the names *inertia, elasticity, attraction,* and *stability.* But, by explaining, we do not mean the clearing up of the ultimate *why* or the final *what,* but the arranging of all the facts in a congruous system which is the ultimate

[4] An illustration of the tedency of modern physics in relation to the concept of materiality, is given by Drude's *Lehrbuch der Optik,* which is devoted largely to the mathematical development of the electro-magnetic theory of light. In this work we find such expressions as "The vacuum (the free ether)," "the velocity of light in empty space (the free ether)," and the following more definite statement: "The concept of the absolutely quiescent ether is most simply and naturally expressed if we understand by ether, not a substance, but simply space provided with certain physical peculiarities." The naïve innocence of metaphysical taint in this statement, where space is supposed to be clothed with certain physical attributes, may seem amusing, but we see at least a recognition of the difficulties inherent in the postulate of material media. The magnificent hypothetical structure erected by H. A. Lorenz (*Versuch einer Theorie der electrischen und optischen Erscheinungen in bewegten Körpern,* Leiden, 1895) rests on the assumption that the ether is always in complete state of rest. The chief value of the electro-magnetic theory is that no special assumptions are necessary for the propagation of light, but its laws follow directly from those of electric and magnetic forces as already worked out, or, as Drude says, "It does, indeed, represent a remarkable advance in natural science when two hitherto unrelated realms, like optics and electrical science, are brought into relations by mensurable control."

how. The dynamic view is that the complete comprehension of the *how* is all that we can ever know of either *what* or *why*. It is not sought to "unify the conception of chemistry and physics and consolidate these sciences into one grand science of matter," as suggested by Risteen, but, on the contrary, it finds the essence of things in their behavior and is satisfied, if it may continually approximate to a knowledge of the forms of these activities, which to know is to *understand* the physical universe. Nor does one doubt that the energy which finds expression in material terms is, in last analysis, of one kind with that whose complex trajectory is interpreted in consciousness.

When the physical demonstrator by means of a box punctured on one side and furnished on the other with a taut membrane, by tapping on the membrane, projects smoke rings across the room and shows us how the smoke curls in vortex-flow along the axis of translation and how two such rings may be made to interfere and intertwine in most complicated fashion, he is careful to tell us that the smoke which we see performing these amusing antics has nothing to do with the phenomena, except to make them visible to us. The vortices would be there just the same, if no smoke were in the box. So when the vortex atom, which comes the nearest at present to affording a scientific concept of the physical unit, is introduced, Lord Kelvin is careful to exclude from the ether, in which such atoms are supposed to exist, all material postulates. It must have the character of a *perfect fluid*. Thus, we see the postulate of materiality is but the smoke for making the vortices comprehensible to the lay mind. A brief analysis of the vortex-atom, or, better, the vortex unit, will make this clear.

1. Helmholtz, in his definition of vortex units by mathematical process, showed that the fluid in which such vortices exist must be frictionless, homogeneous, and incompressible. Such a combination is incompatible with what we are supposed to know of matter, but granting these conditions, a vortex could never be produced or destroyed in such a medium, and it follows that it would be conserved forever, or that it would exist as long as the medium continues.

2. Such a vortex would always contain the same portion of the fluid. It moves as a whole—it is not alone the motion that is propagated, as in wave motion. Thus the energy is doubly identified with the fluid (or conversely) both as to permanence and as to content.

3. Now, compare these points with the definition of matter by Lord Kelvin, the other great student of vortices. "Matter is the rotating parts of an inert perfect fluid which fills all space, but which, when not rotating, is absolutely unperceived by our senses."

If the statements under 1 and 2 are correct, the expression, "when not rotating," is inapplicable; for, if not rotating, this fluid can never be made to rotate, and, if only part be rotating and the rest not, then the part not rotating cannot affect that which is, nor can it be affected by it—it is "inert." If it existed we could never know it, nor could we comprehend in what its existence consists. It would be a case of "pure being," equivalent to "non-being" in the popular nonsense, improperly attributed to Hegel.

We see that the only things which could cause the vortices to affect one another *are their respective activities.* If matter is elastic, it is because there are such things as repellant phases of activity; if there be attraction, it is because certain phases coincide or have congruous periodicities; stability and individuality are inherent in the nature of vortex or vector activities, corresponding to intrinsic or genetic modes; and, finally, inertia is but another name for spontaneity, the last irresolvable, constituent attribute of energy.

It must be noted, in passing, that vortex units are not necessarily vortex *rings.* A better analogy is, perhaps, that of a spheroid of "free path" or field of activity in which the spheroid is tending constantly and in all parts to be everted. A ball continually turning itself wrong side out by a kind of convection motion is a convenient representation. This is a fourth-dimension motion of great mathematical complexity.

Doubtless, every genuine discovery made by the newer molecular physics, however erroneously applied, will find a place in the new dynamic science.

ENERGISM.

What has already been said, while giving but the barest outline of an exceedingly complicated subject, may serve to illustrate the difficulties in the way of any materialistic hypothesis as a foundation of practical science, not to mention the philosophical difficulties encountered at the outset.

There remains but one possibility—the appeal to energy. This method of approach seems very difficult, especially to those who have served an apprenticeship to modern physical science, because the idea of a medium or vehicle of force has become so strongly intrenched in the didactic literature and in the formulæ with which much of the practical work is done. It must be remembered, however, that the fact that a velocipede is equipped with three wheels does not prove that a bicycle may not move faster. If matter is unnecessary as a practical utility, the sooner this conception can be removed the better for the progress of science.

Historically, germs of the energic idea have always existed. It may seem fanciful to discover the nucleus of the dynamic concept in the dawn of philosophy, but in the ἀρχὴ or *Urstoff of* Anaximander we have a ground of energy, which, while not purely dynamic, and developing in dualistic form in antinomies of heat and cold, still indicated a naïve appreciation of energy as real, apart from a material substrate. This method of thought was common till Dalton, with his atomic hypothesis, gave it a long sleep. Malebranche postulated an absolute substance which includes all things and also the *idea* of all things, to resolve the dualism of Cartesian substance. Spinoza, too, denies the possibility of numerous substances, and demands an absolute substance, which is the real ground of all existence and the source of all reality. All expression of this reality is a limitation or negation (*omnis determinatio est negatio*). Matter and spirit are the two forms of self-limitation in which absolute substance appears. These are the attributes in the form of which substance reveals itself. There may, indeed, be many attributes in the substance, but, by the nature of the human mind, we distinguish subjective and objective.

In Spinoza we find the Cartesian dualism between matter and spirit maintained. There is a parallelism, but mind cannot work on matter, nor can matter influence spirit. These two are phases of one reality, so that there is correspondence but no interaction. (It should be observed that this is a much deeper view than that expressed in the current psycho-physical parallelism of psychology, which, as usually formulated, means nothing but the statement of an observed coincidence.)

The reconciliation of these difficulties is to be found in energism, which explains that neither body (matter) nor spirit (soul) exist as independent entities, but both are ways of experiencing the same energy. As Spinoza admits, the distinction between matter and spirit is of our own creation. When I feel a sensation and discriminate my feeling of it from some outside activity, this is a valid discrimination for *me*. The whole chain of activities between the outside source of light and the accommodation activities in my organ, form parts of a segment of activity, which *in itself* requires no explanation beyond the fact of spontaneous *doing*. The things I think about this (objective aspect) and the thinking about it (subjective part) cannot be distinguished as existences (matter and spirit) parallel to each other. Whatever truth they have inheres in the activity producing both.

At the present time, science represents the remarkable and anomalous spectacle of a vast mass of chemical and physical literature permeated and dominated by materialistic-mechanical theories. The entire pedagogic machinery, including text-books and teachers, is adapted to impart a strict construction of matter and energy as the twin realities in the physical universe, while, at the same time, the foremost investigators, and the authors of some of the very texts referred to, have openly or by implication abandoned these postulates.

The student of Ostwald's *General Chemistry,* for example, will find little to prepare him for such views as those presented in his address at Luebeck entitled "The Overcoming of Scientific Materealism."

As this writer observes, there are collected in the idea of matter

numerous elements of sensuous experience, like weight, extension, chemical properties, etc., which are found by experience associated with mass and connected proporionally with it, so that "the physical law of conservation of mass was transformed into the metaphysical axiom of the conservation of matter." "It is important to note that in this extension a number of hypothetical elements have been wrought into what was originally an entirely non-hypothetical notion." The necessary results of this hypothetical matter-hypothesis lead to absurdities, to which we have become so accustomed as hardly to notice them. As Ostwald says, speaking of the assumed persistence of the original substances in compounds: "When we consider, however, that all that we know of any substance is a knowledge of its properties, we see that the assumption that a definite substance remains, although it no longer retains any of its properties, is little removed from nonsense."

Nor is this all, for, having adopted the matter postulate, it is necessary to supplement it by the doctrine of energy. As matter is quiescent and unalterable, it is necessary to connect it with something to correspond with the changes known in experience. This constant cause of motion is energy, and this, like matter, is supposed to be a constant in the sense that its total amount is never increased or destroyed. Ostwald, again, says, respecting the mechanical construction of nature built upon the two above formulæ: "One usually does not observe to what extraordinarily great extent these generally received views are hypothetical not to say metaphysical. On the contrary, it is customary to assume that they express the maximum of exact formulation of actual relations. On the other hand, it must be emphasised that a proof of the consequences following from these theories, that all the non-mechanical processes like heat, light, electricity, and magnetism, are actually mechanical, has not been afforded in a single case."

We have traced in outline the transformations of the optical theory. The others are in no better case.

But if we are deprived of the assistance afforded to imagination by the concept of moving atoms, how are we to conceive of the world of matter and energy at all? Ostwald answers this question very

uncompromisingly: "Thou shalt not make unto thee *any* graven image or likeness. It is not our duty to view the world in a more or less dull or irregular mirror, but rather, so far as the structure of our minds will permit, to view it directly." The function of science is to bring into such definite relations *realities,* i. e., demonstrable and mensurable quantities, that when one is given the other may inevitably be assumed.

This is the energic point of view—not the substitution of one complicated hypothesis for another, but the eliminating of the hypothetical, so far as possible, and the appeal to facts of experience. To the criticism that the concept is empty and lacking in clearness as compared to the material view, we must reply that sensuous perception is a reaction induced by variations in the intensity and form of energy and nothing is gained by postulating media or bearers. Remember that matter is the abstract and energy is the real. The external reality is a reality of relation which the mind makes into *substance,* but substance is not necessarily *matter.* A classical English passage speaks of *faith* as substance.

When asked what advantages are to be expected from a resort to energic methods of notation in dealing with natural phenomena, the energist answers: "First of all, the very important one that by this means we have a natural science of fact and not of hypothesis. We no longer inquire about forces that we cannot demonstrate operating between atoms which we cannot observe, but, in forming judgment of a process, we examine the kind and amount of energy entering and leaving." This method is that proposed by Kirchhoff who wished to supplant explanation of nature by description of nature.

Physics shows that the ratios used in her computations are without exception ratios of different kinds of energy. Aside from the two forms or categories of perception, space and time, energy is the only measure. But space and time are measured by energy alone, for energy forms their only content. The predicate of matter cannot find a mathematical expression in eqations of energy. Only commensurables can be compared.

When physics repudiated force (in the usual sense) and chem-

istry reputiated matter and both cry "back to nature—back to experience," what science is to reap the benefit, or rather is to fill the breach? There can be but one answer. Psychological moments alone remain reliable and trustworthy measures of quantity. In last resort we discover (what has always been known but never realised) that the only energy we really know is that which we ourselves generate. The axiom at the bottom of all science is that the force impinging on my sensorium is commensurate, according to some law, known or unknown, with the reaction within my kinesodic system. In other words, the only real measure is mental reaction thereto—sense of effort or strain. Everything quantitative in science has to be interpreted in terms of effort before it can be recognised in any consciousness. It is customary, e. g., to reduce all measures of physical quantities to scales on some dial, let it be of an electrometer, ammeter, barometer, thermometer, photometer, or the like. The reading of such scales, is in final analysis, reducible to muscle-strain estimates in the eye-muscles, and the graduation of the scales may be reduced to a function of muscle-strain estimates in the hand, etc. It would seem, then, that we really estimate in homo-ergs or man-powers. May it not be possible to reduce all to a standard, say of "psychs"? The suggestion is not so far-fetched as it may seem, but the objection we at first meet is that there is no assurance that a unit of reference that would be true for me would be absolute for all men. A John Smith-erg might not equal a Joe Brown-erg. Expressed scientifically, the neural mechanism of man is so complex and the number of variables is so enormous and its processes so varied that it is difficult to discover a constant for a standard of reference. The resistance offered by the organism to external influences varies. Attention is not a constant, and all mental phenomena are functions of attention. In this dilemma the mind has recourse to an indirection. Being unable to find any single constant, it utilises a ratio. Under the assumption that the variables in perception affect both terms alike, then the result will be the same whenever the ratio affects the mind, no matter what phase attention may be in. This is a process of comparison.

To illustrate crudely, I may not be able to tell how far I travel

by summing up the total effort expended in walking, but I am able to reach an estimate by comparing a constant of effort in walking multiplied by the time employed, with a similar effort multiplied by twice that time. The mind very accurately detects differences when it fails to measure their amount. $(D : te :: D' : 2te) = (D = 2D')$, where e is a constant of effort put forth at any time, i. e., the habitual gait in our illustration. Very little experience shows that both factors, time and effort, vary below the threshold of consciousness and do not vary uniformly. If they varied proportionally and the equation could be written $D : te/x :: D' : 2te/x$, it would still be available but it must be written $D : te/x :: D' : 2te/y$, and cannot be solved. It having proven useless to attempt to construct a constant ratio on the subjective basis only, i. e., entirely on the basis of internal experience, values for x and y, i. e., for the variables in our equation, must be derived from without. The uniformities in experience, such as the succession of day and night and the annual astronomical recurrences, are used and continually corrected, till they can be represented by a contrivance like a clock or metronome. In this way, the internal time estimate becomes definitely linked to external changes. In similar ways, the other term, say, the effort in walking, is linked to external correspondences so that x and y become known in terms of t and e and the ratios t/x and e/y can be used in our construction of the world of experience. At the same time, it must not be forgotten that the ultimate standard is internal unit or constant of effort, without which the entire external mechanism would be valueless.

We have seen that the three categories of experience are time, space, and mode. In these three forms all experience is cast. Time is a necessary form of experience because of psychical limitation; two events cannot co-exist in consciousness. This is a result of the unity or individuality of experience. The psychological equivalent is sequence.

Space is likewise a result of the limitation of experience. Effort implies change. The external equivalent is motion. These two, sequence and motion, are the generators of the extended continuum of experience, which is filled in by the form of experience called

mode. Two modes may be distinguished, identity and difference, or, rather, mode consists in the distinction of difference from identity.

While the mind is incompetent to make quantitative distinctions directly, it has the most remarkable clearness and certainty in dealing with difference. Psychologists have used all their ingenuity to utilise this ability to discriminate differences as a basis for a quantitative psychological science. It would appear that a series could be made after the analogy of differential calculus, in which the several terms should increase by a difference less than any assignable quantity (the discrimination quantity), and that such a series could be compared with a corresponding series of external quantities, thus giving rise to a mathematical relation that should form a quantitative unit for sense perception. Almost the only result, so far, of this effort is expressed in the so-called Weber's law that while the series of excitations increases in arithmetical ratio the corresponding series of excitations must increase by geometrical ratio. And yet even this is found to express only approximately and within narrow and arbitrary limits a relation for which no adequate or constant explanation can be given.

A fundamental criticism of attempts to use the sense of effort as a unit of measure is that two or more things are frequently confused under this head. In the first place, the muscle sense or sense of muscular effort, if we are justified in speaking of such a sense, is a sensation-complex . It is not analoguous with the sense of having originated a voluntary act. Attention, which is involved in all receptive mental acts, involves, among other things, accommodative effects in organs of sense, it may also involve accomodation phenomena in the brain itself.

The inquiry remains: Is there such a thing as effort in consciousness apart from these accommodations? A prevailing psychological interpretation is to the effect that the afferent nerve current passes over into the efferent, according to conditions of structural organisation, and that the issuing into the efferent expression produces, or is accompanied by, a sense of action, or impulse, or initiative, or effort, out of which the sense of having-done-it arises. It is even

customary to speak of the will as arising subsequent to the voluntary act as a consequence of the act. However this may be, if muscular sense is really a sensation, like other sensations, and not a direct feeling of psychical activity or participation, then our supposed quantitative unit reduces to a series of modes. Instead of a simple more or less, we have different impressions which we *interpret* as more or less. The sensation produced by a weight of two pounds is a different sensation from that produced by one pound, not a more of an identical sensation. Evidently, we are on the wrong track somewhere. This raises the general question whether it is possible to use pure modality as a measure of quantity. A light twice as bright as another does not produce a sensation twice as intense nor one in logarithmic series as compared to the series of stimuli. We do recognise identity and change.

Theoretically, it is wrong to seek quantitative measures in the categories of external apprehension, since we are seeking an internal measure. Sensations cannot give this as they are all projected outward or externalised. Succession is, strictly speaking, all that the internal sense or inner experience can contribute.

Can it be, then, that the formal subjective measure is to be expressed in most general terms by at, where a is any attribute and t is succession or time? Such would seem to be the necessary *a priori* assumption. A test of such an assumption may be found in its applications.

Space, when filled, consists of one, and another, and another, etc. An absolutely uniform field of vision (or of any other experience, if possible,) could not be made to seem extended. This creeping from particular to particular is essentially, on its inward side, temporal, as it becomes on its outward side spatial. All our measures are now reduced to serial terms. When we say that one light is twice as bright as another, or that one star differs from another in glory, we express the results of a complicated system of judgments. If it takes me twice as long to traverse the plowed ground as the meadow with the same constant of effort, I have a measure for effort. Even here the difficulty is at once perceived

that we have no subjective time measure. We may use heart-beats, but even heart-beats are objective to the mind.

Succession and change, in last analysis, must be our subjective contribution to quantitative science, and it is useless to seek more. These forms are filled by experience, and we find our periodicity in external experience. The curious, if not altogether unexpected, result is that the soul itself has neither time nor extension.

After having appealed in vain to psychology for a complete quantitative unit, we are prepared to admit that *quantitative estimation is but one of the ways in which we affirm attribute. Its reality is neither wholly subjective nor wholly objective, but one of the forms of reality resulting from the union of both.*

If we eliminate matter as irrelevant, we have left energy, which reveals itself to us in terms of succession and mode. It produces varied sensations, and these are arranged in sequence. Our ability to recognise identity in mode gives rise to periodicity, and this is the measure of time. Some particular period, say a second, is chosen as such unit.

The negation of succession is co-temporaneity which is possible in connection with diversity of mode, and this is only objectively possible in terms of space. Two identical points have no spatial relations. All space relations are possible only upon the assumption or condition of co-temporaneity. The following psychological formulæ may be useful:

1. Sequence with identity produces periodicity = time.

2. Co-temporaneity (o × sequence) with diversity produces space.

3. Sequence with diversity produces change.

4. Co-temporaneity with identity produces intensity.

These abstractions require elaboration.

I. (Seq. × Iden. = T.) I experience a series of sensations, tic, tac; tic, tac; tic, tac; etc. One follows another in temporal sequence. But I detect a rhythm or identity. Where it not for the rhythm I should get no time measure. Thus I have succession and identity as necessary elements of temporal mensuration.

2. (o × Seq. × Diver. = S). On the other hand, in space re-

lations as such, sequence is impossible. Even when we conceive of a moving point generating a line, etc., it is always implied that at the same time the original point and all other points in the line co-exist in time and are considered together. The diversity of each point in space is represented by the locus formula, but the origin represents a constant point of reference, and time is excluded. It may be replied that time is simply ignored and diversity is all that is needed to produce a spatial measure. This is not true, for co-temporaneity is a real concept of form, though impossible in inner experience. Co-existence and diversity are possible only under space conditions. This distribution of mode and identity of time form the psychological data of space.

3. (Seq. $\times$ Diver. $=$ C.) Sequence and diversity are, in like manner, the psychological moments of change. If the sensation or sense datum be not co-temporaneous, or thought in one time with its predecessor, it has taken the place of that predecessor and there has been change.

4. (Cotem. $\times$ Iden. $=$ Int.) But, on the other hand, if the mode has not changed, but is thought into the same time, we get the concept of intensity or more of the same, or quantity. This predicate of intensity is not given in experience, but the same may be said of the others. Time is not a direct element in experience, though sequence is. Space is not a primary idea but is generated from co-existing diversities. Change is other than diversity. It is only when the temporal element is added to difference that the category of change is formed.

We have given, therefore, these fundamental derived psychic data of the second order not as subjective predicates, but as the first results of reaction between subjective and objective. If our psychological analysis has been correct, by means of these four moments it should be possible to construe all phenomena possible to experience. It may be left to mathematical physics to make the applications of these principles and the necessary substitutions in the formulæ in general use.

In conclusion, we may refer to the metaphysical results which transform the physical doctrine of energism into the psycho-philo-

sophical dogma of dynamic monism. In a little book published anonymously by Kegan Paul, Trench, Trübner & Co., London, in 1898, entitled *The Doctrine of Energy*, the author offers suggestions which deserve a wide reading. "The study of physics *can* be carried on practically as a study of phenomena—of heat, colors, sounds, forces, etc., all of which are kinds of phenomena—without the expression of any formulated opinion as to their relation with reality." "But science has been reluctant to recognise that it is now entitled to dispense with the postulation of matter. The theory, as announced by the leading men of science, has, therefore, been to the effect that there exist in the physical universe *two real things,* matter and energy, in place of one only, as commonly supposed for so long. We have elsewhere attempted to show that such a statement of scientific theory is erroneous and redundant; that science is not necessitated to postulate *two* such entities; but the postulation of energy supplies all her requirements." "Our view, therefore, is that the conception of materiality and of real matter can, in the way just indicated, be in all cases analysed into, and derived from the conception of energy; and that science, if consistent, cannot postulate the reality of matter as well. Potential energy adequately supplies the conception of a real substratum of which phenomena are the manifestations."

To the question: "How do I get beyond my presentiment? How pass from ideality to existence?" the answer is, "I never could have got beyond it or got any suggestion of the reality had I been related to my presentiment as a passive and percipient subject." I am in relation with the energic system not merely or primarily as an intelligent percipient of the transformations proceeding in it at a particular point, but also as a will initiative, to some extent, of such transmutations and capable of influencing and directing the physical process." "In my activity there is thus suggested to me a source of phenomena lying beyond the phenomena themselves." "My most incessant mental act is that by which, on analogy of my own active experience, I refer all phenomena to the underlying energic system."

We cannot go into the author's treatment of causation as a

derivative from the self-consciousness of initiative, which is then objectivised and recognised as one with the source of all action—energy. Enough has been said to indicate a close connection with the position taken by Schopenhauer in the *Fourfold Root*. "What we think under the conception, *matter*, is the residue which remains over after bodies have been divested of their shape and of all their specific qualities; a residue which, precisely on that account, must be identical in all bodies. Now, these shapes and qualities, which have been abstracted by us, are nothing but the peculiar, specially defined way in which these bodies act, which constitutes precisely their difference. If, therefore, we leave these shapes and qualities out of consideration, there remains nothing but mere activity in general, pure action as such, causality itself. Matter is throughout pure causality, its essence is action in general."

That these views will be slow in finding acceptance among the rank and file of chemists may be gathered from remarks in F. W. Clarke's "Wilde Lecture" before the Manchester Philosophical Society, May, 1903.

"When we say that matter, *as we know it*,[5] behaves as if made up of very small discrete particles, we do not lose ourselves in metaphysics, and we have a definite conception which can be applied to the correlation of evidence and the solution of problems. Objections count for nothing against it until something better is offered in its stead, a condition which the critics of the atomic theory have so far failed to fulfil."

This illustrates how, for each of us, his own particular brand of metaphysics seems harmless or not to be metaphysics at all, for this is exactly the contention, that the material hypothesis is metaphysical and has added nothing to the definiteness of our conceptions of physical phenomena, neither can it legitimately be utilised for the solution of problems. The abacus has long since been abolished from our schools, is it still necessary to our physicists, must our chemists still continue to count on their fingers?[6]

C. L. Herrick.

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[5] Italics mine.

[6] The question might be asked, (in fact, it has been asked): "How is it

possible to get the resistance or limitation necessary for the objects of our experience out of pure energy?" "Is the element of tension and opposition in your very conception of energy?"

The reply to this should be based upon an examination of the nature of the energy concept more detailed than is germain to our present purpose. The difficulty is, probably, like nearly all philosophical perplexities, a result of our unhappy logical faculty for splitting things that ought not to be divided. We may undoubtedly think of the *word,* "doing," apart from the expression, "doing of something," but it is to be doubted whether we can think of *pure* energy at all. We think by "affirming attribute." It is still more energetically to be insisted that no real severance of the doing from the thing done is permissible. It is the old matter fallacy or the cause-effect fallacy in a new guise. If energy is to be set up in the place of matter as a power behind the throne, let us alone and we will return to our idols.

Viewed from a physical point of view, given no resistance to action, there is no energy. If we mean anything by energy, it must be valid in that it is acting. If the sum-total of universal energy were in like phase, it would be the same as if there were no energy so far as making a universe is concerned. Herbert Spencer has not lived in vain. Pure being is the same as non-being. We have had our Hegel. A non-acting deity would not even potentially be a God.

Practically, energy is called into and remains in existence only under condition of resistance. Resistance is varied and gives rise to *mode* in energy. In an earlier paper the writer defined creation as the self-limitation of creative power. This is not subject to further analysis. Having no experience with universal or infinite modes of being, we do not expect to understand what we must nevertheless postulate. If this view is open to the taunt that we take out no more than we put in and so are no better than prestidigitators, our reply is ready. If other people take out of their logic more than they put in, they lay themselves open to the charge of dishonesty. The taking out of more than is put in is called in logic "fallacy."

DID THE MONKS PRESERVE THE LATIN CLASSICS?

SINCE the civilized world has held the classics in honor, the admirers of the cell and cloister have claimed that, throughout the Dark Ages, the monks loved and studied the classics, and, by copying, preserved them for posterity.

This claim has been pertinaciously urged; and as it has been admitted by certain writers of good repute and great complaisance, there is danger that it will become one of the conventional statements in history.

Believing as I do, that the admission has been made without due examination and in gross misconception of the spirit and history of Mediæval times, and particularly of the monastic system prior to the year 1200, I ask your attention to the opposite view of this subject. I shall treat it as one purely historical, keeping in view nothing but the Latin classics, and how they were treated by the monks of Western Europe up to the end of the twelfth century.

EXTENT AND AMOUNT OF ROMAN LITERATURE.

While the modern public is familiar with the multiplication of books by the printing press, it knows little or nothing of the ease and rapidity with which the "tachygraphs," the swift penmen of Rome, threw off their manuscripts. It is difficult for us to conceive that there were in Rome large numbers of professional literary men, great libraries, public and private, numerous persons engaged in book-selling as a regular business and having a trade with all the provinces of the Roman Empire and with booksellers

in all their cities and towns; that there were in the Roman Empire more copyists probably than there are printers in the United States; that the ancients made better ink than we do; and that their parchment volumes were more durable than our paper books. And we, it may be, admit nothing in favor of the Romans, quite so reluctantly as that, in the matter of books and literature, they were in some respects, barring the difference between types and penmanship, quite equal to the Americans of the twentieth century.

The Public Libraries of Rome, about the year 100, were magnificent. The *Octavian* was built of marble; its floors were laid in mosaic work; its ceilings were frescoed in gold; and the walls were decorated with glass and ivory. A hundred statues stood there upon pedestals. In it there were more than one hundred thousand volumes neatly stored in cases of cedar and ebony. Catalogues, with references to each volume, by case and number, hung upon the walls and pillars. There were tables and seats for the students; and assistant librarians were there to find any volume required.

The *Palatine Library* rivalled the Octavian; and the *Ulpian,* newly erected by the Emperor, was the most magnificent of the three. In these libraries were collected the literary treasures of the Roman Empire, and in them were daily gathered readers, students, writers and authors.

There were also many private libraries: Every lawyer, author, rich man and patrician had one. Among the best known collections in the literature of the age were those which had been begun by Paulus Æmilius, Sulla, Lucullus, Varro, and Cicero. Some of these were large and were kept in buildings which had been erected especially for them. There were many others. This we know from numerous indications in the manners and customs of the times, and from hints in the books which are still extant. These private libraries existed not only in Rome, but in the towns and cities of the provinces, and, doubtless, in the villas of rich men. In the ruins of Herculaneum one was found. It contained eighteen hundred volumes, sadly charred by the molten lava of many volcanic

eruptions; but the art of the chemist restored them enough to show that they were all on the same subject, the Epicurean philosophy. If the Roman literature contained eighteen hundred books on that one subject, how many must it have contained in all?

There were schools in all parts of the provinces; and these must have created a demand for books. Some of these were famous,—we would call them colleges,—e. g., those at Carthage, Marseilles, Lyons and Narbonne. There were schools of rhetoric at Rhodes and Miletus; of philosophy, at Athens; and of law, at Beyroot, on the coast of Syria; and there was a renowned University, at Alexandria, in Egypt. Each of these schools gave employment to copyists.

Some of the swift writers worked alone; others were employed, in large numbers, by capitalists. Atticus, the friend of Cicero, is said to have employed two hundred, most of them slaves. A description of the *Scriptorium* or writing room has been handed down to us. The room was large and furnished with desks for the copyists. The reader sat on a raised platform in the front and center; he read slowly, and the copyists wrote. Their work was carefully revised. When approved, the long strip, on which the writing was done, was rolled upon a stick, tied up with ribbon or string, and labeled. It was then ready for sale.

The Roman booksellers often published what is now called an *edition de luxe.* The finest of these were written in golden letters on purple vellum and embellished with portraits of emperors, authors and other celebrities. The elaborate initial letters of books and chapters were the models of the wonderful decorative illumination of missals and other precious books of the Middle Ages.

The Romans knew nothing of movable types and printing presses. Their method of producing by single copies was not so favorable as ours to the publication of daily newspapers. They managed, however, to get out two, at Rome. They were called the *Acta Diurna,* a name from which our word "Journal" is derived. One of them was the official organ of the government; and the other was devoted to social, political and military news. The number of copies issued is unknown.

The Roman authors had a custom similar to our reunions to hear an essay followed by a discussion of it. When an author finished a work, he invited other authors and the booksellers to hear and criticize it.

It is a great pity that there is not extant a contemporary bibliography of Latin literature. The best help in that regard are the frequent allusions to books in the works preserved to us. The elder Pliny, in his thirty-seven books on Natural History, is said to have quoted by name from several hundred authors. The younger Pliny claims that, in preparing his history, he consulted at least a thousand writers of chronicles, annals, history and biography. The elder Pliny and Cato each published a Cyclopædia. Some authors were prolific; Varro is said to have published more books than Alexander Dumas.

To the student of history, the above facts will suffice to freshen his conceptions of the complexity, variety, universality and wealth of the expression in literature of the mind of ancient Rome.

PERISHED.

Of the innumerable Latin works of the classic period of Rome, there remain, in round numbers, a hundred: I count the survivors, mutilated and whole; and of the immense army of more ancient times, only a company answers to roll-call

About the year 740, Pepin the Short, of France, wrote to Pope Paul I., asking him as a favor to send to Paris all the books he could find at Rome. Paul caused diligent search to be made in the papal palace and the city. The result was, he sent to Pepin five books: an antiphonal, or elementary book of church music; a responsal; and three short treatises: one on grammar, one on orthography and one on geometry.

Between the years 340 and 740, the classics had almost disappeared.

THE MONASTIC SPIRIT.

In those four centuries, the monks were the most striking feature in the Church of Egypt and of Europe. Who were they?

The answer to this is best gleaned from the lives of the hermit fathers and the histories of the monasteries. Rev. Charles Kingsley, in his book on this subject, gives many of the facts. He says:

"Eight hundred years before St. Anthony fled into the desert, that young Hindoo rajah, whom men call Buddha now, had fled into the forest, leaving wives and kingdom, to find rest for his soul. He denounced caste; he preached poverty, asceticism, self-annihilation. He founded a religion * * * democratic and ascetic, with its convents, saint-worship, pilgrimages, miraculous relics, rosaries and much more which strangely anticipates the monastic religion."

This asceticism of the Orient began to infect Egyptian Christianity, in the second century; and in a few generations the mountains and deserts of Egypt were full of Christian men who had fled out of the sinful, dying world, to attain everlasting life. Celibacy, poverty, unconditional obedience to superiors, continued meditation upon the vanity of the world, the sinfulness of the flesh, the glories of heaven and the horrors of hell, were their vows.

Athanasius wrote the life of St. Anthony, the model of the hermits. That saint ate nothing but bread and salt and drank nothing but water. He lived in the desert and in a tomb, drove devils from him in the shape of a black child, was beaten once and again by demons, wore a garment of the skin of a wild beast, which he never changed, and never used water except for drinking. He had been well brought up and educated; but his biographer notes that, "for the future, his memory served him instead of books."

St. Jerome wrote the life of the hermit saint, Paul, who lived in a cavern where "he spent his life in prayer and solitude while the palm trees gave him food and clothes." St. Jerome adds: "I call Jesus and his holy angels to witness that I have seen monks, one of whom, shut up for thirty years, lived on barley bread and muddy water; another in an old cistern * * * was kept alive on five figs each day."

A philosopher asked Anthony, "How art thou content, father, since thou hast not the comfort of books?" Quoth Anthony, "My

book is the nature of created things; in it, when I choose, I can read the words of God."

St. Hilarion was the father of monachism in Palestine. His life was written by St. Jerome, who died a monk in Bethlehem. From his sixteenth to his twentieth year, he lived in a tiny cabin woven of rush and sedge; after that in a cell, four feet wide and too low for him to stand up straight in. He lay "on the bare ground and a layer of rushes, never washing the sack in which he was clothed, and saying that it was superfluous to seek for cleanliness in hair cloth. Nor did he change his tunic until the first was utterly in rags. He knew the scriptures by heart and recited them after his prayers and psalms." His only book when eighty years old, seems to have been a copy of the gospels, which he had made for his own use when young.

"Serapion, the Sindonite, was so called, because he wore nothing but a sindon or linen shirt. Though he could not read, he could say all the scriptures by heart."

Arsenius died, a monk, at ninety-five years of age, having wept in his cell for forty-five years. By the standard of his times, he had been learned in his youth, but gave up books for the monastery and desert.

Marana and Cyra were two women saints who spent forty-two years in a roofless cottage, "shrouded from head to foot in long veils," * * * "and underneath their veils, burdened on every limb, poor wretches, with such a load of iron chains and rings that a strong man," Bishop Theodoret says, "could not have stood under the weight." They had fasted at times for many days together. The Bishop comments upon their holiness with rapturous admiration.

St. Simeon used to fast for forty days together. He lived for many years on the top of a high peak. The account of the visit of his mother to him is instructive. She begged and implored him to come out of the tower in which he was walled up, or to admit her, but he would do neither. He heard her voice and spoke to her, refusing to see her. The biographer says: "But she began to say:

"By Christ who formed thee, if there is a probability of seeing thee who hast been so long a stranger to me, let me see thee; or if not, let me only hear thy voice and die at once, for thy father is dead in sorrow because of thee. And now, do not destroy me for very bitterness, my son."

Saying this, for sorrow and weeping, she fell asleep; for during three days and three nights, she had not ceased entreating him. Then the blessed Simeon prayed the Lord for her, and she forthwith gave up the ghost."

Of St. Godric we are told, he was no scholar, but had gradually learned by heart the Psalter. He was an Englishman, but as great an ascetic as his continental brethren.

It is evident that the monks and hermits were not literary or scientific men. They placed the narrowest interpretation on those New Testament texts which speak of the "wisdom of this world" as "foolishness with God," and which caution believers to "avoid profane and vain babblings and oppositions of science falsely so called."

When Constantine, about 325, made Christianity the State religion, asceticism was the highest ideal of the instituted church. Eusebius, one of his bishops, ascribed the neglect of learning among Christians "to contempt of such useless labor," saying they preferred "turning their souls to the exercise of better things." It was held that the Bible contained all it is necessary for man to know, and that science is sufficiently revealed therein.

"Is it possible," says Lactantius, another father of the Church of the same period, "that man can be so absurd as to believe that the crops and the trees on the other side of the earth hang downwards and that men have their feet higher than their heads?"

The ink was hardly dry on Constantine's proclamation of Christianity as the religion of the Empire, when a bareheaded and black gowned priest started on foot from Constantinople for Athens, bearing an edict which closed up at once all the government schools of science and philosophy and abolished the salaries theretofore paid the professors by the Emperor.

To be a graduate of one of these schools was enough to exclude a man from all employment under the Christian government.

Libanius, a celebrated professor of that day, complains that the Imperial Court looked with an evil eye on the schools. "Men of education," he said, "were driven away and ignorant upstarts promoted to places of honor. Graduates in philosophy and rhetoric found all the avenues to wealth and honor closed to them and were glad to get a place as Emperor's messenger or to wear the livery of household servants."

Under other edicts, the pagan temples in many parts of the Empire were seized and turned into churches or levelled with the ground. The fine libraries attached to them were destroyed; their beautiful statues were overthrown, mutilated and, oftentimes, burned for lime.

About 390, Eunapius, a learned pagan of Lydia, wrote: "Thus, these warlike and courageous champions, after causing general ruin, and stretching forth their hands, not stained with blood indeed, but befouled with avarice, boasted that they had overcome the gods, and, taking credit for their impiety and sacrilege, let loose against the holy places the so-called monks, who were men indeed in outward shape, but of swinish life and manners, who openly committed abominations without number. * * * For any one who liked to put a black coat upon his back, and a sour look upon his face, could lord it like a tyrant."

Libantius, a learned professor of the same century, who had retired from Constantinople to Antioch, thus vented his indignation:

"This black-coated gentry who are more ravenous than elephants * * * in defiance of existing laws, hurry to attack the temples, some with staves and stones and steel, others even with fisticuffs and kicks. The temples fall an easy prey; the roofs are stripped, the walls hurled down, the statues dragged away, the altars overthrown. The priests must hold their peace or die. When one is ruined they hurry to a second or a third and pile fresh trophies in defiance of the law. Such acts of violence occur in the cities, but far more in the country."

For more than sixty years, after the decree of Constantine, the Serapion of Alexandria, in Egypt, had escaped destruction at the hands of the monks. This was due to several causes. It was

an old institution and the pride of the city on account of its magnificent architecture. It was visible over the Mediterranean as far as the eye could reach, being placed on an eminence and towering high in the air. Its rows of gigantic columns were of the finest marble in the world. Long and broad marble steps led up to its front and the equipages of rich citizens could be driven up a beautiful inclined plane in the rear to the level of the temple. It was not only a temple but a university and library. The splendors of the religious ceremonies of the Greeks could be seen here. The university, with its numerous professors and students, was the same in which Euclid had produced his geometry, and the Egyptians had perfected the astronomy of the Ptolemaic system. It was not so prosperous as it had been, but young men still came to it from all parts of the civilized world.

The library, too, was one of the finest. Not so large as the one collected by the Ptolemies before the Christian era and destroyed in the Bruchium, by fire, at the time of Cæsar's siege; but it contained the collection of the King of Pergamos, which had been presented to Cleopatra by Mark Antony, and the additions of three centuries.

It offended the pious Theophilus, the Christian Bishop of Alexandria, that the Serapion, with its philosophy of Aristotle and Plato, and its Greek ceremonial of worship should divert the attention of Alexandria from Christianity. He petitioned the Emperor at Constantinople for leave to destroy it, and his petition was granted.

On a spring morning in the year 389, of the Christian era, the military formed a grand cordon around the Serapion. Then, the Bishop and his train in the background, bareheaded and barefooted monks filed slowly within the Military. The population of the city, the professors and students looked on; the edict was read; the Bishop applied the torch; the building was fired in a hundred places by the monks; and the black smoke carried to the sky the best product of the Greek civilisation of nine centuries. When night came, all that remained of the famous libray of Alexandria

was a mass of cinders; and a band of hooded monks praised God over the ruins!

This signal triumph over paganism greatly strengthened the power and increased the number of ascetics. Many persons abandoned the ordinary pursuits of life and fled to the desert monasteries. On those interminable expanses of white sand, where there were no trees with waving foliage, no rivulets with crystal waters, no birds, no flowers, nothing but sky and desolate wastes, it was easier to think of, and hope for, the future life. On the sands of Nitria, there arose twenty monasteries; on their stone floors barefooted monks chanted prayers every hour in the day; in their cheerless cells ascetics fasted, watched and scourged themselves with bloody thongs.

In the twenty-six years that followed the burning of the Serapion, the University of Alexandria began to re-establish itself. Some of the professors reopened their courses; students, who had been scattered among the schools of Asia Minor and Greece, came again in small numbers to Alexandria. The Bruchium and Serapion had been destroyed; the Museum was now the nucleus of the University. How many books there were, what apparatus there was, is not known. Everything that was done for Greek philosophy, was done in the presence of a jealous Christian patriarch whose authority rivalled that of the Roman Governor.

In the year 415, of the Christian era, the most distinguished professor in Alexandria was a woman. Hypatia was the daughter of a learned mathematician and professor. In her youth she had been sent away to school at Athens, because of the destruction of the University at Alexandria. Her life had been spent in study, in the best schools and among learned men. She was a mathematician and philosopher. Heaven had endowed her with the gift of touching the human soul. Her presence was magnetic and her voice unsealed the founts of human feeling. She had the power which in modern times has been wielded by Mrs. Siddons, Rachel, Angelina Grimke, and other women. Her renown was coextensive with the Roman empire. Her lectures on Neo-Platonism attracted the best intellects not only of Egypt but of other countries.

At the time Cyril, a monk, was Bishop of Alexandria. Full of the intolerant bigotry of his order, he determined that Hypatia should be silenced and the Museum destroyed.

At his summons the Nitrian monasteries poured forth their hordes. Across the sandy plains of north Egypt, thousands of black-gowned and barefooted men with shaved heads,—men gaunt and pale with fastings,—made their way, chanting hymns, to Alexandria.

On their arrival they were duly organized and instructed by the Bishop's agents. Next morning they waylaid Hypatia on the street by which she was wont to drive to her lecture room. They dragged her from her carriage, smote her to the earth with fists and clubs, tore off her garments and hurried her, bleeding and naked, through the streets to the cathedral, then up its marble steps and through its lofty nave to the altar.

There she turned and stretched out her hands as if she would speak; but in all that monkish crowd she met no glance of human pity. Her voice was lost in the cries and shouts of that murderous mob. Then her heart failed her, and sinking on her knees before the crucifix, she prayed Christ to touch with pity the hearts of those fanatics. But, as she prayed, the monk Peter dashed out her brains with a club. In a moment she was hacked and torn to pieces, and the frenzied monks went in procession through the streets, bearing upon a spear a woman's head, whose long, fair tresses were flecked with blood! Her death has been dramatically described by Charles Kingsley.

After the murder the Museum was sacked and pillaged, its pagan works destroyed and its professors silenced.

Whether the University of Alexandria recovered from this blow, history does not tell. Nor, whether a library was again collected there. This is not probable, for the patriarch was adverse and had great power; the Roman governors took little interest in literature or learning; and the public revenues were needed by the Emperor. A few books probably were gathered by professors and teachers; but when the Persians conquered Egypt in 616, there is no sufficient evidence that there was a library at Alexandria; and it

is improbable that there was one there in 630, when the Moslems became the conquerors of the city.

What was done in Egypt was done elsewhere in the Eastern Empire. Justinian, a Christian Emperor, gave the finishing blow to the schools of philosophy and science, at Athens, by confiscating their private endowments and private property and abolishing the salaries of the teachers. Every school not under influence distinctively ecclesiastical was ostracised as pagan.

One of the early popes, Gregory I., is said to have collected all the ancient classics he could find at Rome and to have made a bonfire of them! This, in the Dark Ages was greatly to his credit. In these latter days, however, it has been denied by some papistical writers.

It was not long after Gregory, that the fury of the Iconoclasts broke out afresh. About the year 726, under the Emperor Leo, the Isaurian, it howled like a tempest over the Christian world. The pictures of Christ and the saints which had been placed in some of the churches were torn down and trampled under foot; the statues of Isis and Osiris which had been adopted as those of the Virgin Mary and child and left in the churches, and the rude statues of the saints, which were found here and there, were thrown from their pedestals. A savage war of extermination was waged against the statues of pagan gods which had survived the bigotry of several centuries. It was "impious" to carve in stone such gods as Apollo, Hercules, Mars and Jupiter, and such goddesses as Diana, Minerva and Venus. Most of these statues were wholly destroyed; many of them burned into lime. The marble statue of Jesus, erected by Alexander Severus, in the third century, was demolished. Some statues escaped with mutilation. The frightened owners of others, wishing to save them for times more appreciative of art, buried them deep under the earth or sunk them in streams. It is only a few years since a statue of a pagan god was fished up from the bottom of the Tiber, where it had probably lain for 1200 years. When the mud and shells were scraped off, it was found to be not much the worse for its long concealment.

When the tempest of iconoclasm burst forth, it is probable that

but few of the classics were in private hands; for, during several centuries, it had been a dangerous thing for any one to possess them. The Inquisition in matters of faith had a short way with men suspected of worshipping Jupiter; but a number of public libraries were destroyed and among them, one at Constantinople, containing 120,000 volumes. This was the Imperial library, and its destruction was, doubtless, owing to the hatred for all learning not purely religious. It was a sacrifice made by the Emperor to the bigotry of the monks.

This same spirit of hostility to human learning is shown in the acts of the Crusaders. They destroyed the libraries which had been again collected at Constantinople; and, in 1109, made a campaign against Tripoli, chiefly for the purpose of destroying the magnificent Saracen library at that place. It is said to have been larger and finer than the one at Alexandria ever was.

It is a matter of history that the Saracens had seventy large public libraries in Spain, containing altogether more than 400,000 volumes. Two of them, those at Cordova and Granada, were attached to the Moorish universities at those places. The catalogue of one of them is said to have filled forty volumes. All these libraries were nevertheless destroyed by the Roman Catholic Spaniards, who regarded them as the literature of Satan.

But why multiply historical instances? It would require a volume to mention them all. The "healthy literature" of the monks consisted of homilies, lessons, missals, prayers, response books, the writings of the fathers and a little grammar, rhetoric and history, chiefly ecclesiastical. It was not thought consistent with a pious life to study the classics.

Alcuin, a learned man, became a monk in the middle of the eighth century. His monkish biographer says of him:

"This man of God had, when he was young, read the books of the ancient philosophers and the lies of Virgil, which he did not wish now to hear or desire that his disciples should read."

Alcuin rebuked one of his monks for reading Virgil and spoke of the danger of being "polluted with Virgil's language."

Odo, Bishop of Clugni, read one day in Virgil, but dreaming of snakes the same night, he accepted the divine warning, renounced Virgil and his pomps and ever afterwards sought his spiritual and mental nourishment in the Bible.

Peter Damian (988-1072) speaks of the "vanities of earthly science."

Honorius (1120) says:

"It grieves me when I consider the number of persons who, having lost their senses, are not ashamed to give their utmost labor to the investigation of the abominable figments of poets,"

He speaks of Hector, Plato, Virgil and Ovid who "are gnashing their teeth in the prison of the infernal Babylon under the cruel tyranny of Pluto."

Abelard (1142) asks:

"Why, then, do not the bishops and doctors of the Christian religion expel from the City of God those poets whom Plato forbade to enter into his kingdom of the world?"

Peter of Blois, Archbishop of London (1130—1200) upbraided a monk for studying "the foolish old fables of Hercules and Jove" and the lies and philosophy of the pagan authors.

In the opinion of Pope Gregory the Great it was "shameful" that a priest should study the classics.

From the year 325 to the year 1000 of our era all æsthetic sense seems to have fled from Western Europe. During that long period, with the exception of a moderately good book by Bœthius, a statesman, there was not a single book produced whose literary form makes it valuable; not a single painting which any one cared to preserve; not a single statue which the world has not gladly allowed to perish. The best books were "The Fathers," those wonders of prolixity, the best paintings resembled the figures upon cheap China ware; and the best statues caricatured the anatomical proportions of the human form. The books prove that their authors had never studied the classics; the statues, that the artists had never studied ancient sculpture.

I will now briefly notice a few of the objections to the theory of this essay.

First: *That the monks were good classical scholars; hence, they were inclined to preserve the classics.*

This is not true of the monks of any age; it is deplorably false of those who lived in mediæval times. It is believed that between the beginning of Christian monasticism and the year 1100 there was not a single scholar of fame who had been a monk from his youth. All of the famous writers who were monks were men who had been in civil office; or had been educated in the secular schools; or had practiced law or medicine; or taught rhetoric or oratory. To this class belong Augustine, Jerome, Tertullian, Prudentius and Cyprian. This was the case, too, in later times; Gilbert A. Becket and Richard de Bury had been Chancellors of England; Peter of Blois had studied law at Paris and Bologna; Thomas, Abbot of Evesham, had been a lawyer, then Professor at Oxford and Exeter; all these men were of middle or old age when they went into the church and at once took high honors. An abbacy or priory was then the stepping stone to a bishopric. After they became churchmen most of them denounced the classics as pagan. Such men as Wycliffe and Roger Bacon owed no part of their education to the monasteries.

Though the churchmen generally knew a little Latin, chiefly that of the ceremonial, they certainly knew no Greek before Boccaccio's time. About 1350 that poet could not find a copy of the Iliad and Odyssey in Italy and was obliged to send to Athens for it. It was in 1453, a little more than a hundred years after that, when the capture of Constantinople by the Saracens sent hundreds of educated Greeks through western Europe and made the study of Greek more common among the learned. But this was after the invention of printing.

It is doing no injustice to the monks brought up in the monasteries, to say that of the hundreds of thousands in their orders during the Middle Ages there were scarcely half a dozen who are reputed now to have been scholars. King Alfred said that, during his reign, there was hardly a monk from the Thames to the Channel who could go through the church service correctly. Robertson, the Scotch historian, gives many illustrations of their dense ignorance; and so does Hallam. The few exceptions were

such men as Theodore of Tarsus and the venerable Bede. Theodore had been educated in the schools of Asia Minor and brought with him to England a good library of Latin and Greek books, which he presented to his monastery. Bede was Theodore's pupil and had the advantage of his library. His learning would not pass muster now-a-days.

We need no clearer proof of the character of the literature cultivated by the mediæval monks than the list of books which each priest was then expected to own. These were a psalter, a book of epistles, gospels, and hymns, a missal, a manual, a Gerim, a passional, a penitential and a lectionary. With these his library was complete; and he was a fortunate man who had them all.

His light reading consisted of homilies, prayers, the works of the fathers and the legends of the saints,—many of which, it must be admitted, will compare for imagination with the Arabian Nights Entertainments.

Second: *But it is objected that there were schools attached to the monasteries, and that the monks must have taught the classics.*

It is true that to many of the monasteries schools were attached; but these were of the kind now called parochial and were used chiefly to train the children in the church creed and services. They were far inferior to the secular schools, of which there were many. From the biographies of illustrious men we learn that they were rarely educated at monasteries. For instance Lanfranc was taught at Pavia, Bologna and Avranche and established a famous school at Bec. He became a monk late in life and Archbishop, but his learning was not due to monkish teachers.

Third: *A third objection is, that, in each monastery, there was a scriptorium, or copying room, in which the monks regularly copied the classics.*

Neither of these assertions is accurate; and the second is untrue in regard to the centuries preceding the twelfth.

In the last edition of the *Encyclopedia Britannica*, there are given, under the title "Abbey," thirteen ground plans of representa-

tive monasteries. These show every part of the building down to the smallest offices and out-houses; these are as follows:

1. Santa Laura, Mount Athos.	
2. Coptic Monastery	
3. St. Mary's Abbey, at York.	Benedictine.
4. Clugny.	
5. Clairvaux, No. 1.	Cistercian.
6. Clairvaux, No. 2.	
7. Citeaux.	
8. Kirkstall Abbey, Yorkshire.	
9. Fountains Abbey, Yorkshire.	
10. St. Augustine's Abbey, Bristol,	Benedictine.
11. Carthusian Monastery, at Clermont.	
12. Carthusian Cell, at Clermont.	

The only one which shows a *scriptorium* is St. Gall, a Benedictine monastery, erected about 820. The room devoted to the purpose of copying adjoins the transept and is no longer than the sacristy and vestry. The St. Gall monks had more than they could do to copy the books used by the priests in church service.

The clear inference from these facts is that, while in one out of many monasteries, copying of some kind was systematically done, it was not done in most of them, unless by individual monks in their private cells. At St. Gall it was probably done under the supervision of the Abbot and confined to religious books; in the others copying of the same kind was done occasionally, and no doubt, by monks, who excelled in penmanship.

Of the thirteen monasteries named only three are marked as having "libraries," a fact extremely significant as to the want of appreciation of literature at the time the monasteries were built.

If the monks had copied the classics, their ardent advocate, Mr. Merryweather, would have found the proofs of it and printed them in his curious book, *Bibliomania,* which is devoted chiefly to a vindication of their literary character. He mentions all the monkish copyists known and, whenever he can, every classic copied by any of them; but he fails to produce a single instance of such copying between the foundation of the first monastery and the year 1178. We have to thank him for mentioning numerous donations to monas-

teries of private libraries containing classics. There is no proof, however, that the classics so presented had been copied by monks; and the donations are subsequent to the tenth century.

The Benedictine order was established about the year 529; and it is to its practised penmen that the Church of the Middle Ages looked for copies of the Latin Fathers, homilies, prayers, missals, offices, responsals, antephonals, saints' lives, legends and other religious books. But it is not proved that those pious men copied the classical works to any great extent, at any time, or at all prior to the twelfth century. About the year 1178, one of their monks, a famous penman and illuminator, copied the works of Terence, Suetonius, Claudian and Bœthius. This is the earliest case I have been able to find, and it stands alone in the twelfth century.

The reputation for learning enjoyed by the Benedictine order is due to its early cultivation of religious literature, and to its publication, since the year 1600, of histories and works of general and scientific information. Their earliest historical work, a chronicle of their own order, was not published until 1609. But this was 800 years after the dawn of Latin classical learning, 600 years after such learning was common among literary men; and 156 years after the capture of Constantinople and the exodus of learned Greeks from Eastern to Western Europe. Their earliest work of a purely literary character was not published until the eighteenth century.

Fourth: *A fourth objection is that most of the extant manuscripts of Latin classics were found in monasteries.*

Some of them were; it is not proved that most of them were; and surely the manuscripts of the Greek classics were not. The fact that the manuscripts of the Latin classics which were found in monasteries were not found in the libraries of those institutions shows that they were not held in honor by the monks. They were found in cellar pits, vaults, dark holes, dirty passages, dry wells, old towers, in many a den and dungeon. All the manuscript hunters, from Petrarch and Boccaccio in the fourteenth century to Bracciolini in the fifteenth, give the same account of the places where these

valuable relics were found. They had been acquired probably for the parchment they were written on, not for the works themselves. In our century similar facts are reported:

Lord Prudhoe who visited a Nitrian monastery in 1828 says that he found a pile of manuscripts in a vault into which they had been tumbled through a trap-door. They were covered deep with dust and had been lying there apparently for centuries.

Robert Curzon, a member of Parliament, visited one of the Egyptian monasteries in 1833. Going into the chapel at time of service, he saw that each barefooted monk stood upon a folio manuscript which kept him from the cold stone floor. On further search he found a vault full of old manuscripts in all stages of decay.

Tischendorff, the German manuscript hunter, gives a still more graphic account of the neglect of manuscripts by the monks.

The question naturally occurs:

> If the monks did not copy the classics, how are we to account for the copies found in the libraries of the monasteries?

In the monastery chronicles we find frequent mention of gifts and bequests to them of libraries by civilians. A large number of these donations are mentioned by Merryweather in his curious book on the subject. He tells also what they were, gives some of the catalogues. Generally there were none but religious books; sometimes a few classics, especially after the year 1100, when liberal studies were in fashion among the rich and great.

In 1305 there were 1100 volumes in the library of the Abbey of Ramsey. Of these there were:

70 Breviaries,
32 Grails,
29 Processionals,
100 Psalters.

There were five Greek books and seventeen Latin. But among the latter there was no Cicero, or Cæsar, or Tacitus, or Quintilian, or Pliny. It was clearly a miscellaneous collection, the volumes having been donated by different civilians.

In 1073 the Lord Chancellor of England presented to the Cathedral of Exeter, of which place he was bishop, seventy volumes, probably all on religious subjects. After 1100 the larger gifts of books contained one or more of the classics.

It is by these gifts, made by learned civilians and semi-secular dignitaries of the Church, and the fact that, as a general thing, the monasteries were respected in time of war, that in my opinion, the finding of classics in the monasteries can be accounted for. To infer that the monks copied them because they had them would be as loose as to infer that the Venetian Senate had copied the many valuable manuscripts found in their library, all which were either presented or bought.

HOW, THEN, WERE THE CLASSICS PRESERVED?

During the darkest of the Dark Ages, though there were no schools for the poor, there were some in many cities and towns for the children of the rich. The law school established at Beyroot in the fourth century, flourished until the conquest of the place by the Saracens. The school established at Bologna in the fifth century gradually developed into a university, at which about 1220 there were ten thousand students; and in 1300, fourteen thousand. The schools at Oxford and Cambridge grew into universities before 900; and in 1320 there were at Oxford 30,000 students. The school at Paris became a university soon after the first Crusade and had quite as many students as Oxford. Between the years 850 and 1000 there were many learned men and good academies in Germany. Before the year 1200 there were twenty-three universities in Europe, besides the Moorish universities in Spain, which were reputed the best of all. At all these institutions, grammar and rhetoric were taught; and these included a training in the Latin and more or less instruction in the Latin classics. Greek was not taught perhaps at any of them until after the invention of printing.

Schools of a lower order existed in all the cities and principal towns. Guizot (*History of Civilization*) gives a list of many which existed before Charlemagne; and that monarch established a great

many. A little after him and about 823 the King of Lombardy had, by edict, opened schools in nine of the cities in his dominions.

There were famous schools in Padua, Rome, Marseilles and Toulouse during the sixth and seventh centuries, and one at Carthage up to the date of the Saracen conquest.

As these schools were primarily secular, they created, each one about itself, a demand for classical works. Around each university there grew up again into prosperity the trades of the bookseller and the copyist, which had become insignificant during the reign of the monks. But these trades had at no time been extinct. Before and after the conquest of Rome by the Goths, there had been booksellers, stationers, antiquarians, copyists and illuminators. All these are spoken of by Cassiodorus a little after 500; by Isidor, about 600; and by Benedict, of Wearmouth, about 690; he visited the Continent five times to buy books. About 990, Gerbert, who afterwards became Pope Sylvester II., and who was a graduate of the Moorish university at Cordova, in Spain, and passed for a sorcerer because of his learning, wrote to a friend at Rome to procure him a copy of a book which, he said, could be had of some of the copyists, who, he adds, "may be found in all parts of Italy." In 1170, Peter of Blois, who had collected a good library, speaks of his buying from "public dealers in books," and gives an amusing account of his buying from a bookseller at Paris a book which he left at the store and which was taken off by force, by an eminent dignitary who was eager to have the volume.

In 1287 De Bury mentions having bought manuscripts from booksellers at Antwerp, Brabant, and Paris, and other cities in Europe.

About the same time, Dante was studying at Padua and Bologna where the students were supplied with books by dealers who employed professional copyists.

The booksellers were so important a class to the students in the university towns that the universities generally obtained legislative authority over them and subjected them to many rules. At Paris the price of books was fixed by the faculty; and the dealers were compelled to let books for hire at fixed rates to the students.

The prices and rates were quite low, not much higher indeed than those of a circulating library of our own days.

As the academies and universities, manuscript dealers, antiquarians, copyists and illuminators had co-existed for more than five centuries before the invention of printing; as the greater number of existing ancient manuscripts have been found not in the monasteries, but in the library of the Venetian Senate, to which Petrarch bequeathed all his books; in the library of Florence, built up principally by Lorenzo and Cosmo de Medici; in the library of Oxford, to which Wycliffe and Roger Bacon, each, left his collection; in that of the Vatican, the books of which were bought after the Middle Ages, by Nicholas IV. and Leo X., wherever they could find them; in the royal library of Paris, made up by the Government; and in other libraries of secular character; as there is no positive proof that, prior to the year 1178, a monk ever copied a classical book, and many facts making such copying highly improbable; as the classical books found in the monasteries are all easily accounted for by known donations by civilians and acquisitions made since the revival of classical learning; and as it was, in the language of one of the popes, Gregory, "a shameful thing that it should be said of a priest, that the praises of Jupiter and the praises of Christ should issue from the same mouth"; in other words, that a priest should study or teach the classics; is it unjust to deny to the monks what is now claimed for them by some Roman Catholic writers, the honor of having preserved those masterpieces?

WILLIAM BIRNEY.

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ICELANDIC LITERATURE.

IN his condensed compendium of mediæval and modern Icelandic literature, Dr. Finnr Jónsson admits that the Icelandic people have at no time displayed any marked tendency toward philosophical thought. This is also a widely accepted estimate among well-informed circles of the European continent, and it cannot be denied that the native historians of our national literature still neglect a series of important problems, among them the ethnological research of the prchistoric heterogeneous elements that have contributed to impart such a quaint and different aspect to the literature of Iceland. It seems sufficient to the native critics that Iceland's literary records will forever exert an irresistible fascination upon the modern nations, and that Icelandic literature in our day should have become one of the best exploited literatures of Europe.

As regards the heterogeneous origin of old Icelandic records, it is to be regretted that modern ethnologists, and above all the Icelanders themselves, should have done so little to have cleared up the remote prehistoric contact which must have taken place between Teutonic-Scandinavian tribes and the Finns,—men belonging to, perhaps, the highest type of the old Finno-Altaic race. The "hersirs" and tribal chiefs of Norway until the days of Harold Fairhair are admitted by several modern ethnologists to have been to a considerable extent "Norwegianised" or "Teutonised" Finns, who at the time still preserved several traits of their Asiatic-Tartar origin; and that these were the foremost emigrants to Iceland at the close of the ninth century of our era. The mythological and heroical traditions which these Norwegian-

ised Finns brought with them to Iceland, point to racial traditions which do not exhibit marked Teutonic elements. It is creditable to Iceland that many of these weird racial traditions have been preserved, but it was to be expected that at a later time they should be misunderstood and greatly distorted, particularly by the clerical Celtic-Icelandic scribes. The best preserved mythical and prehistoric sagas were those handed down orally by the popular saga-men for the entertainment of young and old, concerning old-time battles fought far inland in the East of Europe,—weird sagas, rude in form and contents, about kings and heroes, very unlike the Scandinavian kings and warriors of a later saga-time, —about mysterious potentates like King "Guðmundr á Glæsisvöllum"—King Gudmund of Splendid Plains—by which may have been meant the inland steppes to the southwest of the Ural mountains. Even the old Eddic lays, for which there is still lacking any satisfactory ethnological and critical interpretation, may have been evenly divided between Tartar and Teuton. It is certain that the contents and purport of the huge collection known under the title of *"Antiquités russes,"* edited at Copenhagen by the noted Danish antiquarian, Professor Rafn, must read like an unintelligible riddle to modern Icelanders and Scandinavians; and yet, it recalls to mind a recent incident at a session of the Icelandic "Althing" or Parliament. A member of the assembly was heard to encourage modern Finnish immigration as a desirable offset to the injury which American emigration was causing to the Icelanders.

This was an admission of a remote racial affinity, and, in fact, many Icelanders and Scandinavians may apply to themselves the recurring refrain addressed to Ottar in a lay in the afore-mentioned collection—*"Antiquités russes"*:

"Alt er það ætt þin,
Ottarr hinn heimski!"

"It is all your family,
Oh thou foolish Ottar!"

In mediæval Iceland there were no cities or villages proper. The leaders of the immigrant families, whether Norwegian Finns,

pure Teutons, or Norse-Celtic immigrants from the British isles, had settled widely apart on the banks of fjords, along inland valleys, in every available locality. Each had imported their own peculiar traditions and independent saga circles, and for a time led their own lives without very close ties of solidarity between the several ethnic groups. But our modern world has not an adequate idea of the astonishing literary activity, which, during the following centuries, must have reigned in the then wealthy homes of Iceland, at the respective Episcopal Sees of Hólar and Skálholt, in the famous school of Oddi, and in all the convents of the Island. The surprising wealth of manuscripts still existing in the Island in the centuries following upon the reformation forms a rich legacy bequeathed by Iceland to the world at large. The *"Habent fata sua libelli"* applies to the providential preservation of all these Icelandic manuscripts. While Icelandic annals relate the plundering of the treasures of Icelandic Episcopal Sees by the Teutonic reformers, it seems that the latter attributed little value to any kind of manuscripts. In Iceland, however, these accumulated literary treasures would have been lost to the world had not the patriotic Icelander Arni Magnússon conceived the idea of exporting the entire collection *en bloc* to Copenhagen, Denmark. In this connection we have to bear in mind the utter oblivion, neglect, and decay into which Iceland had sunk under the semi-barbaric government during the seventeenth and eighteenth centuries. At Copenhagen, however, fortunately there happened at the time to be found noble-minded, far-sighted Danes,—men like Luxdorph, A. Suhm, Schöning, Engelstoft, the native Icelander and Danish Premier Jón Eriksson, and others.

To the intelligent initiative of all these men mediæval Icelandic literature owes its first introduction to the European world in a series of splendid editions of the Eddic lore and of the most important saga texts, the expense of which was liberally defrayed by the Danish monarchs themselves, and this ought also to be considered as the first genuine step taken toward a national Icelandic literary revival. The Icelander of the early saga period remained

still a man of action, who merely had exchanged the sword for the pen. Whether "Skáld" or "raconteur" saga man, he was prompted either by family pride, or inspired by events leading to the triumph or defeat of some party, but during the golden period of Icelandic literature, from Ari Thorgilson down to the historians of the thirteenth century, the literature has been changed essentially both in form and in utterance under the Celtic, clerical culture of the times. The brilliant historian Snorri Sturluson and his contemporary historians, several of them the inmates of Icelandic convents, belonged to this classical school. It is the only period in which Icelandic literature displays something of inward continuity and of philosophical thinking. All of the writers of this period, in style and utterance, aimed at the "Romanisation" of the old Norse language. They even applied it to several older saga texts; but, not by any means, so intelligently to the mythical saga lore; yet, here I do not expressly allude to either the young or old Eddic texts. The Romanisation, however, put its stamp upon some of the old family sagas, such as the "Niál's Saga,"—regarded by critics as a prominent type of a racy Icelandic saga. The dialogue, for example, between Flosi and his relation Hildigunnr reads like any creditable specimen of impassioned Roman rhetoric. This classical tendency may be said to have advanced one step further in the charming "Biskupa-Sögur" or lives of Icelandic bishops before the Reformation. These "Biskupa-Sögur," by their style and language, read like highly attractive modern biographies. The modern natives shrink from the apparently naïve faith which inspired the mediæval works, like the "Biskupa Sögur," or religious poems, as the strenuous poem "Lilja," by the monk Eystein Asgrimsson; but the Icelanders are apt to forget that, besides naïve faith, those works are also inspired by the same lofty aspirations which prompted the deeper modern thinkers to recognise the inborn ethical cravings of mankind as high above any worldly wise logical ideas. For the rest, at a later period of uncommon national distress—the "Volcœðis" period of the seventeenth century—the broken-hearted, contrite Icelandic people, although nominally

Lutherans, returned to that early fountain-head of naïve Icelandic faith; from an analogous source, likewise, was inspired the great seventeenth century psalmist, Hallgrim Pétursson, and others who sought for spiritual strength and faith in the destinies of the Icelandic people.

As regards the existence and intrinsic value of modern Icelandic literature, foreigners need no longer abide by the efforts of native Icelandic writers, but may be referred to men and women of different European nationalities who have made the Icelandic language and literature a favorite object of study. Of those residing in Germany I shall here mention only the names of M. Phil. Carl Küchler, Fräulein M. Lehmann Filhes of Berlin, and, above all, Poëstion, the distinguished Vienna librarian and worthy translator, critic, and historian of modern Icelandic literature. Modern Icelandic literature in our own day still may produce the impression of a series of unequal, incomplete efforts devoid of continuity and originality, except, perhaps, in its short story and lyrical poetry. But we should remember that there had to be performed a long and arduous preliminary work, mainly philological and linguistic, before there could be any modern national literature.

Until nearly the middle of the nineteenth century none but Icelandic students at Copenhagen were available for the work of reading, correcting, and translating the manuscripts which Arni Magnusson had given the Royal Library at Copenhagen. And this, at a time when in Iceland the native language had practically ceased to exist, or to be the official medium for transacting public business. An abominable Danish - Icelandic jargon was largely spoken by the upper classes. A practical Icelandic grammar did not exist in Iceland until the well-known Danish linguist Rasmus Rask introduced his own short Icelandic grammar in the early decades of the nineteenth century. A few years later the Icelanders also formally date their modern literary revival from the foundation of the review *Fjölnir* at Copenhagen, by a group of gifted and patriotic natives. The articles of the *Fjölnir,* in a short time, seem to have revolutionised both the spoken and written lan-

guage of Iceland. I here refrain from entering into details, but again refer the reader to Poëstion's work, or to Dr. V. Guðmundsson's Danish treatise, *Island's Kultur ved Aarhundredskiftet,* 1900, tranlated into German by R. Pallaske. The old literature of Iceland, in a multitude of aspects, and in its highest classical form, was mainly the outcome of Celtic-Icelandic genius, and of the classical Christian culture of the time.

In the present literary stagnation and even widespread indifference to past literary traditions which is said to prevail in Iceland, it is well to recall to mind that of the 20,000 emigrants, who in late years have settled in America, the majority probably has been made up of Icelanders of Celtic descent. The *American-Icelandic Press* of Winnipeg, Manitoba, occasionally keeps reminding Iceland of this fact. Some of the quaint poems of the Icelandic-American poet Stephan G. Stephansson, in rather drastic language. seem to express the genuine sentiments of a self-confessed modern Icelandic Celt. The Iceland of to-day, according to this writer, is only a sort of "Teutonised" Iceland, dull, realistic, and utilitarian; and apparently he is not "in touch" with the time-serving faction of Dano-Icelandic *chauvinists,* who affect to seek an imagined center of intellectual, political, and racial solidarity in the mediæval literature of Iceland. But on the other hand it is only too true that modern Iceland is actually confronted by a number of perplexing and difficult, political and economical problems; and for the satisfactory solution of these we devoutly trust that Jove will grant to the long-abiding island all the required life through the ages.

A. Högni Gunlogsen.

THE CHRISTIAN DOCTRINE OF RESURRECTION.

JAMES S. RIGGS, D.D., and Professor at the Auburn Theological Seminary, expresses in a recent number of the *Biblical World* his conviction that the Easter message of the resurrection of Christ is an indispensable part of Christianity which should not be surrendered to the demands made by the *Zeitgeist*. A distinction has been made between the Easter message (viz., a belief in the bodily resurrection of the Christ) and the Easter faith (viz., a belief in the immortality of the soul) and the *Zeitgeist* urges us "to accept the latter, but to reject the former as impossible in view of modern enlightenment. In other words, an actual resurrection as the church has commonly understood it did not take place, and yet Jesus lives."

It is true, as Professor Riggs states, that "the immortality of the soul is not a scriptural expression," it is a modern invention. The Gospels believe in "a resurrection of man, body and soul." Redemption includes the whole man. To strike out therefore that side of the truth which shows that the body as well as the spirit is to enter into the true conception of complete immortality, is to miss the real climax of all the teachings of the Scriptures regarding the future of man. Jesus "brought to light this wondrous completeness by coming himself from the grave. . . . . the fact of the resurrection, therefore, is of the most importance." *

It is quite true that according to the early Christians "the Easter message belongs with the Easter faith." The question is only whether we can still believe it. Professor Riggs sees no diffi-

* See Acts xvii. 32; 1 Corinthians xv. 3, 14, 20.

culty; he claims that the "vision theory runs up against stubborn, inexplicable obstacles." Considering all the evidence he says "the empty grave is most satisfactorily explained by the actual resurrection of Jesus," and he argues that it is better to let "the faith of the disciples rest upon the fact of the resurrection than upon God-inspired visions given to create belief in a fact which after all was not a fact." In the opinion of Professor Riggs, "the surety of the fact" is sufficiently vouched for by historical evidence and the value that it possesses for us cannot be underrated by any Christian believer.

No doubt Professor Riggs voices the opinion of the orthodox traditional conception of Christianity, which believes not so much in the immortality of the soul as in the resurrection of the flesh, but a new interpretation of the Christian faith is preparing itself in the minds of the people, and we regard it as most significant that a representative of the more liberal view rises in the person of the scholarly Canon of Westminster, one of the most distinguished clergymen of the Church of England.

Canon Hensley Henson's article on "The Resurrection of Jesus Christ" has created a stir in the religious world because the Canon openly expresses his conviction that a belief in the bodily resurrection of Christ is not essential to true Christianity. He knows very well and grants that in the days of early Christianity the belief in bodily resurrection was regarded as the most important part of the faith. Further, Paul says: "If Christ has not been raised then is our preaching vain, your faith is also vain." But the belief in a bodily resurrection is only evidence of the materialism of the early Christians who could not conceive the truth of immortality otherwise than in the form of a resurrection of the dead body. The Canon is fully informed of the arguments which theological scholars adduce in favor of the resurrection of the body of Christ, but he has also carefully investigated the reports of Biblical criticism, and he comes to the conclusion that it cannot be set aside lightly or easily. He says:*

"The candid Christian, we say, when reading these statements

* *The Hibbert Journal* for April, 1904, pp. 476-493.

cannot escape the inference that the evidence for the quasi-historical statements of the Creed is of a highly complicated, dubious, and even contradictory character."

He further says of historical criticism, the youngest of the sciences, that "it cannot claim even such a measure of recognition as that which the older sciences have succeeded in wresting from the Christian Church; but the analogy between the course of events by which the conclusion of astronomy, geology, and biology have, one after the other, been, so to say, domesticated within the theological sphere, and the course of events by which the conclusions of historical criticism must undergo the same process, is, at every point, complete."

St. Paul himself, though he insists on the fact that Christ has been "raised from the dead," repudiates at the same time a materialistic conception of the resurrection, and Canon Henson adds:

"The dissolution of the physical body in the grave will not, we are assured, hinder the process of resurrection in the case of Christ's disciples."

Therefore the Canon concludes that a physical resurrection cannot be an essential part of the Christian faith. "The emptiness of the sepulchre might conceivably be as little worthy of credence as the materialistic details in St. Matthew xviii. 9 and St. Luke xxiv. 36 ff.*" Quoting Bishop Westcott, the Canon proposes to replace the words "the Lord was raised" in the apostolic conception of the resurrection by the words "the Lord lives," and the real proof of the resurrection should be found in the fact that Christ lives and works still.

Canon Henson's article is a remarkable evidence that the world moves. If he, the Canon of Westminster, can, without being excommunicated, make this statement which we ourselves proposed a few years ago as the only possible solution of the essential doctrine of Christianity, we see the time near at hand when the philosophy of *The Open Court* will be regarded as good Christian doctrine, orthodox not from the standpoint of the traditional conception of dogma-

* Cf. Acts x. 41.

tism, but in the sense of being a doctrine that is tenable before the tribunal of science which is true orthodoxy, for it is rightness of doctrine; it is doctrine that is universally acceptable, and therefore genuinely catholic.

There are heroes in battle and there are also heroes in the domain of thought, and we do not underrate the courage of Canon Henson to scorn all equivocation and make his statement boldly and plainly, risking the enmity of the narrow-minded whose number is legion and the alienation of many of his friends and co-religionists.

The belief in immortality is the crucial point of Christianity. Formulated as the doctrine of resurrection it embodies it in a quasi-allegorical form, but we ought to bear in mind that the Gospel stories of Christ's rising from the dead and his ascent into heaven are later additions which were not part of the original Gospel, and we ought to understand that they are true in an allegorical sense. They reflect the truth of immortality. It may not be out of place to reprint here the passage of a former article of ours which was the subject of Canon Henson's discussion:

"Considering the sanctity that was attributed to Sunday among the Gentiles, especially the disciples and similar sects, it was natural that Easter Day, the festival of Resurrection, should have been celebrated on the first Sunday after the Passover.

"The burden of the Christian Gospel as preached by St. Paul is the message of the resurrection of Christ, in which the apostles implicitly believed. Whatever we may think of the accounts of it in the New Testament we must grant that the doctrine of immortality is the quintessence of the Christian religion, which was the cause of its final triumph. The oldest account in the Gospel according to Mark makes the simple statement that the grave was found empty, and this suggested at once to his followers the idea that Jesus must have risen from the dead. The immediate result was visions of the departed master. He was seen by Mary Magdalene, by St. Peter, by the eleven apostles, then by more than three hundred brethren, and finally by St. Paul.

"One of these visions (that of St. Paul) lies within the pale of historical investigation, and, in spite of the contradictions discov-

ered in the several versions of the event, offers nothing that seems improbable or inexplicable.

"The history of the Gospel stories of the resurrection has been traced by the higher critics, and we may briefly state that later reports, superadded to the original account in Mark of the empty grave, show the spirit in which the early Christians regarded the idea of Christ's resurrection. Paul's Christ is a spiritual presence, while the Christ of a later writer, hankering after a corporeal immortality, is a bodily presence who makes doubters touch him and parades his corporeality by eating in the presence of witnesses. Finally he is reported to have departed from the earth by ascending to heaven.

"Perhaps the most beautiful conception of the risen Christ (incomparably nobler than the crude materialistic notion of a corporeal resurrection) is reflected in the tale of the disciples of Emmaus, where Christ, the departed master, speaks out of the mouth of a stranger whom they meet on the way and with whom they break bread together. They knew him not until he was gone. And how did they know him? His words were the words of Jesus, and the way in which he broke bread and spoke the blessing reminded them of their beloved master. Who will deny that in this sense Christ has proved a living presence ever since and is still so even unto the generations of these latter days?"

EDITOR.

AN ANCIENT MOSLEM ACCOUNT OF CHRISTIANITY.

ABU-'L-FATH' MUH'AMMAD, a Persian author of the twelfth century, in a book on religious sects and philosophers, describes the Nazarenes, or, as we would say, the Christians, in the following terms:*

"They are the Church of the Messiah, Jesus, the son of Mary. He is the true messenger after Moses, who is promised in the law, and he accomplished manifest signs and splendid miracles, such as raising the dead, healing the blind and the leprous; and his existence and very nature were a perfect wonder to [attest] his genuineness: viz., his origin without initial drops of seed, and his wise discourses without any previous instruction. Whereas, with all the prophets inspiration reached its completion in the fortieth year, he was already inspired to speak in the cradle, and the completion of inspiration took place in his thirtieth year; and the time of his calling lasted three years, three months and three days.

"Then, after he was taken up into heaven, the apostles and others were of different opinion concerning him. But the opinion differed upon two points only: Firstly, how he had come down and united himself with his mother, and how the Word became flesh; secondly, how he had ascended up and united himself with the angels, and how the divided Word existed. As to the first point, they held that the Word became flesh, and they had a [manifold] view upon the

* Translated from the German of *Abul-'l-Fath' Muh'ammad asch-Schahrastani's Religionspartheien und Philosophen-Schulen.* Zum ersten Male vollständig aus dem Arabischen übersetzt. Von Theodor Haarbruecker. Halle: 1850-1851, 2 vols.

manner of the union and the incarnation, brought into a system. Some said that he enlightened his body, as light enlightens transparent bodies; others, that he was imprinted into it, as the impress of the seal into wax; others, that he appeared in it, as the spiritual appears in the corporeal; others, that he clothed the Godhead with the manhood as with a coat of mail.

"Lastly, others believe that the Word was mingled with the body of the Messiah, as milk is mingled with water. They hold that there are three persons in God. They say the Creator is one substance, whereby they understand his existence by himself alone, not the inclusion of space and comprehensibility (*Greifbarkeit*). And it is one in substantiality, but three in personality; and by three persons they understand the attributes, such as existence, life and knowledge, the Father, the Son and the Holy Ghost; and only the knowledge has put on the body as a coat of mail, not the three remaining persons.

"As regards his Ascension, they maintain that he died and was crucified; the Jews put him to death out of envy and malice and knowledge of his prophetic calling and dignity. Death, however, extended not to the divine part, but only to the human.

"They say that the perfection of the human personality consists in three things: the prophetic office, the imamhood, and the Lordship. The other prophets had these three distinctions or one of them as attributes, but the rank of the Messiah is a higher one, in that he is the only Son, and no one is like him, and between him and the other prophets no analogy is possible; and he is the one through whom the sin of Adam is atoned for, and who will judge the creation.*

"As to his second coming, however, they are likewise of different views. Some say that he will come down before the Resurrection day, as the disciples of Islam maintain; others think that he will only come down at the day of judgment. However, he came down after he was dead and crucified, and Simon Peter saw him, and he [Jesus] spake with him and transmitted to him the power. Then he left the

* Die Schöpfung richten werde.

world and ascended into heaven, and Simon Peter was his vicar, and was the foremost of the Apostles in whatever related to knowledge, piety and culture; only that Paul disturbed his work and made himself his colleague, and confused the foundations of his knowledge and mixed it with the *Kalam* (i. e. view) of the philosophers and the insinuations of his thought.

"I have seen an epistle from Paul, which he wrote to the Greeks, wherein it is stated:

" 'Ye believe that the position (*Stellung*) of Jesus is like that of the other prophets, but it is not so, but he is only to be likened unto *Melchisedek, king of Salem,* to whom *Abraham gave tithes,* so that *he blessed him* and laid his hand upon his head.* Wonderful is it, to wit, what is delivered in the Gospels, that God said: Thou art mine only son—as if he who is the only one could be likened unto other human beings!'

"But there are four of the Apostles who agree together, and one of them made a compilation (*Zusammensttellung*) of the Gospel. They are Matthew, Luke, Mark and John. The close of the Gospel of Matthew reads that he said: 'I send you to the nations, as my Father sent me unto you. Go and call the nations in the name of the Father and of the Son and of the Holy Ghost.'†

"The beginning of the Gospel of John is: 'In the beginningless eternity was the Word, and this Word was with God, and God was the Word, and all is made by his hand.'

"Later the Christians divided themselves into seventy-two sects, and the chief sects are three: the Melchians, the Nestorians and the Jacobites. From them went forth the Julianists, the [Basilians?] the Macedonians, disciples of Macedonius; the disciples of Sabellius, of Photinus, of Paul of Samosata, and several more."

* * *

The statement that Jesus appeared especially to Peter after the

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* The words in italics are in Hebrews vii. 1-3, but the whole text is either quoted loosely from memory, or else from some lost epistle of Paul to the Greeks. The former is more likely, for what follows is probably a reminiscence of Heb. i. 5.

† A confused quotation from John xx. 21 and Matthew xxviii. 19.

resurrection and transmitted to him the power has been supposed by Rohrbach, in his monograph on the lost Mark-ending, to be based upon that lost ending or upon some document derived from it. Mark is Peter's Gospel, and often contains details omitted by Luke and Matthew; and yet the apparition to Peter mentioned by Luke and Paul (Luke xxiv. 34; 1 Cor. xv. 5) and intimated by the extant Mark (xvi. 7) does not appear in the present ending of that Gospel. A tenth-century Armenian MS. found by Conybeare ascribes the present ending to Aristion, a second-century writer; and this, coupled with its absence in the oldest extant Greek manuscripts and in ancient ones known to Eusebius and Jerome in the fourth century, have forced upon us the conviction that it has been added to supplant the genuine ending. Mary had evidently written something which was disapproved of by the Church, and Rohrbach's monograph exhaustively discusses this question. There is one point, however, which the German scholar overlooks. We know from Irenæus that Mark, in the second century, was alleged by the Docetists in favor of their doctrine that Jesus the man suffered, while Christ, the divine principle, remained impassive (Iren. Haer. iii. 8:7). One is strongly tempted to conjecture that Peter's original account of the resurrection was simply that of a vision or apparition, such as the one that appeared to Saul on the Damascus road, and which Saul himself, in the text from Corinthians quoted, collocated with the undetailed appearance to Peter. When I mentioned this conjecture to Rendel Harris in 1900, he seemed to approve of it, and said: "Yes! His body was phantasmal." To have allowed such an account to stand in the New Testament, when the Docetists were becoming a dangerous party in the Church, would have given them too much hold. Peter's narrative of his experience was therefore suppressed, and only lingered in apocryphal tradition. As the Mohammedans always quoted certain apocryphal Gospel stories on a footing with the Canonical ones, our Persian author may have gotten his statement from such a source. He can hardly have taken it from Clement of Alexandria's lost *Institutions* (ap. Eusebius H. E. ii., 1), for that work put Peter on the same footing with James and John, and taught that all three of them received the gnosis from the risen Lord. It is strongly probable, therefore, that there was once a Gospel narrative telling about a special appearance to Peter, and the celebrated charge to Peter, now misplaced in the Gospel of Matthew, was a likely portion thereof.

PHILADELPHIA, PA. A. J. EDMUNDS.

INFINITUDE AS A PHILOSOPHICAL PROBLEM.

PROFESSOR C. J. KEYSER'S VIEW WITH EDITORIAL COMMENTS.

PROF. CASSIUS JACKSON KEYSER, a mathematician of Columbia University, well versed in the philosophy of mathematics, especially in its more recent development since the appearance of Riemann's famous *Habilitationsschrift,* has published in *The Hibbert Journal* an article on "The Axiom of Infinity," which he criticises in its rôle of "a new presupposition of thought." He says:

"For thousands of years philosophy has recognised the presence of a certain definite problem, namely, that of *extending the dominion of logic, the reign of exact thought, out beyond the utmost reach of finite things into and over the realm of infinite being,* and this problem, by far the greatest and most impressive of her strictly intellectual concernments, philosophy has, for thousands of years, arduously striven to solve. And now I ask—not, has it been worth while? for that is conceded, but—has she advanced the *solution* in any measure, and, if so, in what respect, and to what extent?"

Professor Keyser, continuing, says that "thanks to the subtle genius of the modern Teutonic mind, this ancient problem, having baffled the thought of all the centuries, has at last been completely solved." He then refers to Riemann, Bolzano, Dedekind and Cantor. The first mentioned mathematician distinguishes clearly between boundlessness and infinitude, and Professor Keyser selects for the purpose of his discussion the following definition of "that august term":

"*An assemblage* (*ensemble, collection, group, manifold*) *of elements* (*things, no matter what*) *is infinite or finite according as it*

has or has not a PART *to which the whole is just* EQUIVALENT *in the sense that between the elements composing that part and those composing the whole there subsists a unique and reciprocal* (*one-to-one*) *correspondence.*"

For a distinction of the notions of finite and infinite he quotes the mathematical theologian Bolzano, saying:

"Bolzano's procedure is virtually as follows: Suppose given a class *C* of elements, or things, of any kind whatsoever, as the sands of the seashore, or the stars of the firmament, or the points of space, or the instants in a stretch of time, or the numbers with which we count, or the total manifold of truths known to an omniscient God. Out of any such class *C*, suppose a series formed by taking for first term one of the elements of *C*, for second term two of them, and so on. Any term so obtainable is itself obviously a class or group of things, and is *defined* to be finite. The indicated process of series formation, if sufficiently prolonged, will either exhaust *C* or it will not. If it will, *C* is itself *demonstrably* finite; if it will not, *C* is, on that account, *defined* to be infinite. Now, say Professor Royce and others, a definition like the latter, being dependent on such a notion as that of inexhaustibility or endlessness or boundlessness, is negative; a certain innate craving of the understanding remains unsatisfied, we are told, because the definition presents the notion, not in a positive way by telling us what the infinite actually *is*, but merely in a negative fashion by telling us what it is not.

"Undoubtedly the claim is plausible, but is it more? Bolzano affirmed and exemplified a certain proposition, in itself of the utmost importance, and throwing half the needed light upon the question in hand. That proposition is: *Any class or assemblage* (*of elements*), *if infinite according to his own definition of the term, enjoys the property of being equivalent, in the sense above explained, to some proper part of itself.* Though he did not himself demonstrate the proposition, it readily admits of demonstration, and, since his time, has in fact been repeatedly and rigorously proved. Not only that, but the converse proposition, giving the other half of the needed light, has been established too: *Every assemblage that* HAS *a part 'equivalent' to the whole,* IS *infinite in the Bolzano sense of the term.*

"I turn now to the current assertion by Professor Royce and Mr. Russell, that the modern concept of the infinite, of which I have given above in italics an exact statement, to which the reader is referred, in fact denies a certain ancient axiom of common sense, namely, the axiom of whole and part.

"The question is whether it is possible, by means of the new concept, to demonstrate the existence of the infinite; whether, in other words, it can be proved that there are infinite systems. That such demonstration is possible is affirmed by Bolanzo, by Dedekind, by Professor Royce, by Mr. Russell, and in fact by a large and swelling chorus of authoritative utterance, scarcely relieved by a dissenting voice. After no little pondering of the matter, I have been forced, and that, too, I must own, against my hope and will, to the opposite conviction. Candor, then, compels me to assert, as I have elsewhere briefly done, not only that the arguments which have been actually adduced are all of them vitiated by circularity, but that, in the very nature of conception and inference, by virtue of the most certain standards of logic itself, every potential argument, every possible attempt to prove the proposition, is foredoomed to failure, destined before its birth to take the fatal figure of the wheel.

"The upshot, then, is this: that conception and logical inference alike presuppose absolute certainty that an act which the mind finds itself capable of performing is intrinsically performable endlessly, or, what is the same thing, that the assemblage of possible repetitions of a once mentally performable act is equivalent to some proper part of the assemblage. This certainty I name the *Axiom* of *Infinity,* and this axiom being, as seen, a necessary presupposition of both conception and deductive inference, every attempt to 'demonstrate' the existence of the infinite is a predestined begging of the issue.

"What follows? Do we, then, *know* by axiom that the infinite is? That depends upon your metaphysic. If you are a radical *a-priorist,* yes; if not, no. If the latter, and I am now speaking as an a-priorist, then you are agnostic in the deepest sense, being capable, in utmost rigor of the terms, of neither conceiving nor inferring. But if we do not *know* the axiom to be true, and so cannot deductively prove the existence of the infinite, what, then, is the

probability of such existence? The *highest yet attained.* Why? Because the *inductive* test of the axiom, regarded now as a hypothesis, is trying to conceive and trying to infer, and this experiment, which has been world-wide for æons, has seemed to succeed in countless cases, and to fail in none not explainable on grounds consistent with the retention of the hypothesis.

"Finally, to make briefest application to a single concrete case. Do the stars constitute an infinite multitude? No one knows. If the number be finite, that fact may some time be ascertained by actual enumeration, and, if and only if there be infinite ensembles of possible repetitions of mental processes, it may also be known by proof. But if the multitude of stars be infinite, that can never be known *except* by proof; this last is possible only if the axiom of infinity be true, and even if this be true, the actual proof may never be achieved."

We agree with Professor Keyser when he expresses his conviction that the existence of the infinite cannot be proved, but we venture to supplement this brief statement of his views by the following suggestions: By infinite we understand a process which is to be carried on incessantly. If we think of a mathematical straight line as being produced without limits, we call it infinite. Should we ever try to draw on, even if it were done only in thought, we should soon find out that our line is always of a definite length and never truly infinite, for we would need an infinite time to complete the task. The rigor of logic forces us to admit that infinitude is a process in action, but not a concrete and ready thing. Whether the number of stars or the grains of sand on the seashore are infinite or not is a question which can never be decided by experiment, but if our logical laws hold good, and if they possess any value at all, we must admit that (if our existence were widened into a divine omniscience and omnipotence) we could most easily count the grains of sand on our planet (assuming that there is no quibbling about their size as to which ones are mere dust, being too small to be counted) and we could with no less facility determine the number of stars that course within the range of our milky system (provided again that no doubt exists as to which celestial bodies should be regarded as

stars and which as mere meteorites or stellar dust); for anything that is concrete must be definite and anything that is infinite can never be a concrete thing, but must be a process in progress.

This appears to amount to a negation of the existence of infinity; and perhaps it does, at least in the opinion of those metaphysical philosophers who identify the term reality with substantiality, or even with materiality; but the infinite is after all actual, for it inheres in activity which wherever we take it is always an infinite series. Moreover, every particular part of the universe may be considered in its relation to the whole; yet the present moment in its relation to other moments in both the past and the future is but a fleeting point in infinite time, and every spot that determines a definite locality may in all directions and at any imaginal distance be placed in relation to the surrounding world, which renders the proposition obvious that the infinite is the potentiality of actual existence, and is as such not less real than the finite. The present moment alone is truly existent, and the "here" is to us the centre of the universe. It is the place in which our activity is real, but the directions which it can pursue as well as the distance to which, at least in thought, it may venture, are alike infiinite.

Infinitude is an evanescent quality; it comes or goes according to the viewpoint we take, according to the task we set ourselves. Take, for instance, the line *AB*, which may be one mile, or one foot, or one inch long, just as small as you see fit. It is finite; yet you can divide it and there is no limit to your division. It is infinitely divisible. Thus you create infinitude by a conceptual viewpoint. Or take a definite number, e. g. the fraction 1-3; it is a definite quantity, but if we change it into a decimal fraction, the result is an infinite decimal fraction, viz., 0.3333 . . . . to be continued without end. If we ever stop the fraction is no longer equal to 1-3. Yet this infinite decimal exactly equals the unequivocally finite and definite faction 1-3. The infinite fraction 0.3333....can never be completed, the definite fraction 1-3 is complete. The infinite and the finite are not two different things, but they are two aspects of the same reality. The finite hangs in the infinite as a temporary and concrete actualisation, and the infinite is inherent in the finite as the

inexhaustible potentiality of its activity. The finite is the changeable, the non-permanent, the transient. The infinite is the resource of all possible existence illimitable in its possibilities.

This conception of infinity seems to be a negation of its existence; and assuredly it is a negation of the notion that infinitude can ever be a concrete thing, realised in any place or at any one time, or in any material body or collection of bodies. But while it denies the materiality, the concreteness, the definiteness (or let us directly add, the finiteness) of infinity, it yet implies its actuality as a most prominent feature of the world-process. Infinity is an intrinsic quality of all activity, and as such it is the most essential part of reality constituting its profundity and the mysterious charm of its eternal youthfulness and freshness; for if it were not, reality would be monotonous, and if not meaningless, certainly both shallow and trite because exhaustible in meaning.

LITERARY CORRESPONDENCE.[1]

FRANCE.

IF we accept the theory of evolution—limiting it to the psychological structure of the human individual—we are led to accept also the priority of the emotional life to the intellectual life. And from this follows as immediate consequence that the emotions must have their own logic, anterior to rational logic and different from it in its forms and means, but having the same object, filling the same function in the life of the species.

This further consequence is derived from our premise, that, despite the usual complexity of the phenomena of personality, there can and must be cases of purely emotional memory, that is to say, cases in which the emotional states are recalled by memory and recognised as such independently of the sensorial or intellectual phenomena that accompany them. And, as a necessary accompaniment to this, there must finally exist forms of the creative imagination which are also emotional, affecting only the emotions, "having for their material emotional states and nothing else." Thus the higher mental life would find itself closely united to the physiological trunk by intermediate stages without any break whatever. This is, in brief, the succession of dominant ideas which are developed with remarkable precision and clearness in the most recent works of M. Th. Ribot. To his *Psychologie des sentiments,* and his *Essai sur l'imagination creatrice,* has just been added *La logique des sentiments,* which completes this phase of his work: and this work is nothing less than a total reconstruction of the science of psychology.

[1] Translated from the original manuscript by W. H. Carruth, University of Kansas.

M. Ribot (I may limit myself here to a brief analysis of the work) considers in logic not simply the ensemble of rules, which determine the conditions of a proof, but also the natural facts, individual or collective, the emotions, beliefs, opinions, etc., which furnish a part of the materials for the reasoning process. "This man's judgment is influenced by his feelings," "passion has its logic," are expressions familiar to each one of us: they have a greater import than one thinks before reflecting. M. Ribot faces the subject in its true aspect and in its general features: he assumes the judgment itself to be a primitive element; he does not separate reasoning from the other operations that accompany it in the work of the mind; in a word, he treats the operations called logical as simple facts, without concern for their form or their validity. From his point of view it appears directly that the logic of feeling is very much the most vivid and widespread, and, to use his own words, that "primitive reasoning is to the reasoning of the logicians as the implements of the stone age are to the perfected tools of our own time."

In a preliminary discussion he establishes the fact that we must not expect to find the conditions of structure and connection of emotional reasoning in association: association reveals only the terms of the judgment and the reasoning; we must see also the relations. Emotional reasoning takes association for granted, but goes beyond it: the emotional temperament makes a choice among the states of consciousness, it has an end in view, consciously or unconsciously, neglecting or suppressing whatever tends to turn it aside from this goal.

Contrasted as they are, emotional logic and rational logic have a common foundation in reasoning. Even though the mechanism of the reasoning differs, it retains in both cases its characteristic mark, it is "a mediate operation the end of which is a conclusion." It might be said in objection to this that the logic of the feelings would then be confused with *sophistry*. But M. Ribot shows that they are not in all points coincident. There is a difference between them in both point of view and procedure. Sophisms may be wholly lacking in emotional quality, and emotional reasonings may be

entirely free from sophistry. Rational logic cannot cover the entire domain of knowledge and action; the logic of the feelings serves man in all the cases where he has an immediate interest in assuming or justifying a conclusion.

Emotional logic has, then, its own field; there follows naturally the study of its constituent elements. Its terms are judgments with an emotional coefficient, "judgments of values," variable, subjective, not always consistent, which reasoning will transform on occasion into objective and general judgments. As for the relations which connect these terms, it will be sufficient to note that emotional reasoning sets out from a wish or a belief; that it accordingly proceeds toward a desired goal, toward an end which has been accepted in advance; that the conclusion therefore conditions the sequence of the arguments from which it is predestined to issue, which arguments are in this case not merely words, but in addition gestures, acts, intonations, etc.; and, finally, that the logic of the feelings differs from the other kind by being exempt from the principle of contradiction, since the values of sentiment may be contradictions to the reason and yet reconcilable in practice.

How diverse are the forms assumed by the logic of the feelings may be imagined from the preceding analysis. M. Ribot designates them provisionally by the following epithets: passional (or emotional), unconscious, imaginative, justificatory, mixed or composite; he describes their several manifestations. But yet, whatever be these forms, if we ignore their substance, their content, the logical agency peculiar to each one, their individual ends, and consider only the part that contributes to the general aim of the individual, we find that they may be reduced to two types, according as they contribute to the conservation or to the expansion of the individual—these two fundamental tendencies of emotional life which are so intimately connected in the higher animals.

M. Ribot, I may say in passing, pays some attention, and with good reason, to the subject of religious conversions. It would seem to me to be very interesting to study the reverse situation. I do not doubt that the analysis of certain cases would prove very

instructive. But I can not tarry over this point at present, and I now come to the last portion of M. Ribot's work.

The logic of the feelings has a character fundamentally practical. However, one case constitutes an exception: this is when it is employed in the service of creative esthetics. Even here, it is never reduced to pure association; it is probable that some sort of reasoning is involved in the genesis of every esthetic creation. For my own part I am inclined to affirm this. Does there exist by any possibility a form of emotional creative imagination dealing exclusively with emotions? This is the new question that awaits solution.

M. Ribot has undertaken to prove that musical creation alone of all presents this character. He does indeed show how poetry, as soon as it tries to be purely emotional, tends to approach the type of music, neglecting the sense of the words and listening only to their sound. Similarly with painting when it sacrifices technique to visions seen in dreams.

However, I would make one reservation, or rather a suggestion, on the subject of the division of musicians into two groups, according as they see in their art only an architecture of sounds, a form, an arabesque, or on the other hand as they value in it only the expression of passion. The extreme positions would be those of the composer who would think out his music as one figures out a game of checkers, and again of the musician who would reduce it to some sort of soul without body. But, in fact, it seems to me that all the masters keep between these two practically unattainable extremes; the two methods are really inseparable, at least in practice. The constructors of arabesques cannot wholly escape some sense of grace, of voluptuousness, cannot repress all tendency to expression, nor, on the other hand, can the musicians of passion altogether resist the charm of combinations. There are not wanting in the works of the most passionate masters pages which bear witness to a regard for ingenuity or even have their origin in the fondness for some concourse of sweet sounds.

The exceptions which may be pointed out will not break down the thesis,—that the fundamental condition of the emotional creative

imagination is "the disposition to be moved not simply by actual events, but by memories of feelings, that is to say, by the emotional memory, and to build with these materials just as the imagination with a sensational basis builds with forms and colors." However, we must not demand of the musician that he necessarily and absolutely realise the type. After all is said, the musician works in sounds as the painter works in colors. The language of each of the arts is the peculiar discovery of that art, and music itself, be it ever so mystic, appeals to a sensory pleasure which at least serves as support or as vehicle for a feeling.

If we consider, on the other hand, that many poets and painters also represent the emotional type, we shall be led to the conclusion that this disposition to build with materials of an emotional character is independent of the special—psychological—endowment which makes this artist a poet or a painter and that one a musician. But this gift afterwards reacts upon his character because of the media peculiar to the language which his endowment indicates and imposes upon him. It is the very quality of sound that makes it to an artist of an emotional temperament a more adequate and more immediate instrument than color. The language of sounds is a creation of man, even more so than the language of colors. In fine, it would seem that hearing is, if I may venture to say it, a more intimate and interior phenomenon than sight. We are obliged in some sort to go outside of ourselves in order to see something outside, and this is one of the reasons for the opposition of these arts, an opposition, which, while common, is not constant, not always so pronounced in many individuals.

In short, there remain for me certain difficulties inherent in the thesis, and I publish them now as they occur to me, expecting to get more light by so doing. M. Ribot has such clearness and force that I am not quite sure but the mistake is mine. However, it is time to leave his fascinating volume, over which I linger in spite of myself. It will stand among the most original works that have thus far been written by this unchallenged master of French psychology.

The work of M. Th. Ruyssen, *Essai sur l'évolution psychologique du jugement,* touches in some points that of M. Ribot, and follows the same method. The main thesis of M. Ruyssen involves, in fact, the following procedures, which are, moreover, intimately connected—the application of the genetic method to the study of the judgment, and the extension of physiology into psychology.

Philosophers hitherto have studied the judgment as exemplified in judgments,—the completed judgment of the adult or even of the child. According to the particular doctrine of each philosopher the judgment has been regarded as an operation of the intelligence, an act of the will, etc. And the intervention of the will, of desire, has led to the paying greater attention to the part of the physiological concommitants, sensations, movements, etc. When once the method of the natural sciences was introduced, the investigators became more bold; they have attempted, and not without success, to apply the genetic method to the operations of the mind: for example, they have undertaken to determine the manner in which judgments are formed, of what elements they are composed, and what paths are travelled by the mind in forming judgments.

M. Ruyssen intends to push this investigation still further. He takes note not only of the composition and evolution of our judgments; he would attempt to go to the heart of the matter and report the formation of credulity, that is to say, of the habit developed within us of judging and believing. Accordingly, judgment will not be considered henceforth in its isolated exterior products; it will be traced back to the fundamental acts of life, studied as a function in the process of evolution of the individual himself just as deeply as it may be possible to follow it. Physiology must illumine, if not explain, the psychological process.

But how shall the transition be accomplished? What principles may be followed in connecting the evolution of the judgment with that of life? M. Ruyssen hopes to find them in these two great facts: habit and adaptation, which are met under different aspects at every step of the ladder of life: the tendency to perpetuate the

vital stimuli, and to respond (with an excess of energy, he adds in italics, following Spencer) to the stimuli most favorable to living.

It is evident that spontaneity is a prime fact involved and recognised, without which we could not conceive either habits or adaptations. It is no less clear that we can scarcely refuse to recognise something like a rudiment of consciousness in the elementary manifestations of life. M. Ruyssen does not flatter himself that he will find the first states of consciousness of the child emerging from "a sort of psychic vacuum or non-existence," but rather, as he puts it, "from a background at once extraordinarily complex and solid of psychological states obscurely perceived and of habits unconsciously acquired." The repetition of acts beneficial to the organism will be, in brief, the initial point. It takes a liberal step to get from this to the clear consciousness of these relations and the construction of the edifice of logic. On the genesis itself of our faculty of judgment we have no direct light; we have been able only to try to untangle the vital reasons of our tendency to affirm, to judge, and to believe. M. Ruyssen has announced no pretention of teaching us more than this. In the very interesting pages in which he studies the attention, doubt, belief, etc., and which constitute the subject of another part of his book, he follows, indeed, the ordinary processes of psychology. I have not the time to pursue this further; it will suffice to have characterised his meritorious attempt. His work marks one of the most pronounced steps that have been taken toward the solution of a problem of first importance.

* * *

To what class of feelings the esthetic feeling belongs; to what other feelings it is related; what place these feelings occupy in the life of the individual and the species; to what characteristics in things the sense of beauty in us corresponds; by what signs the peculiar sense of beauty is recognised; under what forms and in what circumstances it is manifested; from what capital the various arts are enriched; in what proportion the passions of the soul and rational motives unite to form them: these are some of the problems that present themselves to us as soon as we begin to discuss the origin of art, its expression, its nature. The very title of the im-

portant work of M. Paul Souriau, *La beauté rationnelle,* shows us that he does not propose to attack them all, and that he has devoted himself especially to establishing, in accordance with his conception of the term, the plan of a system of esthetics calculated to bring together divers theories and to formulate general principles which would assure a practice at once rational and more conscious of its object and its means.

Perhaps this title will rouse the apprehensions of some readers. Let them be reassured, M. Souriau does not approach his subject in an autocratic spirit; he begins his study where we might all begin it, excepting that we would not carry the theory of subjectivity in art to the extreme point of denying all relation of appropriateness between the qualities of things and the impressions that we receive from them. He concedes that esthetic judgments "are perhaps the most subjective, those into which we put the most of ourselves and involve our personality most profoundly."

But for all that, not everything here is personal; objective judgments are "implied in all our judgments of taste." These are the elements which it is necessary to eliminate. It is necessary to subject our esthetic judgments to rational supervision, taking them just as facts, experience and acquired notions have made them to-day, instead of going back to the Deluge. And if, on the other hand, this work of supervision leads back constantly to reasons derived from self-interest, from our knowledge, from our dignity, M. Souriau accepts the reproach which may be brought against him of confounding esthetics with logic, with science, with morals, for it is precisely toward such a fusion that it is tending with all its might.

Determination of the idea of the beautiful, sensual beauty, intellectual beauty, moral beauty,—these are some of the divisions under which the author's arguments are arranged. Starting, in accordance with his programme, not from experience nor from evolution, but from reason, he posits to begin with these two principles: beauty is evident perfection, and perfection is the conformity of a thing to its purpose, so that the domination of purposes will give us that of perfections, the most elevated purpose that we can

possibly conceive being the full flower of conscious life. Accordingly the beautiful and the useful, while remaining distinct ideas, are no longer antagonistic;[2] intelligence will contribute, furthermore, to beauty, since its ultimate function is neither to know nor to comprehend, but to arrange actions with a view to an end; morality and beauty consist alike in the perfection of the being, or at least tend toward it.

I am giving only the skeleton of the theory, which is richly and very clearly developed. One cannot but approve of M. Souriau's designs. It has always seemed to me, as it does to him, that every work of art is subject to one essential condition, that it shall not contradict either our scientific logic or our moral logic. It is a hackneyed truth, that the perfection of man is the ultimate object of our sciences, of our rules of life and of our arts, over and above the pleasure which they yield us. It would even be legitimate to conceive of esthetics as "the complete science of sensation and feeling," (as did only recently the much to be regretted Durand de Gros), ethics being regarded as a branch of it: in fine, the science of application or of adaptation, under the general principles of which would be grouped morality and artistic creation, each having its own theory, its own methods of instruction, and its own technique.

Some time since (in *Dix années de philosophie,* p. 141) I wrote that art is more or less directly useful in so far as it favors the exercise of natural faculties (this being the biological point of view), in so far as it ennobles the individual and strengthens social bonds (this being the ethical point of view), and also in so far as it is a variety of knowledge and reveals to us something of man and of exterior nature (this being the scientific point of view); nevertheless it remains distinct both by virtue of its means of expression, its language, and by virtue of its immediate end, which is a specific

[2] On this point I have always thought that the utility of an object does not detract from its beauty, but nevertheless it will not suffice to create it: the beauty lies in the manner of expressing the useful. This consideration should never be neglected in the judgments which we form on architecture especially; economic utility produces many ugly results here, which are still further aggravated by a false art.

pleasure, or an emotional state and at the same time an intellectual pleasure. Some further explanations would be necessary here, but a more thorough discussion of the subject would exceed the limits of this correspondence. I must take leave of M. Souriau, thanking him for his work and his criticisms. His book is important and timely in the midst of the confusion of our schools. Yet I will not offer to guarantee its efficiency.

* * *

M. Marcel Mauxion, in an *Essai sur les éléments et l'évolution de la moralité*, makes a careful analysis of the idea of the good. He reduces the elements of morality to the following three: the esthetic element, to which individual perfection corresponds; the logical element, to which correspond justice and law; and the sympathetic element, pity and love. The view which is particularly his own is the genetic exposition of these elements. The development of the esthetic element has, in his opinion, always prepared the way and fixed the conditions for the rational element, which in its turn has preceded that of the sympathetic element. Whence is derived this practical conclusion, that it will be impossible to base morality upon either one of these elements to the exclusion of the others, or to invert their natural and rigorous order.

Incidently I would note an excellent criticism of the theories of what is called solidarity,—one of those words on which it is fashionable to build to-day without considering exactly what they signify. The little volume of M. Mauxion deserves to be read and studied.

* * *

The Monist has already published an account of the volume of M. Fr. Paulhan, entitled *La fonction de la mémoire et le souvenir affectif*. Therefore I may be excused if I do not devote so much attention to it to-day as the value of the work would demand. M. Paulhan maintains the reality of emotional recollections (this question of emotional memory seems to be the order of the day), but not without letting it be seen that he mingles with them constantly intellectual recollections: moreover they both present the characteristic of being constantly modified, separated, or transformed ac-

cording to new circumstances. They tend to organise themselves into systems which will become the foundation of the individual and will be useful to him. In fine, and without entering into the analysis of the facts, which are so numerous and so complex, we have here a painstaking study of the mental mechanism looked at in an especial light and connecting with the general theory of "systematic finality," which has been presented by M. Paulhan with sufficient detail in his previous works.

* * *

M. Malapert's *Le caractère*[3] is a very complete and interesting work. The reader will find in it a history and a profound criticism of the attempts at classification proposed in recent years, the economy of which I have previously pointed out in the present journal. I think it best to reproduce here the remark made concerning M. Malapert's work by M. Alfred Binet in the last volume (10th year) of the *Année psychologique*. It is impossible, M. Binet thinks, to study characters in the lump and at one sitting; but one can study and observe particular traits of character very well by putting oneself in favorable conditions called forth if need be by the observer himself. The wise method to follow, would be to obtain from nature, series of reactions which one would then group and classify in order to select typical reactions. Attempts at classification based upon theoretical views seem to me, as they do to M. Binet, to have yielded all that they are capable of yielding, and I think with him that investigators would make a mistake to linger in the path that has been followed until now. It is better to use a longer but doubtless a more fruitful method.

* * *

Here we have a volume of particular interest for American readers, that of M. Emile Lauvriere, *Edgar Poe, sa vie et son œuvre*. The mere name of Poe gives sufficient ground for conjecturing that it is a study of pathological psychology; such it is, and the most complete that has ever been written, if I am not mistaken. Poe's clinical table is startling. The relations of the work to the tempera-

[3] Paris, Doin, pub. Works without any publisher's name are from the house of F. Alcan.

ment of the poet seem to be apparent. It is no exaggeration to say, in accordance with the documents here collected, that "the poetic originality of Poe was his affliction"; his imagination was "the projection of his defects into literature." And yet, M. Lauvriere remarks, the critical sense of the man, his studied taste, his conscious logic succeeded in organising into a harmonious work discordant elements which seemed incapable of yielding anything but the incoherence of delirium. "Poe's lucid reason triumphs over his irritated sensibility; his art subdues his madness."

In another place (*Mémoire et imagination*) I have undertaken to show that the attention persists in the improvisations of the poet and the dramatist, that the judgment continues to play its part even in the midst of rapid and inspired performance. I have pointed out, besides, in connection with the declarations of certain writers, the watch kept by the poet over the automatic march of the images of his fancy, the constant and efficient presence of the reason, despite a seeming subdivision and distraction of the ego and of the unconscious operation of a stranger who might have entered upon the scene. The example of Poe, in my opinion, supports the truth of this observation and supports the assumption of the constant presence of the critical sense. It also permits us to demonstrate that the effect of troubles combined with a tendency to degeneracy is not to prevent this activity of the reason or the critical faculty, but rather, at first and in the majority of cases, to supply the imagination with imperfect materials. It would be a really instructive study to disentagle, in certain chosen and particular cases, the precise influence of the various pathological states upon the production of the artist and the poet; only in this way would the much debated question of the relation of genius to madness find any proper answer. And it is in fine a chapter of such a study, a very important chapter, which M. Lauvrière has presented to us.

* * *

M. Guy de Charnacé has published under the title *Hommes et choses du temps present*[4] independent articles in criticism on works of philosophy, esthetics ,and science. Himself an eminent

[4] 2 vols., Paris, Emile Paul, pub.

zootechnician, the Marquis de Charnacé is particularly instructive in the pages where he treats of Groos, Metchnikoff, Lebon, etc. Evolution finds in him a persistent adversary. He is further interesting in the pages devoted to volumes on psychology, sociology, or metaphysics, for here he takes up the questions as a man of the world who has lived his life, and he finds in his "common sense" of an enlightened and inquisitive reader objections which too frequently escape the specialist shut up in his study. His attitude is clear and frank: he takes the position of a Catholic and a Christian, yet without narrowness.

There remain for me to name, without at present being able to say anything about them, the following works: M. Queyrat, *Les jeux chez les enfants;* MM. Toulouse, Vaschide, and Piéron, *Technique de psychologie expérimentale*[5]*;* M. A. Lévy, *La philosophie de Feuerbach;* M. Rémy de Gourmont, *Physique de l'amour, essai sur l'instinct sexuel*[6]*;* L'abbé Laberthonnière, *Le réalisme chrétien et l'idéalisme grec*[7]*;* M. Le Dantec, *Les influences ancestrales*[8]*;* M. Brunetière, *Sur les chemins de la croyance*[9], a work which will demand a thorough discussion. Etc.

LUCIEN ARRÉAT.

PARIS, FRANCE, December, 1904.

POSTSCRIPT. I have just received a copy of the *Revue de philosophie,* managed by M. Peilloube (4th year, No. 11).[10] This excellent review is not unknown to the readers of *The Monist.* It is well arranged, liberal, and offers to its readers the means to follow the philosophic movement. I will mention in this number a very complete report of the International Congress of Philosophy, held at Geneva, of the Congress of History and Sciences, also held at Geneva, and of the Congress of the British Association for the Advancement of Science at Cambridge.

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[5] Doin, pub. [6] Mercure de France, pub. [7] Lethielleux, pub.
[8] Flammarion, pub. [9] Perrin, pub. [10] Chevalier et Rivière, pub.

CRITICISMS AND DISCUSSIONS.

AN INTERNATIONAL AUXILIARY LANGUAGE.

To the Editor of The Monist.

I am late in thanking you for your kind gift of the July *Monist* containing so many interesting articles on the international language. The cause of my delay is found in the many claims upon my time and particularly in the Second International Congress of Philosophy, which met at Geneva from the fourth to the eighth of September. I take pleasure in informing you that the Congress, after having heard my report on the progress of the notion of an international language, took the following action:

1. It endorsed the platform of the Commision on the adoption of an international auxiliary language.

2. It renewed my appointment as member of the Commission, which I had received from the first session of the Congress at Paris in 1900.

3. It appointed as a new member of the Commission Prof. Ludwig Stein, of Berne, who has long been in sympathy with our undertaking and who spoke in its behalf at the Congress.

It seems to me that these results are of sufficient importance to deserve communication to your readers and that they cannot fail to be interested in them.

If I did not fear to trespass on your indulgence I should add a brief reply to the objections raised by yourself and M. Arréat, polite and appreciative though they be. Permit me to say that they are all due to an incorrect or too narrow conception of the problem, or even to a simple lack of information. I will begin by taking up those which are based upon simple errors of fact.

You say, for example (p. 565), that the devotees of Volapük in different countries have had much difficulty in understanding one another. On the contrary, at the International Congress of Volapük, held in 1889, people of all countries conversed and held discourse in Volapük with great ease and understood one another perfectly. Volapük has even made marriages (I could cite the names) of persons of different nationalities who had no other com-

mon language. To-day Esperanto has accomplished still more completely what you regard as a miracle: this summer there have been several meetings of French and English Esperantists at Havre, Rouen, and Dover, and they all conversed continually in Esperanto with the greatest ease and familiarity. You may confirm this by inquiry of the British Consul at Havre, or of the Mayor of Dover.

Moreover, the unheard of and almost incredible fact was observed, that the English who spoke Esperanto had none of that characteristic accent which marks them forthwith when they undertake to speak French! This in response to M. Arréat who still doubts whether an artificial language can actually be spoken (p. 563)! If my personal testimony has any value I will record the following fact: I have never learned to speak Esperanto; I only read it. Now a Russian Esperantist came to my house one day unexpectedly and addressed me in Esperanto. I understood him perfectly without losing a single word of his conversation (which never happens to me with either a German or an Englishman), and without any preparation I was able to reply to him in Esperanto and make myself perfectly intelligible to him (which I should not be able to do in English, and only with difficulty in German). Draw your own conclusions! You (and M. Arréat) say that an artificial language would not be easier to learn than a living language (pp. 563 and 596). This is an entire mistake! It is a hundred times easier to learn, because it is regular. Just think of what a marvel of simplicity you have in a language without exceptions! You speak of English as an easy language, because its grammar is a bit simpler than that of other languages. But you forget that it is quite as irregular as others, quite as full of anomalies and want of logic, that the English syntax frequently gives rise to equivocations (for example, in the deplorable habit of omitting the relative pronoun), and that English style swarms with idioms that are unintelligible to an uninitiated foreigner. Reforming English orthography and making it phonetic will not render English easier for foreigners to pronounce; this will simply make it more difficult to read.

M. Arréat says: "Is it not better to learn English, which puts me into touch with 150 millions of men?" Without discussing this number, which seems to me to be exaggerated (the number of those whose mother tongue is English is usually reckoned at 125 millions, and it is evidently unfair to add to this the number of foreigners who may know English, for in this case we must also add to the number of Frenchmen the number of those who can speak French, etc.), I will simply reply to this: I have not and shall never have anything to do with these 125 millions of people; but as trader and scholar I shall have to do with a thousand persons who speak English; but I shall also have to do with a thousand who speak German, with 500 speaking Italian, with 500 speaking Spanish, with 500 speaking Russian, with 200

speaking Dutch, with 100 speaking some Skandinavian language, and so on. What good will English do me with all these other people? Why should a Frenchman and a German, an Italian and a Russian use English in talking with one another rather than the national language of some one of them? Will my knowledge of English enable me to read the literary works and scientific publications of Hungary and Poland? This shows how absurd it is to propose any given living language whatever as an international language. You propose English because it is spoken by 125 millions of people. Why not propose Chinese, which is spoken by 400 millions? If it is a matter of numbers the Chinese ought to carry the day. Is it not better to be in touch with 400 million men than with 125 million? You see, your arguments are refuted by the *reductio ad absurdum.*

You allege that English language and literature are international (p. 595), and I may reply: Neither more nor less than the French literature, the German literature, the Russian literature (Tolstoy), and even the Skandinavian literature (Ibsen). This then is not a peculiar claim of the English, nor an argument in its favor. You think that it is spoken and understood "everywhere"; but go to Italy, for instance: French is the language spoken by all who have business with foreigners, and I have seen Englishmen very much embarrassed where a Frenchman could get along perfectly well. You accuse Mr. Ostwald of having a "national prejudice" against English, and you attempt to find political reasons for this (592). I am not prepared to reply to this in the name of the Germans, but I can affirm as a Frenchman that the animosities which you recall no longer linger among us, and that public opinion is favorable to "a cordial mutual understanding."

Permit me to say to you, that if any one is the victim of national prejudice it is he who proposes his own language as the international medium, and not the one who discards every national tongue, including his own, in favor of the international language. The exclusion of national languages, recorded in our programme, is a clause expressing mutual disinterestedness; it is the indispensable condition for any international agreement, and it may boldly be asserted that if an international language is ever adopted it will of necessity be a neutral one.

I know very well that you think very little of a formal and, as it were, diplomatic agreement, and that you expect the solution of the problem not from an agreement and a vote, but from the natural concurrence of languages. I have no objection; but you forget that the same national prejudices which were opposed to the official adoption of a living language are also invincibly opposed to its natural propagation. You invoke "the struggle for existence," "natural selection," and "the survival of the fittest." But precisely because they do struggle for existence national languages will not abdicate in favor of one from among their own ranks. As for natural selection, it may

just as well occasion the triumph of two or three languages or even of six, as of a single one; the problem will not be solved in this way.

But even this is a chimera: the Germans and Russians have not succeeded after a century in suppressing the Polish tongue, even when it would be to the interest of the Poles to use the language of their conquerors. And yet you expect that the English can ever suppress German, French, or Russian? English will be the universal language only when the whole world is English!—and even then it is not sure of dominion. Greek survived alongside of Latin in the heart of the Roman Empire and was the international language of the entire Orient; Roman emperors, such as Marcus Aurelius and Julian, wrote in Greek. And let me add, that you are dreaming of a universal language, that is, one common to all nations, while we are asking only for an auxiliary language, which will be learned in any case only by a minority in each country and which will leave the national languages as they are, with their natural territory and their peaceable rivalry.

But it is unworthy of philosophers to expect from constraint and violence the solution of a problem in civilisation. It is not by exciting national self-love and interest and by favoring dreams of universal conquest and megalomania that we shall succeed in making humanity better and happier: every appeal to violence is a relapse of civilisation, a return to barbarism. This is particularly true of the problem of an international language. This problem can be solved only by an agreement among civilised nations (whether this understanding be spontaneously developed, or under the official form which we are proposing in order to speed its realisation)—and by the adoption of a neutral idiom, which shall be equally intelligible for all the peoples of European civilisation, and whereby all may communicate together on a perfectly equal footing. Every time that a national language is made use of between two people of different race one of the speakers or writers is more or less sacrificed or subordinated to the other; he feels himself to be in a position of inferiority, and this produces a sentiment of embarrasment and resentment. On the other hand, an auxiliary language is neutral ground, equally unfamiliar, or rather equally familiar to both parties, and one on which they feel themselves equally at ease. Here as everywhere else equality is the condition of fraternity.

LOUIS COUTURAT.

Postscript: I am glad to be able to announce that the "French Philosophical Society" determined on October 27 to support the Commission and appointed as its representative on the same M. Bergson, member of the Academy of Moral Sciences and Professor in the Collège de France, the well known and respected philosopher, who has long approved our undertaking.

EDITORIAL REPLY.

It is not our intention to enter into a controversy with M. Couturat, especially as we cherish toward his endeavor the most kindly sentiments and (in spite of our doubts) wish that his hope of an auxiliary international language might be fulfilled. Accordingly we shall here limit ourselves to a few statements in which M. Couturat has mistaken our attitude.

If an auxiliary international language will prove to be what M. Couturat expects of it we shall be most glad to use it and spread it all over the world. So far we have not yet been convinced of the usefulness of any of the auxiliary international languages, among which Esperanto seems to be the most promising one. Our doubts as to the success of Esperanto do not prevent us, however, from serving the good cause and making the ideal, as well as all the propositions to actualise it, known to our readers. That is all we can do under the present circumstances, and therefore our attitude is one of decided friendliness, not of hostility.

M. Couturat seems to be under the impression that I have proposed English as the international language. That is not the case. I have only used the spread of the English language as an instance how an international language will gradually establish itself and how it will conquer the world. I have not as yet declared myself an adherent to making English the international language. While English is at present the simplest language, I am perfectly aware of its many shortcomings among which I enumerated only a few.

When I said that English is no longer the language of the English but international I did not mean to declare that English is as yet *the* international language. I simply meant that English is spoken by other nations than the English. English is the national language of the United States as well as all the English colonies, which are so many budding nations, and practically also of South Africa. It is a fact that the bitterest enemies of England speak the English tongue. No more vigorous invectives against the English nation and the English government have been published in other languages than in English. English is spoken by the Irish and also by almost half of the anti-English Africanders.

My policy with regard to the adoption of an international language is simply the principle of *laissez faire*. I believe that the best adapted language will naturally conquer in the long run. Should English prove to be the simplest and best medium for an international exchange of thought, let English by its own intrinsic merit become the international language. If there be any other language, artificial or natural, that is superior, let it prove its superiority by being acceptable to the majority of mankind, and I believe that in a free competition in which we give fair chances to every one the fittest will survive.

Most assuredly I believe in the ideal that at last mankind will speak one language, and I trust that the time will come when mankind will have one civilisation, whose forms may differ but which is one in possessing the same moral ideals. Whether or not the different national languages will be preserved is a matter of secondary importance.

So long as the different nationalities still have a hold on the several races of mankind it seems to me that a pasigraphy would be the best and easiest medium of communication, and with this idea in mind, I have proposed my scheme as published in *The Monist,* Vol. XIV, No. 4, which is so far a mere general scheme but could, if completed by competent hands, be condensed into a grammar of a few pages, the principles of which could be learned within an hour by the mere perusal of a leaflet, and thus it would enable any traveller to make his wishes known to strangers while travelling among people with whose language he is absolutely unacquainted, if only he carries a grammar of pasigraphy along in the shape of a small pamphlet, written in the language of the country. PAUL CARUS.

SUGGESTIONS CONCERNING PASIGRAPHY.

I have been much interested in your suggestion of a new universal language, Pasigraphy, in the July number of *The Monist.* A few suggestions have come to my mind that I send you, thinking perhaps you might consider them while the language is still in an experimental stage.

To begin with, I am heartily in favor of your suggestion and think it altogether the most promising one that I have ever seen for a universal language. I do not think there is any hope of securing the universal adoption of any one language, on account of national jealousies, and I am not even sure that it would be advantageous, since many of the race differences which have been so effective in the building up of our complex civilisation in all its different phases would be wiped out if race and national differences were eliminated. It seems to me, however, that pasigraphy might well be tied up to English pronunciation in case it were to be widely used, English being so direct a language that few modifications would be required to make its grammar scientific. Still, I suppose a German could read pasigraphy if he wanted to, though it would never seem like German.

This brings up the matter of a phonetic system to accompany pasigraphy. For proper names some phonetic system must be used, and if the English pronunciation be given to pasigraphy the pronunciation could be figured in this phonetic alphabet for the use of beginners. I have not looked up Alexander Graham Bell's Scientific Alphabet, but it might perhaps be useful for this purpose.

The matter of fundamental importance, however, which occurs to me

is that in pasigraphy you will in the long run sacrifice legibility to convenience in writing. I believe Chinese will be easier to read than pasigraphy when you get a large vocabulary. Why not make your characters more complicated and then have a simplified form, as the Chinese do, for quick writing. The great advantage of Chinese characters that has been pointed out to me by an educated Japanese who knew English perfectly and which is, I believe also noticed by Williams, is the startling definiteness with which the idea stands forth when once the character has been mastered. We read words by their shape, and certainly the Chinese have more distinctive shapes than our own printed words where often some small mark, for instance, like the straight line of an *e* distinguishing it from a *c*, is all that separates widely different words.

However, the most important matter of all to my mind is the construction of a dictionary. I do not see that you have made any provision for this, which, however, must be made early in the development of pasigraphy.

As soon as you have a thousand characters it will be a hopeless task to hunt through them to find one that is forgotten or as yet unlearned. The Chinese system of a certain number of root characters out of which other words are formed by compounding might be used, or perhaps some system based on the geometrical form of the character. At any rate, some sort of a dictionary must be gotten up, and I believe you will be forced to compound characters in order to avoid having too many primary roots which would be difficult to find.

The awakening of China is at hand, and I believe a rational system of pasigraphy based on a world language could perhaps be adopted early in the development of that great country.

I hope you will devote a page in each number of *The Monist* to pasigraphy and ultimately give exercises, perhaps with keys, written in the new system.

All these are mere suggestions which grew out of my interest in your suggestion. I think it would be well for a commission to get together as soon as possible a grammar, elementary reader, and a dictionary, since I do not think it best to leave to the spontaneous efforts of experts the perfection of the symbols. The co-operation you speak of on page 582 would be essential to the proper development of the new language.

A last suggestion is that a society could perhaps be formed for the perfection of pasigraphy and that for the present it could be kept in an embryonic condition; that each member of the society be called upon to suggest symbols for new words, to be submitted to the council of the society; and that after a few months or years of such experimenting the language be put out in final form in such shape that it could be taught in the public schools and struggle for existence against Esperanto and other artificial languages. The

minute one tries to write a sentence one strikes the need for new characters, as you will see from the slip I enclose. From the results that I have seen in many lines of work I am much inclined to think that Mr. Cook's symbasis is as important in intellectual advancement as in organic evolution, and I believe its application to pasigraphy would be advantageous whereby the co-operating intelligences of many would be blended together to form as perfect a language as possible.

WALTER T. SWINGLE.

THE POWER OF POLITICAL INSTITUTIONS AS A FACTOR IN THE DETERMINATION OF THE WORLD LANGUAGE.

In the discussion of the theme dealt with in Dr. Ostwald's *Weltsprache* there is one phase of the problem that is usually left out of account, namely, the political force behind a language.

As long as Greece sent forth colonies the Greek tongue continued to spread. It is true, the rich and varied intellectual treasures of which it was the bearer counted for something, but they were not the most important factor in its expansion: this was the governments that were able to hold their own against the tribes by which those colonies were surrounded. As soon as Rome came into conflict with Greek peoples they had to give way to better organised political institutions. At first Italy and its islands ceased to be Greek; next the more specifically Greek lands followed and became to a greater or less extent Romanised. But in the East neither Greece nor Rome could long hold its ground in the face of the foes that appeared on every side.

On the basis of these facts and of others of a similar nature, what is the legitimate inference to be drawn? Every one who knows anything about the development of political institutions is aware that those worked out in England have more powerfully influenced modern thought than any other. More than two centuries ago continental writers began to point to the English representative system as the ideal government, while the English themselves have evinced very little inclination to change it. They go no farther than to admit the necessity of some modifications.

We are compelled by the events themselves to say that the English, using the term in its widest sense, expand because the government supports but does not lead those who go forth to make homes for themselves in new countries. The spirit of personal initiative and individual independence is carried abroad by the emigrants. Both the French and the Spaniards had the start of the English in getting a foot-hold on this continent, the Spaniards especially preëmpting the fairest portions of it; but neither held its possessions long or made much of its opportunities.

Professor Fouillée says in his *Psychologie du peuple français*: "At the end of the seventeenth century France had twenty million inhabitants, Great Britain and Ireland eight or ten millions, the present German empire twenty-one millions, Austria twelve to thirteen millions." He cites the authority of Leroy-Beaulieu to the effect that if a statistician had made a prophecy of the population of England at that time for about the year 1900 he would not have put down to the credit of the country more than eight or ten millions. Fouillée continues: "In 1789 France had twenty-six millions, Great Britain and Ireland twelve millions, the German empire thirty-three millions, Austria eighteen millions." It will thus be seen that one hundred years ago several European languages were more numerously represented than the English; for to the above we may add the Spanish and the Italian, to say nothing of the Russian.

How does the case stand now?

There are in North America not less than eighty millions who speak English. In the rest of the world, outside of Great Britain and Ireland, there are probably eight millions more. We thus get a total of English-speaking people greater than the whole population of the Russian empire, in which, however, a large portion of the population does not speak Russian. Toward the end of the sixteenth century England had only five millions of a population, and a hundred years later it had gained only a million. From that time on the increase has been almost marvellous. At the present rate, which there is no reason to believe will be materially checked within the next century, it is not hard to see that by the year two thousand English will be the *Weltsprache.*

CHARLES W. SUPER.

CLARENCE L. HERRICK. OBITUARY.

We publish in this issue a posthumous article of Dr. Clarence L. Herrick, well known in the scientific world for the services he rendered to the University of New Mexico in his capacity as President, and among neurologists as the Editor of the *Journal of Comparative Neurology,* the standard periodical of its kind in this country. The Editor of *The Monist* has been in correspondence with Dr. Herrick for a long time and during past years carried on a friendly controversy in the neurological journal concerning the seat of consciousness. Of late Dr. Herrick had sent a manuscript for publication in *The Monist,* "On the Passing Away of Materialism," and the date of its appearance had been fixed for the present number, but unfortunately Dr. Herrick, who had suffered for a long time from ill health, passed away on Thursday morning, the 15th of September. The following condensed statement of his career is extracted from the *U. N. M. Weekly* of

Albuquerque and advance sheets of the *Journal of Comparative Neurology,* kindly forwarded by his brother, Prof. C. Judson Herrick:

"Prof. Clarence L. Herrick, M. S., Ph. D., was born in Minneapolis, Minn., in 1858. He graduated with high honors from the University of Minnesota in 1880. A year was next devoted to hard study and careful research in the University of Leipsic. In 1885 he accepted the professorship of geology and biology in Denison University, Granville, Ohio. Much success crowned his efforts there, but in 1889 he accepted the chair of biology in the University of Cincinnati. It was here that he founded the *Journal of Comparative Neurology,* of which he remained editor-in-chief up to the time of his decease.

"After another season of study in Germany and return to Denison, Professor Herrick became distinguished in the scientific world. In America there was not his superior as a neurologist. The University of Chicago elected him to a chair of biology. A naturally vigorous constitution, however, now gave way, even under forty years of age, owing to his unremitting zeal and toil, and he sought the almost hopeless expedient of the climate of New Mexico.

"Here out-of-door life and his intense interest in nature so far restored him to health that he successfully held the presidency of the University of New Mexico for some time, but ill-health again obliged him to resign that important post.

"During his last year there was an obvious failing of physical strength, so that long field trips had to be abandoned. But the more quiet life gave opportunity for a thorough recasting of many questions and formulation of matters which had been in his mind all his life. So that before his death much of the philosophical correlation, of which mention has been made, was effected. A number of articles have already been published in the philosophical serial bearing on these matters, and there is a considerable collection of manuscripts remaining, much of which can doubtless be edited for publication. It is gratifying to know that he had the satisfaction of seeing this work so well rounded out before his death, and that the later months of his life were much more restful than those preceding, some of which were marked by extreme suffering. He continued in about the usual health until September 8, when he again had a series of uncontrollable hemorrhages, daily becoming weaker until on the morning of the 15th he peacefully passed away.

"The end came in accordance with his own most earnest wish—he fell fighting for the truth. As one of those who were near him when he passed away has said: 'He was taken literally "in the harness." His laboratory and study tables showed the unfinished tasks. His morning mail brought its usual load of duties. He had contributed an article to the September number of the *American Geologist,* and his mail on the morning of his death brought

a request from Dr. N. H. Winchell for some further contributions to the October number. Thus in the midst of his labors he passed into the larger sphere.'

"In estimating the character of his work it is difficult to say whether he was primarily an investigator or a philosopher. And this is to his great credit, for he combined in a remarkable degree the qualifications of an expert in both of these lines. He had at once acute perceptions and keen insight for scientific details, and a broad philosophic horizon and perspective, which peculiarly fitted him for the work he undertook of throwing light upon the nature of consciousness from the neurological side."

"The aim of his life was to throw light upon just such so-called insoluble problems as the relation of consciousness to the brain. 'Ignorabimus' is a word which never fell from his lips. The unity of the material and the mental is a truth upon which he came to lay increasing stress in his later years. Starting from a Lotzean spiritualistic idealism he never lost hold of the monism which characterises this philosophic world-view, though in many respects he worked beyond it, his scientific studies serving to correct any tendency to an exclusive emphasis upon the mental.

"In the memory of his pupils Professor Herrick was greatest as a teacher. This statement can only be appreciated by those who knew him personally and were in his classes. There was no display of oratory. He was not what would be called a gifted public speaker, though he was often called upon for such services. It was in the class-room or about the seminar table or in general conversation that the inexhaustible fertility of his thought and fine suggestiveness of his language appeared. In his lectures one always knew that he was getting the best, the latest, the deepest results of his scientific research and philosophic reflection. Never was any work slighted in which his students were involved. Other things might be sacrificed—time, money, convenience, even health itself, but never the student."

BOOK REVIEWS.

RELIGION AND THE HIGHER LIFE. Talks to Students. By *William Rainey Harper*, President of the University of Chicago. Chicago: The University Press. 1904. Pp. lx, 184. Price, $1.00.

Dr. William Rainey Harper, President of the University of Chicago, is one of the strenuous men of the present generation. He is not only an exceedingly active administrator of the Chicago University but also a good teacher. In fact, in his specialty as Professor of Hebrew he has no superior and scarcely an equal among his colleagues. And here we have before us a book of his in which he shows the methods and tendencies of his influence upon the students entrusted to his care. It allows an insight into Harper the educator. Its sub-title "Talks to Students" indicates the spirit that characterises him as college president in his pastoral work.

Religion in President Harper's opinion is indispensable for obtaining the higher life. He says:

"Religion is not the mother of art, science, philosophy, and ethics. Religion is not to be identified with one or all of these. Religion is not the enemy of art, science, philosophy, or ethics. Religion is independent of these phases of the higher life, but closely akin—in fact, the oldest sister of the family. Religion is essential for the fullest development of these phases of the higher life. Religion must have certain characteristics to work in harmony with them."

President Harper speaks of religion in general, meaning those essential features which all religions have, or ought to have, in common, but the religion which he has first of all in mind is Christianity. He sees not the Christianity of any special church or sect, but Christianity in the broadest sense, which he calls "the religion of Jesus Christ":

"The religion of Jesus Christ is a religion capable of adjustment to any and every individual, however peculiar his temperament, however exacting his demands. Its simpliciity, as the Master himself presented it, is marvellous. In its proper form it has always stood the most rigid tests; and it appeals as strongly to the reason as to the heart. It will permit you to respect your friend's religion; if he is a Jew, because it came out of Judaism;

if a sincere follower of Islam, because much of Islam came from it; if a disciple of some Eastern faith, because its founder, Jesus, was broad-minded and tender, and saw the truth wherever it existed, without reference to the name it bore. It is a religion of ideals, not weird and fanciful; but chastened, strong, and inspiring to true service. It is ethical in a sense peculiar to itself, for it is the religion of the Beatitudes and the Golden Rule. It is a religion that says: "Come unto me all ye that labor and are heavy laden, and I will give you rest.'

"The greatest minds of nineteen centuries have found this religion helpful. I do not urge upon you any special *form* of this religion, for I have in mind its very essence, that which is common to all forms, that which makes it the power history shows it to have been through all these centuries. This, as found in the teaching of Jesus, is, in the words of old Hebrew philosophy, the fear of the Lord—i. e., belief in and acceptance of One who has power to help, even to the uttermost. This step, this position, this opening of the mind and heart to an influence of the highest spiritual character, will prove to be the beginning, and indeed, the chief part, of that higher life which lies before you, that higher life upon which you have already entered, and in which, we trust, your walk will continue, until there comes the next step forward—the step that will usher you into the life still higher, the highest life—the life beyond."

It will be of special interest to notice the position of President Harper with regard to the significance of the Bible and Biblical criticism in his pastoral work, for President Harper belongs to the higher critics, and we may even say that he is one of the boldest among them. It is a matter of course that he finds the Bible still indispensable, and he mentions the problems connected with Bible study among the difficulties that beset our path in trying to realise the higher life in religion. These difficulties to the scholar are mainly of a purely intellectual, not a moral or typically religious, nature and do not hinder the honest Christian from realising his ideals. President Harper says:

"These intellectual difficulties may continue to exist without being settled in *any* way, and still one's faith may remain unaffected. Faith in Jesus Christ and in the living principles of Christianity is not bound up or in any vital way connected with the outside intellectual difficulties which are all the while presenting themselves to us. You have your difficulties; some one else has other difficulties. The result should not and need not affect one's active Christian life."

Whichever way the intellectual difficulties may be settled, the great fundamental principles of the truth will remain standing as on a rock, and a good Christian will not have his confidence in them shaken. The Bible has

been and will forever remain a book that should be used for instruction and education, a book that will teach us the truth.

As to Biblical criticism, President Harper says:

"To be sure, I reserve the right for myself to decide that one book of the collection has more of religious truth in it than another. Who, for example, would deny that the nineteenth psalm was not more helpful than the first chapter of Chronicles? I reserve the right also whether this or that book is really to be taken as one of the collection. Luther exercised this privilege. Why should I not enjoy it also? I reserve the right, still further, to decide for myself in what way I shall interpret this passage or that. When I read:

'The mountains skipped like rams,
The little hills like lambs,'

I am at liberty to believe that it is poetry and not to be taken literally. So likewise when I read,

'Sun, stand thou still upon Gibeon,
And thou, moon, in the valley of Ajalon!
And the sun stood still and the moon stayed,
Until the nation had avenged themselves of their enemies,'

and see that it is poetry, as it is shown to be in the Revised Version, and that it is obviously quoted from that ancient collection of poetical pieces, the book of Jasher, I understand that I may believe the Bible, without believing at the same time that the sun and moon stood still."

"For relief from difficulties of every kind, whether of life or thought; for a help which may always be obtained; for a rock on which firm standing-ground may be gained—go to the Bible; not as to some talisman possessed of magic power, but as to a book containing story after story which tells of God's dealings with man; to a book containing precept upon precept, richer in truth than any other of the world's possessions—a book which will guide your thought unfailingly to the only source of wisdom, to the source of all wisdom—to God."

"Every Christian man should face this question: 'Is the Bible what I have supposed it to be? If so, it is for me to treat it differently, to make it the subject of systematic study, and, through acquaintance with it, to come closer to God; to know him better, and, having this knowledge, to realise, as I have not hitherto realised, my responsibility to my fellow-men.' No man need ever fear that he will attain too large a knowledge of these sacred books."

President Harper is a Christian but he believes in an American Christianity, the Christianity as it is developing in the United States. He concludes his book with this remark:

"Centuries will pass; and gradually humanity will come to recognise the

significance of love; gradually Jesus the Christ will come to reign in the hearts of men. In this work of educating humanity to understand God and itself, America is the training school for teachers."

A TREATISE ON COSMOLOGY. By *Herbert Nichols.* Vol. I. Introduction. Cambridge, Mass., 1904. 8vo. Pp. 455. [Copies can be purchased from the author, 219 Commonwealth Ave., Newton Centre, Mass. $3.50.]

The first paragraph of Helmholtz's immortal memoir *Ueber die Erhaltung der Kraft,* declares that the proposition that perpetual motion is impossible and the proposition that all the phenomena of physics can be explained by (indeed he says "are due to") attractions and repulsions between pairs of particles, are "identical," meaning, of course, experimentally identical. But before many years had flown, it began to be clear to the minds of most of those who had examined the question that they were so far from being identical in the phenomena to which they would give rise, that the proposition about work was true, while the proposition about pairs of particles was false. It was certain phenomena of the elasticity of crystals which first brought this conviction to the few who were masters of that difficult subject. Next, those most significant of all chemical phenomena which are called the phenomena of the unsymmetrical carbon atom spread the wave of doubt to a wider circle. But what awakened physicists in general to the doubt was the difficulty of forming any adequate and purely mechanical or even hydrodynamical theory of electricity. The problem with which physical theorists were thus confronted goes by the name of the question of the constitution of matter, though the laws of motion are as much thrown into question as is the nature of ordinary matter. This question has been the chief subject of discussion in theoretical physics for many years. Some of the chief hypotheses which have been propounded for its solution have been the vortex theory, the electron theory, and Hertz's theory of concealed constraints. In the introductory volume of his *Treatise on Cosmology,* Dr. Herbert Nichols, who is already well known as a psychologist of high attainments in physics, and who here shows himself to be remarkably well-read in German philosophy, produces a new theory in competition with the three we have mentioned. The exposition of it occupies about a quarter of the volume. This theory, however, is not confined to matter, but is at once a theory of the constitution of matter and of the constitution of mind, having a thoroughly *monistic* character. It is based upon a philosophy which may fairly be described as a modification of Wundt's system, and thus gives a pretty fair idea of what that system would amount to when worked out into physical science. It is probably from that point of view that it will excite such interest as it may come to excite. This, however, is not the most interesting part of the volume.

Considerably more than another quarter of it is occupied with describing in detail what one may call a list of sensualistic categories. These are Quality, Quantity, Changeableness, Lawfulness, Presentativeness, and Personality. This is the part of the work which has most interested the reviewer (who is decidedly opposed to the author's nominalistic sensationalism, and less decidedly to parallelism,) and which seems to him to show very considerable power, although little of an analytic kind. But for the consideration that the kind of power shown is not that which is most needed, it might be rated much higher. But even from the author's point of view the reviewer would expunge Quantity and add a category in order to have some place in the system for false notions, which are certainly a part of the phenomena of mind. But it is truly astonishing that a man should be so blinded by his theory as to declare that "by no power of imagination can we conceive of any similarity whatever" between any two of his six categories. (This seems to be the meaning, although the precise words quoted are only applied to one pair.)

A little less than a quarter of the volume is occupied with a "Historical Review of Cosmology within Philosophy," meaning, mainly, German philosophy. This shows thorough learning, is agreeably written, and will prove instructive to physicists as well as to others who are not well read in philosophy.

As the doctrine is a modification of Wundt's system, so the method may be said to apply a modification of Wundt's logic. But it is to be feared that it will afford more comfort to Wundt's logical opponents than to his friends, if any application is acknowledged. If we might indulge in a little parody, we should say the form of syllogism seemed to be as follows:

Anaxagoras said *A*,
Wundt says *B*;
Ergo, I will risk saying *C*.

However, this introductory volume only sets forth a hypothesis; and it is to be hoped that the main body of the work will subject this to the severest experimental tests. It is, at any rate, certain that such sincere and single-hearted work must do much to bring the day when philosophy shall have entered upon the course of a true and progressive science; and from that point of view we must acknowledge that, be its errors what they may, it is certain to be a source of benefits to mankind. CUSP.

KOHELET ODER WELTSCHMERZ IN DER BIBEL. Ein Lieblingsbuch Friedrichs des Grossen. Verdeutscht und erklärt von *Paul Haupt*. Leipsic: J. C. Hinrichs'sche Buchhandlung. 1905. Pp. vii, 36.

Prof. Paul Haupt, the editor of the *Polychrome Bible*, of which so far all of the Hebrew texts but six volumes only of the English translation have

appeared, here offers a German translation of Koheleth or Ecclesiastes, being a new translation, quite literal and yet imitating the poetical original even in details.

Our readers, even those who are not Hebrew scholars, may know that Koheleth is one of the latest productions of the Biblical canon, written by some Hebrew thinker deeply imbued with Greek thought, and through his knowledge of Greek philosophy the author must have imbibed also much of Eastern philosophy. be it Buddhist or Brahmanic. The book became very popular among the Jews, so much so that the orthodox priests to whose views it was diametrically opposed were compelled to incorporate it into the canon. The pessimism was so natural, and the sentiments of the Koheleth appealed so strongly to the Jews of that age that the book could not be suppressed, but in order to conciliate the broad spirit of the Koheleth with the narrowness of Jewish orthodoxy, some orthodox redactor added to the author's philosophy some comments of his own which should give to these radical thoughts a gentler turn that would show them in the light of an orthodox interpretation.

Profesor Haupt has published those passages of Koheleth which form the original text in a connected order and relegates the priestly addition to footnotes. In this way we are enabled to grasp at once the original sense, and a little reflection teaches us why the domatic counter-statements cannot be ascribed to the same pen as the main body of the text.

The critical and historical notes are very terse but quite sufficient, and so the little book will not only be welcome to the specialist, but also to that large class of readers who take an interest in a rational study of the Bible.

P. C.

LAZARUS, DER BEGRÜNDER DER VÖLKERPSYCHOLOGIE. By *Dr. Alfred Leicht.* Leipsic: Dürr'sche Buchhandlung. 1904. Pp. 111. Price, Mark 1.20.

Professor Lazarus, the founder of *Völkerpsychologie,* i. e., folk psychology or psychology of nations, was born September 15, 1824, and, had he not died a short time ago, would this year have celebrated his eightieth birthday. In his honor the present booklet has been written by Dr. Alfred Leicht, who sets forth his merits as the founder of an important branch of science, the psychology of nations, and substantiates the claim by rehearsing the story of his life as well as his labors. The principles which Professor Lazarus has established are now generally acknowledged, but in his days he had to fight for their recognition. Even such a liberal and broad man as Eduard von Hartmann claims that the existence of a national psychology depended upon the existence of a national soul, and that the national soul was impossible except on the assumption of a metaphysical unity and substantiality of the collective spirit of a nation. Without such a substratum Hartmann

deemed the existence of a national soul impossible, but Lazarus insists that the assumption of a metaphysical soul unit is redundant and even inadmissible, and that the psychology of a nation exists by the very truth of a communal will. If the nations existed in metaphysical entities, humanity would throughout be cut up into several antagonistic beings, but, as a matter of fact, the only reason for antagonism among the nations originates by a contrast of their wills, not by a difference of soul substrata. The quality of things consists in their activity not in any metaphysical essence. What a thing in itself may be (except what it is in its activity) is an illegitimate question.

In order to characterise the significance of Lazarus's work we ought to consider the influence which he exercised upon the different domains of science. The recognition he found in theology possesses a greater significance in consideration of the fact that he was a Jew. His philosophical comprehension is sufficiently indicated by the honor which the University of Halle conferred upon him by renewing his Doctor's diploma. He stimulated historical research and his labors were especially suggestive to jurisprudence. A great honor was bestowed upon him by his co-religionists when the Hebrew Union College of Cincinnati introduced his ethical lectures for official reading and the faculty of this institution conferred upon him the honorary degree of Doctor of Divinity.

VÖLKERPSYCHOLOGIE. Eine Untersuchung der Entwicklungsgesetze von Sprache, Mythus und Sitte. By *Wilhelm Wundt.* Leipsic: Wilhelm Engelmann. 1904. Pp. xv, 667.

Professor Wundt, who has been so indefatigable in working out a philosophical system for all the several fields connected with psychology, and method, brings out a second edition of his *Völkerpsychologie,* which has been revised and enriched by several additions.. The first folio only lies before us containing Wundt's speculations on language in all its phases and formations, gesture, speech, and word formation. When the whole work lies before us we intend to give a more complete review of Wundt's views.

(The second volume just reached us when we were preparing the present number for publication.)

LEIBNIZENS APRIORISMUS IM VERHÄLTNIS ZU SEINER METAPHYSIC. By *Dr. A. Silberstein.* Berlin: Mayer & Müller. 1904.

The author has taken a Doctor's degree on this study of Leibnitz's apriorism, and he here republishes his dissertation, adding thereto his criticism of Dr. Ernst Cassirer with whose views concerning Leibnitz's system he does not agree. The main result of the pamphlet seems to be that Leibnitz has anticipated Kant more than is generally believed, and his standpoint may be characterised as "critical apriorism."

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THE MONIST

WHAT PRAGMATISM IS.

THE writer of this article has been led by much experience to believe that every physicist, and every chemist, and, in short, every master in any department of experimental science, has had his mind moulded by his life in the laboratory to a degree that is little suspected. The experimentalist himself can hardly be fully aware of it, for the reason that the men whose intellects he really knows about are much like himself in this respect. With intellects of widely different training from his own, whose education has largely been a thing learned out of books, he will never become inwardly intimate, be he on ever so familiar terms with them; for he and they are as oil and water, and though they be shaken up together, it is remarkable how quickly they will go their several mental ways, without having gained more than a faint flavor from the association. Were those other men only to take skilful soundings of the experimentalist's mind,—which is just what they are unqualified to do, for the most part,—they would soon discover that, excepting perhaps upon topics where his mind is trammelled by personal feeling or by his bringing up, his disposition is to think of everything just as everything is thought of in the laboratory, that is, as a question of experimentation. Of course, no living man possesses in their fullness all the attributes characteristic of his type: it is not the typical doctor whom you will see every day driven in buggy or coupé, nor is it the typical pedagogue that will be met with in the first school-room you enter. But when you have found, or ideally constructed upon a basis of observation, the typ-

ical experimentalist, you will find that whatever assertion you may make to him, he will either understand as meaning that if a given prescription for an experiment ever can be and ever is carried out in act, an experience of a given description will result, or else he will see no sense at all in what you say. If you talk to him as Mr. Balfour talked not long ago to the British Association, saying that "the physicist seeks for something deeper than the laws connecting possible objects of experience," that "his object is a physical reality" unrevealed in experiments, and that the existence of such non-experiential reality "is the unalterable faith of science," to all such ontological meaning you will find the experimentalist mind to be color-blind. What adds to that confidence in this which the writer owes to his conversations with experimentalists is that he himself may almost be said to have inhabited a laboratory from the age of six until long past maturity; and having all his life associated mostly with experimentalists, it has always been with a confident sense of understanding them and of being understood by them.

That laboratory life did not prevent the writer (who here and in what follows simply exemplifies the experimentalist type) from becoming interested in methods of thinking; and when he came to read metaphysics, although much of it seemed to him loosely reasoned and determined by accidental prepossessions, yet in the writings of some philosophers, especially Kant, Berkeley, and Spinoza, he sometimes came upon strains of thought that recalled the ways of thinking of the laboratory, so that he felt he might trust to them; all of which has been true of other laboratory-men.

Endeavoring, as a man of that type naturally would, to formulate what he so approved, he framed the theory that a *conception,* that is, the rational purport of a word or other expression, lies exclusively in its conceivable bearing upon the conduct of life; so that, since obviously nothing that might not result from experiment can have any direct bearing upon conduct, if one can define accurately all the conceivable experimental phenomena which the affirmation or denial of a concept could imply, one will have therein a complete definition of the concept, and *there is absolutely nothing*

more in it. For this doctrine he invented the name *pragmatism.* Some of his friends wished him to call it *practicism* or *practicalism* (perhaps on the ground that πρακτικός is better Greek than πραγματικός). But for one who had learned philosophy out of Kant, as the writer, along with nineteen out of every twenty experimentalists who have turned to philosophy, had done, and who still thought in Kantian terms most readily, *praktisch* and *pragmatisch* were as far apart as the two poles, the former belonging in a region of thought where no mind of the experimentalist type can ever make sure of solid ground under his feet, the latter expressing relation to some definite human purpose. Now quite the most striking feature of the new theory was its recognition of an inseparable connection between rational cognition and rational purpose; and that consideration it was which determined the preference for the name *pragmatism.*

* * *

Concerning the matter of philosophical nomenclature, there are a few plain considerations, which the writer has for many years longed to submit to the deliberate judgment of those few fellow-students of philosophy, who deplore the present state of that study, and who are intent upon rescuing it therefrom and bringing it to a condition like that of the natural sciences, where investigators, instead of contemning each the work of most of the others as misdirected from beginning to end, co-operate, stand upon one another's shoulders, and multiply incontestible results; where every observation is repeated, and isolated observations go for little; where every hypothesis that merits attention is subjected to severe but fair examination, and only after the predictions to which it leads have been remarkably borne out by experience is trusted at all, and even then only provisionally; where a radically false step is rarely taken, even the most faulty of those theories which gain wide credence being true in their main experiential predictions. To those students, it is submitted that no study can become scientific in the sense described, until it provides itself with a suitable technical nomenclature, whose every term has a single definite mean-

ing universally accepted among students of the subject, and whose vocables have no such sweetness or charms as might tempt loose writers to abuse them,—which is a virtue of scientific nomenclature too little appreciated. It is submitted that the experience of those sciences which have conquered the greatest difficulties of terminology, which are unquestionably the taxonomic sciences, chemistry, mineralogy, botany, zoölogy, has conclusively shown that the one only way in which the requisite unanimity and requisite ruptures with individual habits and preferences can be brought about is so to shape the canons of terminology that they shall gain the support of *moral principle* and of every man's sense of decency; and that, in particular, (under defined restrictions,) the general feeling shall be that he who introduces a new conception into philosophy is under an obligation to invent acceptable terms to express it, and that when he has done so, the duty of his fellow-students is to accept those terms, and to resent any wresting of them from their original meanings, as not only a gross discourtesy to him to whom philosophy was indebted for each conception, but also as an injury to philosophy itself; and furthermore, that once a conception has been supplied with suitable and sufficient words for its expression, no other *technical* terms denoting the same things, considered in the same relations, should be countenanced. Should this suggestion find favor, it might be deemed needful that the philosophians in congress assembled should adopt, after due deliberation, convenient canons to limit the application of the principle. Thus, just as is done in chemistry, it might be wise to assign fixed meanings to certain prefixes and suffixes. For example, it might be agreed, perhaps, that the prefix *prope-* should mark a broad and rather indefinite extension of the meaning of the term to which it was prefixed; the name of a doctrine would naturally end in *-ism*, while *-icism* might mark a more strictly defined acception of that doctrine, etc. Then again, just as in biology no account is taken of terms antedating Linnæus, so in philosophy it might be found best not to go back of the scholastic terminology. To illustrate another sort of limitation, it has probably never happened that any philosopher has attempted to give a general name to his own doc-

trine without that name's soon acquiring in common philosophical usage, a signification much broader than was originally intended. Thus, special systems go by the names Kantianism, Benthamism, Comtianism, Spencerianism, etc., while transcendentalism, utilitarianism, positivism, evolutionism, synthetic philosophy, etc. have irrevocably and very conveniently been elevated to broader governments.

* * *

After awaiting in vain, for a good many years, some particularly opportune conjuncture of circumstances that might serve to recommend his notions of the ethics of terminology, the writer has now, at last, dragged them in over head and shoulders, on an occasion when he has no specific proposal to offer nor any feeling but satisfaction at the course usage has run without any canons or resolutions of a congress. His word "pragmatism" has gained general recognition in a generalised sense that seems to argue power of growth and vitality. The famed psychologist, James, first took it up, seeing that his "radical empiricism" substantially answered to the writer's definition of pragmatism, albeit with a certain difference in the point of view. Next, the admirably clear and brilliant thinker, Mr. Ferdinand C. S. Schiller, casting about for a more attractive name for the "anthropomorphism" of his *Riddle of the Sphinx,* lit, in that most remarkable paper of his on *Axioms as Postulates,* upon the same designation "pragmatism," which in its original sense was in generic agreement with his own doctrine, for which he has since found the more appropriate specification "humanism," while he still retains "pragmatism" in a somewhat wider sense. So far all went happily. But at present, the word begins to be met with occasionally in the literary journals, where it gets abused in the merciless way that words have to expect when they fall into literary clutches. Sometimes the manners of the British have effloresced in scolding at the word as ill-chosen, —ill-chosen, that is, to express some meaning that it was rather designed to exclude. So then, the writer, finding his bantling "pragmatism" so promoted, feels that it is time to kiss his child

good-by and relinquish it to its higher destiny; while to serve the precise purpose of expressing the original definition, he begs to announce the birth of the word "pragmaticism," which is ugly enough to be safe from kidnappers.[2]

Much as the writer has gained from the perusal of what other pragmatists have written, he still thinks there is a decisive advantage in his original conception of the doctrine. From this original form every truth that follows from any of the other forms can be deduced, while some errors can be avoided into which other pragmatists have fallen. The original view appears, too, to be a more compact and unitary conception than the others. But its capital merit, in the writer's eyes, is that it more readily connects itself with a critical proof of its truth. Quite in accord with the logical order of investigation, it usually happens that one first forms an hypothesis that seems more and more reasonable the further one examines into it, but that only a good deal later gets crowned with an adequate proof. The present writer having had the pragmatist theory under consideration for many years longer than most of its adherents, would naturally have given more attention to the proof of it. At any rate, in endeavoring to explain pragmatism, he may be excused for confining himself to that form of it that he knows best. In the present article there will be space only to explain just what this doctrine, (which, in such hands as it has now fallen into, may probably play a pretty prominent part in the philosophical discussions of the next coming years,) really consists in. Should the exposition be found to interest readers of *The Monist,* they would certainly be much more interested in a second article which would give some samples of the manifold applications of pragmaticism (assuming it to be true) to the solution of problems of different kinds. After that, readers might be prepared to take an interest in a proof

[2] To show how recent the general use of the word "pragmatism" is, the writer may mention that, to the best of his belief, he never used it in copy for the press before to-day, except by particular request, in *Baldwin's Dictionary.* Toward the end of 1890, when this part of the *Century Dictionary* appeared, he did not deem that the word had sufficient status to appear in that work. But he has used it continually in philosophical conversation since, perhaps, the mid-seventies.

that the doctrine is true,—a proof which seems to the writer to leave no reasonable doubt on the subject, and to be the one contribution of value that he has to make to philosophy. For it would essentially involve the establishment of the truth of synechism.

The bare definition of pragmaticism could convey no satisfactory comprehension of it to the most apprehensive of minds, but requires the commentary to be given below. Moreover, this definition takes no notice of one or two other doctrines without the previous acceptance (or virtual acceptance) of which pragmaticism itself would be a nullity. They are included as a part of the pragmatism of Schiller, but the present writer prefers not to mingle different propositions. The preliminary propositions had better be stated forthwith.

The difficulty in doing this is that no formal list of them has ever been made. They might all be included under the vague maxim, "Dismiss make-believes." Philosophers of very diverse stripes propose that philosophy shall take its start from one or another state of mind in which no man, least of all a beginner in philosophy, actually is. One proposes that you shall begin by doubting everything, and says that there is only one thing that you cannot doubt, as if doubting were "as easy as lying." Another proposes that we should begin by observing "the first impressions of sense," forgetting that our very percepts are the results of cognitive elaboration. But in truth, there is but one state of mind from which you can "set out," namely, the very state of mind in which you actually find yourself at the time you do "set out,"—a state in which you are laden with an immense mass of cognition already formed, of which you cannot divest yourself if you would; and who knows whether, if you could, you would not have made all knowledge impossible to yourself? Do you call it *doubting* to write down on a piece of paper that you doubt? If so, doubt has nothing to do with any serious business. But do not make believe; if pedantry has not eaten all the reality out of you, recognise, as you must, that there is much that you do not doubt, in the least. Now that which you do not at all doubt, you must and do regard as infallible, absolute truth. Here breaks in Mr. Make Believe: "What! Do you mean

to say that one is to believe what is not true, or that what a man does not doubt is *ipso facto* true?" No, but unless he can make a thing white and black at once, *he* has to regard what he does not doubt as absolutely true. Now you, *per hypothesiu,* are that man. "But you tell me there are scores of things I do not doubt. I really cannot persuade myself that there is not some one of them about which I am mistaken." You are adducing one of your make-believe facts, which, even if it were established, would only go to show that doubt has a *limen,* that is, is only called into being by a certain finite stimulus. You only puzzle yourself by talking of this metaphysical "truth" and metaphysical "falsity," that you know nothing about. All you have any dealings with are your doubts and beliefs,[3] with the course of life that forces new beliefs upon you and gives you power to doubt old beliefs. If your terms " truth" and "falsity" are taken in such senses as to be definable in terms of doubt and belief and the course of experience, (as for example they would be, if you were to define the "truth" as that to a belief in which belief would tend if it were to tend indefinitely toward absolute fixity,) well and good: in that case, you are only talking about doubt and belief. But if by truth and falsity you mean something not definable in terms of doubt and belief in any way, then you are talking of entities of whose existence you can know nothing, and which Ockham's razor would clean shave off. Your problems would be greatly simplified, if, instead of saying that you want to know the "Truth," you were simply to say that you want to attain a state of belief unassailable by doubt.

Belief is not a momentary mode of consciousness; it is a habit of mind essentially enduring for some time, and mostly (at least) unconscious; and like other habits, it is, (until it meets with some surprise that begins its dissolution,) perfectly self-satisfied. Doubt is of an altogether contrary genus. It is not a habit, but the privation of a habit. Now a privation of a habit, in order to be anything

[3] It is necessary to say that "belief" is throughout used merely as the name of the contrary to doubt, without regard to grades of certainty nor to the nature of the proposition held for true, i. e. "believed."

at all, must be a condition of erratic activity that in some way must get superseded by a habit.

Among the things which the reader, as a rational person, does not doubt, is that he not merely has habits, but also can exert a measure of self-control over his future actions; which means, however, *not* that he can impart to them any arbitrarily assignable character, but, on the contrary, that a process of self-preparation will tend to impart to action, (when the occasion for it shall arise,) one fixed character, which is indicated and perhaps roughly measured by the absence (or slightness) of the feeling of self-reproach, which subsequent reflection will induce. Now, this subsequent reflection is part of the self-preparation for action on the next occasion. Consequently, there is a tendency, as action is repeated again and again, for the action to approximate indefinitely toward the perfection of that fixed character, which would be marked by entire absence of self-reproach. The more closely this is approached, the less room for self-control there will be; and where no self-control is possible there will be no self-reproach.

These phenomena seem to be the fundamental characteristics which distinguish a rational being. Blame, in every case, appears to be a modification, often accomplished by a transference, or "projection," of the primary feeling of self-reproach. Accordingly, we never blame anybody for what had been beyond his power of previous self-control. Now, thinking is a species of conduct which is largely subject to self-control. In all their features, (which there is no room to describe here,) logical self-control is a perfect mirror of ethical self-control,—unless it be rather a species under that genus. In accordance with this, what you cannot in the least help believing is not, justly speaking, wrong belief. In other words, for you it is the absolute truth. True, it is conceivable that what you cannot help believing to-day, you might find you thoroughly disbelieve to-morrow. But then there is a certain distinction between things you "cannot" do, merely in the sense that nothing stimulates you to the great effort and endeavors that would be required, and things you cannot do because in their own nature they are insusceptible of being put into practice. In every stage of your

excogitations, there is something of which you can only say, "I cannot think otherwise," and your experientially based hypothesis is that the impossibility is of the second kind.

There is no reason why "thought," in what has just been said, should be taken in that narrow sense in which silence and darkness are favorable to thought. It should rather be understood as covering all rational life, so that an experiment shall be an operation of thought. Of course, that ultimate state of habit to which the action of self-control ultimately tends, where no room is left for further self-control, is, in the case of thought, the state of fixed belief, or perfect knowledge.

Two things here are all-important to assure oneself of and to remember. The first is that a person is not absolutely an individual. His thoughts are what he is "saying to himself," that is, is saying to that other self that is just coming into life in the flow of time. When one reasons, it is that critical self that one is trying to persuade; and all thought whatsoever is a sign, and is mostly of the nature of language. The second thing to remember is that the man's circle of society, (however widely or narrowly this phrase may be understood,) is a sort of loosely compacted person, in some respects of higher rank than the person of an individual organism. It is these two things alone that render it possible for you,—but only in the abstract, and in a Pickwickian sense,—to distinguish between absolute truth and what you do not doubt.

Let us now hasten to the exposition of pragmaticism itself. Here it will be convenient to imagine that somebody to whom the doctrine is new, but of rather preternatural perspicacity, asks questions of a pragmaticist. Everything that might give a dramatic illusion must be stripped off, so that the result will be a sort of cross between a dialogue and a catechism, but a good deal liker the latter,—something rather painfully reminiscent of *Mangnall's Historical Questions.*

Questioner: I am astounded at your definition of your pragmatism, because only last year I was assured by a person above all suspicion of warping the truth,—himself a pragmatist,—that your doctrine precisely was "that a conception is to be tested by its prac-

tical effects." You must surely, then, have entirely changed your definition very recently.

Pragmatist: If you will turn to Vols. VI and VII of the *Revue Philosophique,* or to the *Popular Science Monthly* for November 1877 and January 1878, you will be able to judge for yourself whether the interpretation you mention was not then clearly excluded. The exact wording of the English enunciation, (changing only the first person into the second,) was: "Consider what effects that might conceivably have practical bearings you conceive the object of your conception to have. Then your conception of those effects is the WHOLE of your conception of the object."

Questioner: Well, what reason have you for asserting that this is so?

Pragmatist: That is what I specially desire to tell you. But the question had better be postponed until you clearly understand what those reasons profess to prove.

Questioner: What, then, is the *raison d'être* of the doctrine? What advantage is expected from it?

Pragmatist: It will serve to show that almost every proposition of ontological metaphysics is either meaningless gibberish,—one word being defined by other words, and they by still others, without any real conception ever being reached,—or else is downright absurd; so that all such rubbish being swept away, what will remain of philosophy will be a series of problems capable of investigation by the observational methods of the true sciences,—the truth about which can be reached without those interminable misunderstandings and disputes which have made the highest of the positive sciences a mere amusement for idle intellects, a sort of chess,—idle pleasure its purpose, and reading out of a book its method. In this regard, pragmaticism is a species of prope-positivism. But what distinguishes it from other species is, first, its retention of a purified philosophy; secondly, its full acceptance of the main body of our instinctive beliefs; and thirdly, its strenuous insistence upon the truth of scholastic realism, (or a close approximation to that, well-stated by the late Dr. Francis Ellingwood Abbot in the Introduction to his *Scientific Theism*). So, instead of merely jeering at meta-

physics, like other prope-positivists, whether by long drawn-out parodies or otherwise, the pragmaticist extracts from it a precious essence, which will serve to give life and light to cosmology and physics. At the same time, the moral applications of the doctrine are positive and potent; and there are many other uses of it not easily classed. On another occasion, instances may be given to show that it really has these effects.

Questioner: I hardly need to be convinced that your doctrine would wipe out metaphysics. Is it not as obvious that it must wipe out every proposition of science and everything that bears on the conduct of life? For you say that the only meaning that, for you, any assertion bears is that a certain experiment has resulted in a certain way: Nothing else but an experiment enters into the meaning. Tell me, then, how can an experiment, in itself, reveal anything more than that something once happened to an individual object and that subsequently some other individual event occurred?

Pragmatist: That question is, indeed, to the purpose,—the purpose being to correct any misapprehensions of pragmaticism. You speak of an experiment in itself, emphasising "*in itself.*" You evidently think of each experiment as isolated from every other. It has not, for example, occurred to you, one might venture to surmise, that every connected series of experiments constitutes a single collective experiment. What are the essential ingredients of an experiment? First, of course, an experimenter of flesh and blood. Secondly, a verifiable hypothesis. This is a proposition[4] relating to the universe environing the experimenter, or to some well-known part of it and affirming or denying of this only some experimental possibility or impossibility. The third indispensable ingredient is a sincere doubt in the experimenter's mind as to the truth of that

[4] The writer, like most English logicians, invariably uses the word *proposition,* not as the Germans define their equivalent, *Satz,* as the language-expression of a judgment (*Urtheil*), but as that which is related to any assertion, whether mental and self-addressed or outwardly expressed, just as any possibility is related to its actualisation. The difficulty of the, at best, difficult problem of the essential nature of a Proposition has been increased, for the Germans, by their *Urtheil,* confounding, under one designation, the mental *assertion* with the *assertible.*

hypothesis. Passing over several ingredients on which we need not dwell, the purpose, the plan, and the resolve, we come to the act of choice by which the experimenter singles out certain identifiable objects to be operated upon. The next is the external (or quasi-external) ACT by which he modifies those objects. Next, comes the subsequent *reaction* of the world upon the experimenter in a perception; and finally, his recognition of the teaching of the experiment. While the two chief parts of the event itself are the action and the reaction, yet the unity of essence of the experiment lies in its purpose and plan, the ingredients passed over in the enumeration.

Another thing: in representing the pragmaticist as making rational meaning to consist in an experiment, (which you speak of as an event in the past,) you strikingly fail to catch his attitude of mind. Indeed, it is not in an experiment, but in *experimental phenomena,* that rational meaning is said to consist. When an experimentalist speaks of a *phenomenon,* such as "Hall's phenomenon," "Zeemann's phenomenon" and its modification, "Michelson's phenomenon," or "the chess-board phenomenon," he does not mean any particular event that did happen to somebody in the dead past, but what *surely will* happen to everybody in the living future who shall fulfil certain conditions. The phenomenon consists in the fact that when an experimentalist shall come to *act* according to a certain scheme that he has in mind, then will something else happen, and shatter the doubts of sceptics, like the celestial fire upon the altar of Elijah.

And do not overlook the fact that the pragmaticist maxim says nothing of single experiments or of single experimental phenomena, (for what is conditionally true *in futuro* can hardly be singular,) but only speaks of *general kinds* of experimental phenomena. Its adherent does not shrink from speaking of general objects as real, since whatever is true represents a real. Now the laws of nature are true.

The rational meaning of every proposition lies in the future. How so? The meaning of a proposition is itself a proposition. Indeed, it is no other than the very proposition of which it is the meaning: it is a translation of it. But of the myriads of forms into which

a proposition may be translated, what is that one which is to be called its very meaning? It is, according to the pragmaticist, that form in which the proposition becomes applicable to human conduct, not in these or those special circumstances, nor when one entertains this or that special design, but that form which is most directly applicable to self-control under every situation, and to every purpose. This is why he locates the meaning in future time; for future conduct is the only conduct that is subject to self-control. But in order that that form of the proposition which is to be taken as its meaning should be applicable to every situation and to every purpose upon which the proposition has any bearing, it must be simply the general description of all the experimental phenomena which the assertion of the proposition virtually predicts. For an experimental phenomenon is the fact asserted by the proposition that action of a certain description will have a certain kind of experimental result; and experimental results are the only results that can affect human conduct. No doubt, some unchanging idea may come to influence a man more than it had done; but only because some experience equivalent to an experiment has brought its truth home to him more intimately than before. Whenever a man acts purposively, he acts under a belief in some experimental phenomenon. Consequently, the sum of the experimental phenomena that a proposition implies makes up its entire bearing upon human conduct. Your question, then, of how a pragmaticist can attribute any meaning to any assertion other than that of a single occurrence is substantially answered.

Questioner: I see that pragmaticism is a thorough-going phenomenalism. Only why should you limit yourself to the phenomena of experimental science rather than embrace all observational science? Experiment, after all, is an uncommunicative informant. It never expiates: it only answers "yes" or "no"; or rather it usually snaps out "No!" or, at best, only utters an inarticulate grunt for the negation of its "no." The typical experimentalist is not much of an observer. It is the student of natural history to whom nature opens the treasury of her confidence, while she treats the cross-examining experimentalist with the reserve he merits. Why should

your phenomenalism sound the meagre jews-harp of experiment rather than the glorious organ of observation?

Pragmaticist: Because pragmaticism is not definable as "thorough-going phenomenalism," although the latter doctrine may be a kind of pragmatism. The *richness* of phenomena lies in their sensuous quality. Pragmaticism does not intend to define the phenomenal equivalents of words and general ideas, but, on the contrary, eliminates their sential element, and endeavors to define the rational purport, and this it finds in the purposive bearing of the word or proposition in question.

Questioner: Well, if you choose so to make Doing the Be-all and the End-all of human life, why do you not make meaning to consist simply in doing? Doing has to be done at a certain time upon a certain object. Individual objects and single events cover all reality, as everybody knows, and as a practicalist ought to be the first to insist. Yet, your meaning, as you have described it, is *general.* Thus, it is of the nature of a mere word and not a reality. You say yourself that your meaning of a proposition is only the same proposition in another dress. But a practical man's meaning is the very thing he means. What do you make to be the meaning of "George Washington"?

Pragmaticist: Forcibly put! A good half dozen of your points must certainly be admitted. It must be admitted, in the first place, that if pragmaticism really made Doing to be the Be-all and the End-all of life, that would be its death. For to say that we live for the mere sake of action, as action, regardless of the thought it carries out, would be to say that there is no such thing as rational purport. Secondly, it must be admitted that every proposition professes to be true of a certain real individual object, often the environing universe. Thirdly, it must be admitted that pragmaticism fails to furnish any translation or meaning of a proper name, or other designation of an individual object. Fourthly, the pragmaticistic meaning is undoubtedly general; and it is equally indisputable that the general is of the nature of a word or sign. Fifthly, it must be admitted that individuals alone exist; and sixthly, it may be admitted that the very meaning of a word or significant object

ought to be the very essence of reality of what it signifies. But when, those admissions having been unreservedly made, you find the pragmaticist still constrained most earnestly to deny the force of your objection, you ought to infer that there is some consideration that has escaped you. Putting the admissions together, you will perceive that the pragmaticist grants that a proper name, (although it is not customary to say that it has a *meaning*,) has a certain denotative function peculiar, in each case, to that name and its equivalents; and that he grants that every assertion contains such a denotative or pointing-out function. In its peculiar individuality, the pragmaticist excludes this from the rational purport of the assertion, although *the like* of it, being common to all assertions, and so, being general and not individual, may enter into the pragmaticistic purport. Whatever exists, *ex-sists,* that is, really acts upon other existents, so obtains a self-identity, and is definitely individual. As to the general, it will be a help to thought to notice that there are two ways of being general. A statue of a soldier on some village monument, in his overcoat and with his musket, is for each of a hundred families the image of its uncle, its sacrifice to the union. That statue, then, though it is itself single, represents any one man of whom a certain predicate may be true. It is *objectively* general. The word "soldier," whether spoken or written, is general in the same way; while the name, "George Washington," is not so. But each of these two terms remains one and the same noun, whether it be spoken or written. and whenever and wherever it be spoken or written. This noun is not an existent thing: it is a *type,* or *form,* to which objects, both those that are externally existent and those which are imagined, may *conform,* but which none of them can exactly be. This is subjective generality. The pragmaticistic purport is general in both ways.

As to reality, one finds it defined in various ways; but if that principle of terminological ethics that was proposed be accepted, the equivocal language will soon disappear. For *realis* and *realitas* are not ancient words. They were invented to be terms of philosophy in the thirteenth century, and the meaning they were intended to express is perfectly clear. That is *real* which has such and such

characters, whether anybody thinks it to have those characters or not. At any rate, that is the sense in which the pragmaticist uses the word. Now, just as conduct controlled by ethical reason tends toward fixing certain habits of conduct, the nature of which, (as to illustrate the meaning, peaceable habits and not quarrelsome habits,) does not depend upon any accidental circumstances, and *in that sense,* may be said to be *destined;* so, thought, controlled by a rational experimental logic, tends to the fixation of certain opinions, equally destined, the nature of which will be the same in the end, however the perversity of thought of whole generations may cause the postponement of the ultimate fixation. If this be so, as every man of us virtually assumes that it is, in regard to each matter the truth of which he seriously discusses, then, according to the adopted definition of "real," the state of things which will be believed in that ultimate opinion is real. But, for the most part, such opinions will be general. Consequently, *some* general objects are real. (Of course, nobody ever thought that *all* generals were real; but the scholastics used to assume that generals were real when they had hardly any, or quite no, experiential evidence to support their assumption; and their fault lay just there, and not in holding that generals could be real.) One is struck with the inexactitude of thought even of analysts of power, when they touch upon modes of being. One will meet, for example, the virtual assumption that what is relative to thought cannot be real. But why not, exactly? *Red* is relative to sight, but the fact that this or that is in that relation to vision that we call being red is not *itself* relative to sight; it is a real fact.

Not only may generals be real, but they may also be *physically efficient,* not in every metaphysical sense, but in the common-sense acception in which human purposes are physically efficient. Aside from metaphysical nonsense, no sane man doubts that if I feel the air in my study to be stuffy, that thought may cause the window to be opened. My thought, be it granted, was an individual event. But what determined it to take the particular determination it did, was in part the general fact that stuffy air is unwholesome, and in part other *Forms,* concerning which Dr. Carus has caused so many

men to reflect to advantage,—or rather, *by* which, and the general truth concerning which Dr. Carus's mind was determined to the forcible enunciation of so much truth. For truths, on the average, have a greater tendency to get believed than falsities have. Were it otherwise, considering that there are myriads of false hypotheses to account for any given phenomenon, against one sole true one (or if you will have it so, against every true one,) the first step toward genuine knowledge must have been next door to a miracle. So, then, when my window was opened, because of the truth that stuffy air is malsain, a physical effort was brought into existence by the efficiency of a general and non-existent truth. This has a droll sound because it is unfamiliar; but exact analysis is with it and not against it; and it has besides, the immense advantage of not blinding us to great facts,—such as that the ideas "justice" and "truth" are, notwithstanding the iniquity of the world, the mightiest of the forces that move it. Generality is, indeed, an indispensable ingredient of reality; for mere individual existence or actuality without any regularity whatever is a nullity. Chaos is pure nothing.

That which any true proposition asserts is *real,* in the sense of being as it is regardless of what you or I may think about it. Let this proposition be a general conditional proposition as to the future, and it is a real general such as is calculated really to influence human conduct; and such the pragmaticist holds to be the rational purport of every concept.

Accordingly, the pragmaticist does not make the *summum bonum* to consist in action, but makes it to consist in that process of evolution whereby the existent comes more and more to embody those generals which were just now said to be *destined,* which is what we strive to express in calling them *reasonable.* In its higher stages, evolution takes place more and more largely through self-control, and this gives the pragmaticist a sort of justification for making the rational purport to be general.

There is much more in elucidation of pragmaticism that might be said to advantage, were it not for the dread of fatiguing the reader. It might, for example, have been well to show clearly that the pragmaticist does not attribute any different essential mode of

being to an event in the future from that which he would attribute to a similar event in the past, but only that the practical attitude of the thinker toward the two is different. It would also have been well to show that the pragmaticist does not make Forms to be the *only* realities in the world, any more than he makes the reasonable purport of a word to be the only kind of meaning there is. These things are, however, implicitly involved in what has been said. There is only one remark concerning the pragmaticist's conception of the relation of his formula to the first principles of logic which need detain the reader.

Aristotle's definition of universal predication, which is usually designated, (like a papal bull or writ of court, from its opening words,) as the *Dictum de omni,* may be translated as follows: "We call a predication, (be it affirmative or negative,) *universal,* when, and only when, there is nothing among the existent individuals to which the subject affirmatively belongs, but to which the predicate will not likewise be referred (affirmatively or negatively, according as the universal predication is affirmative or negative)." The Greek is: *λέγομεν τὸ κατὰ παντὸς κατηγορεῖσθαι ὅταν μηδὲν ᾖ λαβεῖν τῶν τοῦ ὑποκειμένου καθ' οὗ θάτερον οὐ λεχθήσεται· καὶ τὸ κατὰ μηδενὸς ὡσαύτως.* The important words "existent individuals" have been introduced into the translation (which English idiom would not here permit to be literal); but it is plain that existent individuals were what Aristotle meant. The other departures from literalness only serve to give modern English forms of expression. Now, it is well known that propositions in formal logic go in pairs, the two of one pair being convertible into another by the interchange of the ideas of antecedent and consequent, subject and predicate, etc. The parallelism extends so far that it is often assumed to be perfect; but it is not quite so. The proper mate of this sort to the *Dictum de omni* is the following definition of affirmative predication: We call a predication *affirmative,* (be it universal or particular,) when, and only when, there is nothing among the sensational effects that belong universally to the predicate which will not be, (universally or particularly, according as the affirmative predication is universal or particular,) said to belong to the subject. Now, this is sub-

stantially the essential proposition of pragmaticism. Of course, its parallelism to the *dictum de omni* will only be admitted by a person who admits the truth of pragmaticism.

* * *

Suffer me to add one word more on this point. For if one cares at all to know what the pragmaticist theory consists in, one must understand that there is no other part of it to which the pragmaticist attaches quite as much importance as he does to the recognition in his doctrine of the utter inadequacy of action or volition or even of resolve or actual purpose, as materials out of which to construct a conditional purpose or the concept of conditional purpose. Had a purposed article concerning the principle of continuity and synthetising the ideas of the other articles of a series in the early volumes of *The Monist* ever been written, it would have appeared how, with thorough consistency, that theory involved the recognition that continuity is an indispensable element of reality, and that continuity is simply what generality becomes in the logic of relatives, and thus, like generality, and more than generality, is an affair of thought, and is the essence of thought. Yet even in its truncated condition, an extra-intelligent reader might discern that the theory of those cosmological articles made reality to consist in something more than feeling and action could supply, inasmuch as the primeval chaos, where those two elements were present, was explicitly shown to be pure nothing. Now, the motive for alluding to that theory just here is, that in this way one can put in a strong light a position which the pragmaticist holds and must hold, whether that cosmological theory be ultimately sustained or exploded, namely, that the third category,—the category of thought, representation, triadic relation, mediation, genuine thirdness, thirdness as such,—is an essential ingredient of reality, yet does not by itself constitute reality, since this category, (which in that cosmology appears as the element of habit,) can have no concrete being without action, as a separate object on which to work its government, just as action cannot exist without the immediate being of feeling on which to act. The truth is that pragmaticism is closely allied to the Hegelian absolute idealism, from which,

however, it is sundered by its vigorous denial that the third category, (which Hegel degrades to a mere stage of thinking,) suffices to make the world, or is even so much as self-sufficient. Had Hegel, instead of regarding the first two stages with his smile of contempt, held on to them as independent or distinct elements of the triune Reality, pragmaticists might have looked up to him as the great vindicator of their truth. (Of course, the external trappings of his doctrine are only here and there of much significance.) For pragmaticism belongs essentially to the triadic class of philosophical doctrines, and is much more essentially so than Hegelianism is. (Indeed, in one passage, at least, Hegel alludes to the triadic form of his exposition as to a mere fashion of dress.)

C. S. PEIRCE.

MILFORD, PA., September, 1904.

POSTSCRIPT. During the last five months, I have met with references to several objections to the above opinions, but not having been able to obtain the text of these objections, I do not think I ought to attempt to answer them. If gentlemen who attack either pragmatism in general or the variety of it which I entertain would only send me copies of what they write, more important readers they could easily find, but they could find none who would examine their arguments with a more grateful avidity for truth not yet apprehended, nor any who would be more sensible of their courtesy.

C. S. P.

Feb. 9, 1905.

THE CEPTACLE HYPOTHESIS.

The Law of Ceptacle.
Any thing is everything in an inverse ratio of the power of consciousness to separate or distinguish itself from the inseparable or indistinguishable.

THE word "Ceptacle," which is here applied to the hypothesis proposed, has been coined, out of necessity, in order to express a new idea or thought. We already have in use the word "thing," so broad and comprehensive that up to the present time it has been sufficient, with it, to refer to any existing entity as—"thing." All philosophy and all science has found this word equal to its needs. Or, to speak more properly, consciousness has had no thought broad enough to require a more all inclusive symbol for any entity. The necessity which calls for the word "Ceptacle" comes out of the fact that the books at least disclose no law or principle that will give it vitality. Whoever will give this subject their thought must have the patience needed to grope for a while in a dark land until he sees the light which the Ceptacle conception affords. For nearly twenty years has the writer been trying to open the way, some few years ago saying the same thing in print, in a very unsatisfactory way, even as he is now saying it. The effort must be to comprehend, if it be possible, this truth, that: there is a principle in nature out of which human consciousness can develop or evolve that which the word "thing" in its broadest, most comprehensive and largest possible sense cannot and does not contain. It is as if we had reached the ultimate limit in any direction of *any* "thing," as that word expresses it, and that at

this limitation of entity this principle accounting for "Ceptacle" unfolds a beyond.

This Ceptacle principle is to be found in the *peculiar nature of a ratio* existing throughout nature, where all is in a state of flux, or elasticity, and not an equilibrium, as it were, wherein nature is a relationing or proportioning of relatives which we now know as "things." The nature of this *ratio* between relatives is sufficient to account for any entity as a unit and yet for every entity as the many; sufficient to establish any difference between any entities and equally sufficient to hold in one unyielding grasp the whole as an inseparable unity. Whoever follows this "Ceptacle" thought is expected to go one step beyond any "thing" as now known, and by an unfolding consciousness of the *ratio* which any such "thing" has in its broadest relation, there to find a Ceptacle.

In this particular example given below in an endeavor to acquaint the reader with the hypothesis, its application is made to the "thing" called Matter, and the *ratio* of the *relation* existing between Matter and Mind, whereby Matter or Mind while being "things" in their common acceptance are much more where as "Ceptacles" they are being inseparably the same.

If mental or natural philosophy and this Ceptacle Hypothesis be each true, they must be found consistent at all points where their application to each other is made; but, if at any point in the application they seem not to agree, it must remain to be proven in which the error exists.

In testing the truth of this Hypothesis, the Ceptacle Principle involved should be applied to well-settled and accepted facts and not theories or speculations. Therefore the text-books on the science of natural and mental philosophy should be used, and not books arguing in support of assumed facts not yet scientifically accepted. It is not even to be assumed that all that has been accepted by science and incorporated into its text-books is unquestionably true, but that these books contain such facts as have been accepted as representing the consensus of opinion of what is true.

Our question is not what either matter or mind is or how either material or mental facts are possible; or, being possible, how

they coincide with this or that theory; but, instead, recognising that there are material things and mental things which are accepted as the foundation facts upon which natural and mental science build themselves and without which there could be no human experience, our purpose is to learn whether this Hypothesis will make such accepted facts more reasonable, and make more clear that problem of "the one and the many" which confronts philosophy.

This Hypothesis does not assert as new the principle that "things" are related to one another, or are inseparably related, but that they have that relation in inverse ratio of sameness and difference; it does make the claim that a thing itself consists of relatives and is itself a relative, and adds that the *nature of the ratio* between these relatives will explain both their Separability and Inseparability.

Science and philosophy have thus far exhaustively defined a "thing" as "any separable or distinguishable object of thought, whatever exists or is conceived to exist as a separate entity whether actual, possible or imaginary, animate or inanimate, concrete or abstract, any existence or event." The deduction assumed in this Hypothesis is that this definition only partially describes any "thing." To this accepted definition should be added this fundamental Ceptacle Principle; that a "thing" consists of relatives and is itself a relative, where in each relation there is a ratio of difference between the relatives greater than any given sameness, and a ratio of sameness greater than any given difference. So that, completing the definition according to this Hypothesis:

A Ceptacle is any separable or distinguishable object of thought; whatever exists or is conceived to exist as a separable entity, whether actual, possible or imaginary, animate or inanimate, concrete or abstract, any existence or event; having the further principle determining its nature, that it consists of relatives and is itself a relative where the ratio between the relatives is from a sameness greater than any given difference to a ratio where the difference is greater than any given sameness.

All matter is defined in its broadest sense as occupying space; while an idea or thought can not in any sense be defined as occu-

pying space. Science and philosophy both accept the position that matter and mind, as two separate entities, differ in this fundamental fact. Now, these definitions may be accepted as true as far as they go, and will answer for a partial and superficial purpose in identifying them; but according to our Hypothesis, they can not be so defined in a scientific and philosophic sense if they are to be tested in their ultimate truth. It is only a half-truth to say that matter does, and mind does not occupy space, for while this is true where the ratio of their difference is a definable or determinable one, there is a ratio concomitant with this (the other half of the truth) where they occupy the same space and where the ratio of their sameness is greater than any given difference. This seems paradoxical, but it can be explained to reason and will disclose a principle of existence applicable to all things.

What can be set up in its own identity as a thing can also be made to disclose an inhering concomitant which can also set up an identity of its own which proves to be its antithesis. The principle in the Hypothesis must be adequate to the unity of difference without its insistence upon an infinity belonging to it too great to destroy its sameness in any finite expression as any "thing."

EXAMPLE OF A CEPTACLE.

Let us illustrate with an orange:

Thus, when we observe a particular round body, of two or three inches in diameter, of a reddish yellow color, and with a peculiar unevenness of surface, and awakening certain associations of taste and smell, instead of being merely conscious of certain impressions, we perceive an orange; and in doing so we become aware of an external object, and at the same time we combine into one idea of that object the shape, and size, and color, and roughness, and taste, and smell, thinking these not as elements of thought in our mind, but as belonging to the orange.

Now this orange, as matter, occupies space and has the different elements of shape, size, roughness, color, acidity, pungency, etc.: Within the necessary distance is a human being who experiences the

sensations of seeing, feeling, smelling, and tasting in relation to the orange.

In the language of science, what can now occur is explained as follows:

We are not only capable of experiencing these sensations awakened within us by impressions from without, but we can also, through such impressions, perceive external objects.

That is, science would say that the "we" or "ego," which is mind and does not occupy space, perceives the orange, which is matter and does occupy space, and that this ego and this orange are entirely separate and different, the ego, mind, having no part in the orange matter space, and the orange matter having no possible part in the conscious "we" or "ego" that is perceiving it. That each in its last analysis, and in the principle which will account for its nature as a thing, is definable and determinable as separate from the other.

To which this Hypothesis dissents and replies: Granting, as true, for this case, and as is perfectly permissible, that the orange was, before any human being saw it or knew it to be, that it was possessed of all of its elements of shape, size, color, roughness, acidity, and odor, that these were "being," related to each other in a given order in space, occupying the whole of that orange space, in that particular manner which gave it that particular shape, size, roughness, etc., or in other words, this space held a particular degree of color, acidity, odor, etc., which made this particular orange; that it was also being in its relation to other things surrounding it; that it was having its duration in time as related to past, present, and possible future; that all this was true of this orange up to the instant that the human ego enters upon our problem; now, with the coming of this ego, what occurs? First another form of matter, consisting of the human body, enters as a factor—it is itself matter, occupying space, and in that respect only differs from the orange in the kind of matter. It possesses the added phenomenon of being in a peculiar way impressionable, of being acted upon from without. This body, "as matter," is not the "ego," which thinks and

has ideas, although it seems to be an unquestioned fact that the body is a necessity to the ideas, and thoughts, and perceptions, and that whatever the ego is, it is through and with the body that it is capable of experiencing sensation, which is awakened within the body by impressions from without the body, and that it can also, through such impressions, perceive that external object (the orange), and perceive it, not as within but as external to the body.

In the perceiving of this external object, the orange, what occurs, as nearly as science enables us to answer, is this: The body is capable of being impressed by contact with the elements of the orange through the intervening material mediums accounting for feeling, which feeling is diversified into touch, taste, sight, and smell, but so far as this contact in itself is concerned, it is but a contact of one form of matter with another. It is only as it results in experience, sensation and perception that becomes ideas and thoughts. It is true that it does result in these, but when it does so result, what does this experience, these sensations, and this perceived orange prove to be as these ideas and thoughts? The orange in its own identity, as a material thing, as it was having its being, before it was related in any way to this thinking phenomenon, was in no wise dependent upon it for its own entity. It was being its several elements of form, size, unevenness of surface, and those accounting for its color, taste, pungency in their relation to each other in the space they occupied independent of any ego. It was being an entity of single separate elements in space in the form or fact of an occupancy of that orange space. It was being this particular orange thing also as a spatial fact related to its environment. It was so existing without a human being in any relation to it at all. Upon the coming into this relation, however, of a human body and with it the phenomena, sensation, impression, perception, expression, consciousness, as ideas and thought, what has actually occurred? What has been added to creative expression? For our reply we again accept the best scientific statements upon the structure of the mind.

The human faculties are capable of experiencing sensations awakened by impressions resulting from the contact or merger of

exterior matter with that of the human body. This exterior matter, in this case the orange, being a unity of elements in the sense that they occupy a given space, but incapable in this condition as that orange apart from that human relation of being more than its separate elements in a material unity in that particular space, the phenomenon which develops with this human is the capability, the possibility of that unity consciously knowing its *unity* by consciously *being* the process or activity of unifying itself. Here the unrealised capability has actually *become,* is being by being a knowledge of the process of unity unifying its elements. Ideas which are thoughts in this process think this orange as the orange itself, external to that human body, thinking them as *in* the source that awakened the impressions. This *process* is itself now as real as that material was before this evolution. The activity which expresses itself now as the unifying consciousness of that material unity is enabled to become such by an enlarged relation of the orange, reaching out to where it includes the human phenomenon. Consciousness thereby *becomes.* What already has been as possibility before this consciousness is now become itself as this new phenomenon, which proves to be the orange itself in a larger relation which has unfolded the *real existence* of these orange elements and their unity. This real existence was a necessity to the orange before the human relation entered. Its *conscious* realisation is essential only to the human phenomenon. The consciousness of *real existence* is what has evolved. It is these experienced sensations of which the orange is an example which constitute human *being,* and this orange experienced in this particular instance is the spatial dimension and phase of that being.

The different element attributes of the orange, its color, roughness, form, size, and whatever else is needed of material elements to make it what it is, make it an orange without human consciousness being a necessity to it. It can be and is unified by the principle of being its own relatives, but when human consciousness does become a relative, it *evolves* one of these heretofore unevolved relatives into its difference through a new phenomenon. The intelligence that is attributed ordinarily to consciousness only is not

in consciousness only; it is and *was* in the orange before it was human intelligence, but then it was having both its relatives only within the orange; the ratio of difference within itself as phenomenon was not sufficient to evolve the variations. It was a unity, but without consciousness of itself within that limitation; it had no perspective, as it were, it could not within its limitations get a measure of itself or reflect upon itself. What then occurs according to science is, that every element in that orange is in an *unbroken* material contact through the other elements up to and including the brain. Sensation results, but sensation is only the unbroken contact of the elements *in* the orange which nature has found a way for projecting into their wider relation, where their succession or order in space and duration in time as they are in the orange, is having this wider relationing. This new relation evolves the inhering difference; because the new phenomenon of sensation, thought, mind, whichever it may be called, does not act in the same ratio in this evolved phase that is the ratio between the relatives when limited to the orange only. With the human brain in the limitation the ratio between these elements can be separated as a succession through these succeeding impressions of which the brain is capable. The succession through these new phenomena proves to be a process, for it is the difference of that inert or sameness in the orange, but it is the process of the orange, and because it is occurring where the orange is now being also its exterior relative, it is therefore where the ratio is a *given* difference, and in which this other relative, as that difference, can also set up an identity. In this particular relation we call that identity consciousness. If we call one matter, the other in this particular difference can not be matter, and we call it mind; or, in language, we classify one as noun, really because it evolved only substance in its limited ratio of sameness; the other as verb, because we can predicate process or change out of the ratio from one to the other. A wheel at its center is apparently at rest, at another part is an apparent solid. It is the same wheel in the same motion, where within a given range and where the spokes and space are seen, it is neither at rest nor a solid. The explanation, as we know, is a matter of

ratio accounting for a sameness and difference in one fact, and yet science can truthfully rest itself upon the principle that a solid must be to science what the wheel is in its apparent solidity, and that rest is what rest is at its center when in either the ratio is beyond its given. Nevertheless, any such solid has space and any such rest has motion.

What we are endeavoring to demonstrate in this application of the Hypothesis is, that the most common material thing cannot be limited and described as its own entity only, notwithstanding such a description has been satisfactory to science and philosophy. Knowledge has already progressed sufficiently to add to such material description elements inseparable to it while being its difference. This Hypothesis recognises the apparent paradox. It makes no attempt, either in this induction or others to follow, to eliminate the paradox; on the other hand, it is because it is seen to exist in all things that the purpose is to find the principle, if there be one, underlying all things which will explain this paradox and make it consistent in human reason, and to do this the line which it is following is this: The present universally accepted method of determining or defining any "thing" in its own identity or integrity is to confine such thing to quality or qualities, quantity or quantities, relation or relations, mode or modes which are in time and space identical or measurably so: That the elements which make up the thing are virtually alike to the extent at least that a different element does not enter into that identity or the integrity of such thing. Now to this universal method this Hypothesis takes no exception save that while these elements of sameness thus used to define such things are there, it is equally true, whether paradoxical or inconsistent with accepted methods, that already conscious knowledge has advanced in its development to where no exhaustive definition or determination of a "thing" can be given without the recognised presence of a quality, or quantity, or relation, or modality which can not be likened to these other elements and can neither be eliminated from nor confined to that same space and time, yet are an inseparable part of the identity and integrity of such "thing," and without which it cannot exist. The paradoxical, the apparently in-

consistent conditions which nature has always thrust upon reason, the antithesis of things, has been a problem from the beginning to both science and philosophy. The method of meeting the difficulty has not been to accept what has been so evident as a part of nature and readjust our reasoning, but instead to retain our system of logic, to insist, for instance, upon no new adjustment of the point of view of ego as to itself, and attempt either to eliminate the paradox or ignore the antithesis or to call the unexplainable a negligible quantity. This Hypothesis seeks to find a place for the so-called paradox, for this antithesis, this negligible, although to do so it assumes that reason must readjust itself and logic find new rules by which to assert itself. Because matter and mind as related to each other have been at the very foundation of the difficulties, the battle-ground of controversy, our demonstration of the Hypothesis begins with the application of material things where they have appeared fundamentally inconsistent in their relations to mind.

We began with matter occupying space—this as related to the orange elements of shape, size, roughness, etc., environed by other matter. Through the medium of this other matter, now usually considered to be the atmosphere, its radiation and vibrations, or else by direct contact, impression was made upon, through or in another form of matter called the human body, whereby was evolved or developed an entirely new phenomenon—conscious self—the power of combining as that self all of those separate elements in space into a unified entity. Not as something new in themselves, but a larger relation of something already existing, evolving the *power* of *self*-realisation. This is ego, but here it only adds knowledge to existence. In this particular relation it is mind, and while this mind is not matter in any of the forms given to matter and will not permit of a scientific classification as matter, yet when it appears it is as an inseparable relative; where in their *sameness* is needed the very same space for an exhaustive analysis of either. For the same identical space by which the orange is determined and defined is necessary to what proves to be mind, and in this relation in their sameness the ratio between them in that sameness of space is greater than any given difference. The Hypothesis being tested

does not take the position that the statement is erroneous which defines matter as occupying space, that is, as those elements that coexist in space, but that this is but the definition of the unity of this matter as one of its relatives and that no exhaustive definition can be given, after the human enters, which does not include the unifying as the other relative. That when this relative is included it will prove to be a sameness wherein the ratio is greater than any given difference, which sameness we are endeavoring to demonstrate where mind is the relative of the orange. This demonstration is, however, but a part of the principle disclosed in the Hypothesis where it further asserts that in this same relation of matter and mind in this same space these relatives, matter and mind, are in a ratio of difference which is greater than any given sameness. This orange, called matter, consists of elements occupying space in measurable quantity, but it is the unifying of these elements and not the elements in their unity which is the orange, and this unifying element is not the matter accounting for the orange. This unifying element will unify any other thing, as well, of entirely different elements, and yet this unity consists of these two differing relations, while in this relation their ratio of sameness is greater than any given difference for the reason that neither one in this relation can be eliminated in their occupancy of the same space, nor can either be described in this orange without the other in any exhaustive description. That the unifying element in the course of evolution becomes mind is only a step forward in creative expression; the principle is the same as a basic fact related to the orange thing itself, without the mental evolution.

We began the application of the Hypothesis in this particular instance to this statement, "All matter is defined in its broadest sense as occupying space, while an idea or thought cannot in any sense be defined as occupying space." What has been shown by the Hypothesis is that the "thinking principle," contrary to accepted belief, may be extended and in its true state as a related instead of an unrelated principle can be and is known where it is being its form and location. It has space relations, contrary to prevalent assumptions.

This orange, consisting of matter, occupies space.

These ideas and thoughts prove to be a unifying of this same matter in this same space.

In this spatial relation, matter and thought are inseparable relatives, having a ratio of sameness between them greater than any given difference.

A definition or description of either matter or thought confined to one of these relatives is not a complete definition and is not in accord with the scientific or philosophical knowledge of the day; and to so confine it is inconsistent with such knowledge.

PROP. I. Matter and mind in an inseparable sameness occupy the same space.

SECOND APPLICATION.

Matter and mind, which in an inseparable sameness occupy the same space (PROP. I), as related to that space have a ratio of difference between them greater than any given sameness.

Matter and mind are both extended and may be so related (PROP. I) that either is determinable by the same space, and while in that relation neither can be defined or determined except by that particular spatial fact. Yet the paradox must be true, according to the Hypothesis here set up, that related to this same space and sameness, there is a difference between this same matter and thought where the ratio of that difference is greater than any given sameness.

Now, any given matter elements in a given space, being unified by or through related thought (PROP. I), must have that particular relation as one existing fact in a given present time as related to any past or any possible future. That "given present" is the duration of that particular relation in that given space, yet within this "given," change is taking place according to scientific assumption, for science is agreed that there is no such thing as the absolutely constant in matter. "All things are growing or decaying, accumulating matter or wearing away, integrating or disintegrating." The Hypothesis asserts that there must be a paradoxical or apparently inconsistent principle involved in what will account

for the existence of the orange; where two relatives, which can be identified separately as matter and thought, nevertheless merge the elements of one with the unifying process of the other so that their merging is to a sameness where the ratio of that sameness is greater than any given difference. Nevertheless the principle in the Hypothesis requires that the same two relatives in that same space shall have a ratio of difference greater than any given sameness. Through PROP. I, the condition is shown to prevail asserted in the first phase of the principle; it is the unity of variety in the unifying of a variety of elements, but it is existing in a given space (as the orange). It *is* that orange, it is the one dimension, as it were, in time, a present orange, which is the unified of those particular matter elements, but as we have learned from science there is no such thing as the constant in matter, then that matter relative cannot exist longer than it is *being* that "given" present in that particular specific relation, while the other or thought relative in this same particular relation is constant in that it unifies the succession of this *being* with what *becomes* as a result of change. It is the other phase of the principle. It becomes, as it were, a second dimension, in time. To this thought relative, but not to the matter relative, it *is* the orange, as well as it *was* the orange. Therein lies the fact that between inconstant matter and related enduring thought there is the ratio of difference greater than any given sameness, and yet the same unifying thought can no more be separated from either the past or the present relations than can the same matter be present in the change. If what are treated as facts in this application are true as set out in PROP. I, as well as in PROP. II, the Hypothesis undertakes to account for those facts upon the principle that the material fact can only exist as matter when merged with that which can nevertheless be defined or determined as another entity, and where that merger is in a degree of ratio between these two greater than any difference, and further that, once this merger is established, there will be found in one of those relatives a difference where the ratio of *that* difference between them is greater than any given sameness. That is, there appears to be a reasonable explanation for the paradox of a sameness which will

produce variety, which in this second application gives us the variety or difference existing in the first application and enables us to state:

PROP. II. Matter and mind have a ratio of difference between them, as related to the same space, greater than any given sameness.

We find such statements constantly confronting us as the following (James's *Psychology*):

"According to the assumptions of this book, thoughts accompany the brain's workings, and thoughts are cognitive of realities. The whole relation is one which we can only write down empirically, confessing that no glimmer of explanation of it is yet in sight. That brains should give rise to a knowing consciousness at all, this is the one mystery which returns, no matter of what sort the consciousness and of what sort the knowledge may be."

As heretofore stated, in developing this Hypothesis, both material and mental "things" will be assumed as existing facts, as science and philosophy have found and classified them for their purposes; as, for instance, it accepts:

"Matter as that which occupies space or is extended, and with which we become acquainted by means of our bodily senses or organs," and that "mind is self-conscious intelligence, possessing rational power of self-determination; or more widely—specially from a physiological point of view—to include such recognition of external objects as is provided for through the special senses as related to the cerebrum."

If, therefore, the mystery to be explained, as pointed out by Professor James, is how brains as matter are possible, or how a knowing consciousness as mind can be an actuality at all, then so far as this hypothesis goes it must remain a mystery, but if these actualities are accepted as unquestioned existing phenomena, definable as indicated, then the hypothesis is intended and expected to point out a law of cause and effect which will explain how "brains should give rise to a knowing consciousness."

In Proposition I there were certain several matter elements such as color, form, etc., which, as matter either separately or together, can best be defined or determined when they are simply

asserted to be extended or occupying space. In the further development of Proposition I it was stated that these several matter elements were *unified*.

We have here two distinctly differing things, the one definable as material substance, that is extended and occupying space, the other an activity, a process, the existing or being of the first as a unifying, being, or process of that extension. The Hypothesis holds that it is because it is a difference between these two, that because there is an opportunity or stress present in any "thing," that such thing, in its own identity, with such inhering stress between sameness and difference, constitutes a cause which must of necessity produce as effect that which is an identifiable difference. Therefore, in this instance or relation matter gives rise to consciousness. What accounts for this is a *never-ceasing* relationing of relatives in a ratio which discloses a concomitant integration and disintegration of identity,—a never-ceasing interchange of what in the Hypothesis is called sameness and difference. It must not be assumed that in any given induction possible to be made these changing identities can all be followed any more than it is possible for all nature to be known. But it should be assumed according to the Hypothesis that every identity will have an inhering difference beyond any possible given ratio of sameness sufficient to be cause for the effect indicated.

In the Hypothesis what is called a sameness between the relatives does not mean that a difference does not exist in that relation, but no *given* difference exists, none can be determined or defined. It is where in nature the ratio between the relatives has not yet been pushed back upon itself, from out of which any difference must come. An analogous case in principle where consciousness is a factor is where a base can not be had large enough in a triangle by which, with the present mechanism for measurement of the angles, there can be found but parallel lines on the two sides pointing to some fixed star. The principle of sameness and difference, it must be understood, is within *any* thing; as, for instance, an assumed indivisible atom. This atom must by this very principle itself consist of relatives, though, as in the case of any such ulti-

mate in consciousness, it only appears to that consciousness in its aspect of sameness and not that of its difference, because, again, as the Hypothesis would hold, the ratio in such "thing" between the relatives is yet where the sameness is greater than any given difference, and not yet where any nature phenomenon has evolved a vantage by which to disclose the ratio of difference which nevertheless does exist. For here we should again note, which we can not too often repeat, that the principle upon which this Hypothesis proceeds is that *every* thing consists of relatives and is itself a relative, and that the ratio in any relation is *from* sameness *to* a difference with a concomitant relationing of difference to sameness, where the *given* is the definable or determinable limitation at either extreme, and that this "given" is itself a thing like the rest, subject to the same principle. If within one relative that principle will permit its being a thing which can set up its own identity and prove itself to consist of relatives, then it would seem as if the principle would be sufficient to establish a method whereby with that other identified relative the unity of difference and the difference in unity throughout nature would become reasonable. It will be seen, however, that to do this requires, what this Hypothesis assumes must follow, that human understanding should no longer define any "thing" in its last analysis except as a relative where its known or unknown difference is a part of any complete definition or determination.

In the illustration cited, the wheel taken as its whole might be said to be involved in a movement upon its own sameness and difference where this fact discloses a principle in such movement which becomes a cause accounting for two apparently opposite or contradictory effects, for in one relation the effect is what science classifies as a solid occupying all the space at a given center, while in the other relation it is motion; that is, it is in fact the same principle as duration or succession in time. Now, the application of the Hypothesis to Professor James's difficulty of "knowing consciousness," as, for instance, a knowing consciousness of the orange, would be in some such manner as this: The elements in the orange as related to themselves when the orange is being its own relatives,

are to each other being in one and the same instant, with no *given* difference in a related duration in time, but when this sameness becomes a relative in its evolved and larger phenomena, then in their impress upon the brain the succession of that impression becomes a given difference and no longer a given sameness.

OREN B. TAFT.

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THE PLACE OF THE CODE OF HAMMURABI.

TO the present day, the studies of the famous code of Hammurabi have been made solely from the Semitic standpoint. One group of scholars has sought to find support for the contention that Hebrew civilisation was dependent upon the Babylonian from the very beginning; that it is in fact, but a certain logical development therefrom. The effort is conspicuous for its failure. An opposing school, influenced by traditional views of Hebrew history, strongly resents the suggestion that the Hebrew code should be for one moment considered or spoken of as upon so low a moral plane as the Babylonian. But such protest is even more futile than the above theory. No worthy end is attained, no useful purpose subserved, by insisting upon the unapproached superiority of the Hebrew and his code in their earlier years. The Hebrew records themselves do not make the claim, nor afford material for its support. The great Hebrew teachers assert that their people had received a peculiar training, which began when they were intellectually, morally, and socially in a very primitive condition. The final products of this historic training remain just what they ever have been, no matter what view be taken as to the origin of the people and the methods used in their instruction. The evidence is becoming preponderant, moreover, to indicate that the Hebrew organisation in its final shape owed much to Babylonia, if indeed it did not closely copy the ritual and religious organisation of the great Eastern center of law and religion. The value of Biblical teaching is in no wise assailed or impaired, even if such a possibility resolve itself into a fact.

We have a third theory, of which D. H. Müller, of Vienna,

may be considered the spokesman. It is frankly recognised that the differences between the codes of Palestine and Babylonia are more prominent than the resemblances: and it is suggested that we have before us sister-codes, so to speak: each being a regular development of certain principles of primitive Semitic social life. It is then maintained that we are in a position to determine what were the few elementary principles of primitive Semitic social and religious law.

But this view has the objection that the very elements that we might expect to be common to both codes, in case of such descent, are those which are notably missing from the Hebrew law, and constitute its supreme defects. We might expect minute and carefully detailed regulations concerning commerce and trade, rental, agriculture, etc., to be lost during any relapse to nomadic life, such as we find recorded in the case of the Hebrew. But why should the highly developed code of individual rights, of feminine independence, of equitable inheritance, of judicial organisation and procedure, be utterly lost by a people who had once been in southern Babylonia? May it not be that the Hebrew civil and secular code is simply Palestinian? that it is in its main features as Canaanitish as their language? The principles which the theory of common descent from an earlier code would give us reason to expect in the Hebrew code we do not find expressed in it. They had to be learned later, in some measure, from Babylonia. We must account these facts fatal to the theory.

It has long been suspected by students of anthropology that Semitic scholarship has allowed itself to be too much affected by the conception of the peculiar separateness of the Semitic race. The acknowledged presence and influence of animistic and totemistic elements in its religious development have served in some measure to obliterate the distinction, and to link the Semite religiously to the rest of mankind. Can any other position be safely assumed in the study of Semitic law? It is time to take another leaf out of Bastian. Does what is known as Semiticism represent an independent type of human development, something pre-eminently *sui generis*? Or is it only one of the necessary stages in human evolution, affected

by the peculiar local conditions in Arabia? Are we to find in the Semitic codes compared Ur-Semitic ideas, with Müller, or pre-Semitic ideas—principles latent in humanity and common to the race? Does the final highly developed code of Babylonia represent anything else than a certain stage of human progress?

There are those who are peculiarly restive under the suggestion that the evolution of man is so largely controlled by material factors as Buckle's view indicates. Ingersoll's dashing statement that "man is a machine into which we put what we call food, and get therefrom what we call thought" is sometimes selected as an expression of the principle, and assailed as hopelessly atheistic or materialistic. But is it? Without discussing the soundness of the statement, are we not still compelled to ask who made the machine, its food, and the environment and laws of its operation?

We may inquire then if the evidence of so-called Semitic law does not compel us to a monistic view of mankind, as the necessary correlate to a monistic conception of God. The influence of local environment does not conflict with the view, but supports it. And such monistic view of mankind the Hebrew literature asks us to accept. We may then compare the principles of the Hammurabi code with those of other bodies of legislation, to determine whether we should not explain it simply as a high development of man, embodying elements common to the race, and attaining a point possible only after long ages of social evolution.

One fundamental principle of all primitive law is retaliation. We cannot perceive any essential difference in this respect between the laws of the Semite and those of the Aryan, the central African, or the North American Indian. There is a mere impulse of the human animal to strike back when struck; the disposition to cherish the memory of an injury, and to avenge it at the first opportunity. There are no necessarily moral ideas in such behavior, nor can we fairly say there is a law in it, in the sense which we are considering.

The idea of law seems to begin in the establishment of a rude notion of proportion between an injury and the vengeance repaid. What we know of humanity does not suggest that this results from any reflection upon the abstract idea of justice. Primitive ven-

geance is noted for being entirely disproportionate to the original offense: and it remains so till a tolerably definite social order has become established. When necessity has extended the crude family idea to a body of men forming a clan, the impulse of the avenger is seriously hampered. He is compelled to consider what may be the result if he takes the whole matter into his own hands. Thus a rigidly applied *lex talionis* develops as a pure compromise between two opposing factions. The savage man would fain torture his enemy to death for a comparatively trivial injury. But the friends of this aggressor would have him go scot-free, if possible. The result of the contention is eventually to establish the law that the aggressor shall be treated just as his victim was. The one faction will allow no more, the opposing clan will accept no less. Thus a consuetudinary law becomes established with no necessary moral associations or impulses, with no other notion of justice than a rude sense of proportion between the two injuries inflicted. The abstract conception of justice, the purpose to work to some high end, must be regarded as a far off consequent, rather than as a cause, of the *lex talionis.*

How difficult it is to get beyond this stage and to reach abstract treatment, how very lame all effort to administer such a codal principle necessarily must be, is well illustrated by the story of the man who was haled into a Turkish court upon a charge of murder. He had fallen from an upper window upon a passer-by; thereby the latter was killed, though the former escaped unharmed. The dead man's son, as next of kin, took up the case: the court gave verdict in his favor. The son was to go to the same upper window: the accused was to stand beneath, and the son was to fall upon him and kill him. An American court might render such verdict as a bit of sarcasm upon a senseless suit. But there is no grim humor intended in the Oriental verdict.

The tale illustrates one point in the arrest of development of Oriental law, as contrasted with the more modern Aryan laws. A second difficulty in the application of such principle appears when the literal application of the *lex talionis* directly involves other parties in addition to the original plaintiff and defendant. In the code

of Hammurabi some trace of this difficulty remains, as in the case of the builder who erects a flimsy structure. Should its collapse occasion the death of son or daughter of the householder, the son or daughter of the builder must be put to death. But this stage is much beyond that of the early Hebrew, or of modern China, where the man is not viewed as an unrelated individual, but merely as the representative of a clan or family: and any grave misdeed of one may involve the destruction of the whole, as in the case of Achan. Or, the sons may be slain long after the father's death, to avenge an old grudge against the father, as in the case of Saul's sons. So in China to-day supposed treason involves the destruction of all male kin within the first degree: and in West Africa a man having a grudge against some member of a neighboring tribe kills the first member of that tribe whom he may meet: thus satisfying the grudge. It is the tribe, not the individual, that has wronged him. The correlate of this view is that the clan acknowledges the deed of a member as its own, and the effort to protect the wrongdoer may involve the destruction of the clan, as in the case of Gibeah of Benjamin, and of Jabesh-Gilead. But this stage is wholly past in the code of Hammurabi: clans have given way to the individuals, and the single law referred to is the only apparent trace remaining of overstepping the conception of purely individual responsibility for any given act. It is worth remembering, in this connection, that Ezekiel, the exile in Babylon, preaches to Israel the recent Deuteronomic law that no son should be punished for his father's misdeeds: "Ye shall no more use this proverb in Israel." "The soul that sinneth, it shall die," was the law of Babylon.

It may be recognised that the abandonment of such primitive principle was essential to the empire-building of the ancient Babylonians. We know that in the lower Euphrates valley cities sprang up ages before the ascendency of Babylon: their relations to each other being much like those of the free cities of mediæval Germany, or the city-republics of Italy. Only a common body of law, something of a compromise, embodying some principles acceptable to each clan city, could fuse the group of individual competitors for the hegemony into a harmonious whole. The compilation of such

was the achievement of Hammurabi: and it is very clear that such consolidation was hardly possible till the idea of clan responsibility was practically abandoned for that of personal responsibility.

The code of Hammurabi has again passed beyond the Hebrew law, or indeed any other Semitic law, in modifying the *lex talionis* by recognition of the right of self-defense. The Hebrew code, even its latest form, recognises only accidental killing as constituting a ground for modification of the law; and the method is not one that would commend itself to Christian courts. It is to be noted, also, that murder is not dealt with by state courts: there is no state concerned in the matter. The whole thing is left really to private vengeance: and the man who in an altercation kills another in self-defense has no protection. The story of Abner, Joab, and Asahel serves to illustrate the matter. David has been criticised as weak in his dealing with Joab. This is beside the mark. David had no jurisdiction in the matter. A further step in the modification of the rigid law of retaliation may result from large commercial development, and the necessity of regarding a slave as a piece of property, upon which a pecuniary value is placed. Late Babylonian decisions may show the influence of this, and suggest a new meaning for "a life for a life." We have a case in which a man had been killed: whether accidentally or no, we cannot say, as the tablet is damaged. But the judges decide that he must make over to the family of his victim a certain valuable slave: otherwise he must be put to death on the grave of the slain. The great prominence given to the commercial value of a man in Babylon, with the everywhere apparent effort to make amends to all injured parties, suggest that we have not here a mere case of compounding a felony, but the effort to make amends to a family for the loss of a breadwinner by giving it another. In this point the Babylonian practice may have somewhat the advantage of modern codes, in that it endeavored to make amends at the only point where such was possible.

Yet this may have been the survival of a very ancient, and slightly different practice. Among the wild Arab tribes of the lower Euphrates protracted inter-clan feuds are to-day finally ad-

justed, after counting up the losses, by the payment, to the worsted clan, of two women for each man that it has lost above the number killed in the rival clan. A man is accounted more valuable than a woman, for the warlike purposes of peoples: further, the defeated clan needs more child-bearers, to repair its numerical losses. Very similar methods of settling clan feuds are reported from West Africa. The view taken of woman in tribal wars may recall to the reader the savage destruction of women in the earlier narratives of the Old Testament. And it is interesting to recall that Bellamy, in his *Looking Backward,* advocated the adjustment of all fluctuations in the working-strength of a nation, if produced by emigration, by reimbursing such nation for the loss of each efficient laborer. He may have been looking backward more really than he knew. Such early practice is one important root of slavery. The persons thus paid over generally become servants of the clan. But it is, on the other hand, proper to inquire if modern law, dealing only with moral and retributive aspects of murder cases, has not wholly omitted to consider the inevitable economic or commercial interests involved. The earlier law, whether Semitic or Aryan, seems to have tried to grapple with both.

The very large development of commercial law in Babylonia, and its influence in humanising the *lex talionis,* are indirectly supported by the prominence given to adoption. It became much more than a means of securing an heir for a childless family. It was an effective method of recruiting the powerful labor guilds that were so prominent a feature of the Babylonian social structure. Adoption was void if the child were not taught his adoptive father's trade. A commercial estimate of a man's value does not appear as modifying the *lex talionis* in murder cases, where men of different ranks were concerned; at least it does not appear in the code.

Now this question of rank is one of the largest factors in detroying the rude equity of the law of retaliation. The noble cannot meet the serf upon equal terms. An injury to one cannot be considered the equivalent of an injury to the other. Yet it need not always displace the method of compounding petty injuries, that has developed among men of equal rank. We observe this, in the case

of such, in the code of Hammurabi. The basis of estimation seems to be the cash value of the services of a first-class slave. From this standpoint the relative values of hand, foot, or eye, approximate those adopted by modern accident insurance companies. But in the case of slaves, only those salable or transferable are viewed as chattels. The man whose service is merely temporary, in order to cancel a debt, is legally a free man, and an injury to him must be treated from that standpoint.

The two principles of recognition of rank and of commercial compounding are naturally susceptible of great abuse. The former has produced the larger injustice in Aryan law and practice, owing to the more minute social subdivision. The commoner or burgher is above the serf or bondman; neither is held of any value in comparison with the knight or nobleman. In India the Brahmin eventually assumes the same unapproachable pre-eminence. The fearful oppression of the lower ranks, under such conditions, is a familiar tale. But Semitic society has not attained these sharply defined delimitations. Even the slave of to-day may be the prince of to-morrow. The one is not so inferior socially, the other not so pre-eminent, as in Aryan society. So in Babylonia industrial and intellectual efficiency seem to be recognised, whether in freeman or slave. We do not find the minutely graded officialdom so prominent in military Assyria. The institutions seem to be moulded in no small degree by the earlier Sumerian precedents. The judicial organisation rather suggests the Chinese civil service than the methods of other Semitic peoples. The powerful guilds, their apparent importance in the social structure, remind us of the guilds that arose similarly among the free Teutonic burghers of mediæval Europe, or the guilds and societies so important among modern Mongolian peoples. But legally there seem to be but two great classes in Babylonia, as in Central Africa: the chiefs or officials, and the freemen. A law is promulgated for the punishment of the man who injures one of higher rank than himself: the penalty is a public whipping. There is but one law, one penalty, one comparison of rank involved. While this elementary difference in rank works abuses in Semitic lands, it does not seem to have been re-

duced to a regular "Wehrgeld" scale, as among ancient Teutons and Hindus, according to which "every man has his price," at which he may be injured. On the other hand, the compounding idea has been the more abused among Semites and Africans: greed for petty gain overruling other considerations. A woman appealed to King Theodore of Abyssinia; her husband had been murdered; the offending soldier had escaped with a small fine. King Theodore summoned the judge and the soldier, heard the evidence, then asked the judge what penalty had been imposed. "Ten dollars fine," replied the judge. "Very cheap!" said Theodore: "I can afford that!" and drawing a pistol he shot the soldier dead, then laid down the ten dollars before the astonished judge, whose subsequent judicial conduct was more circumspect.

We have also applications of the *talio* to property questions. Two children are playing on the floor. One breaks the toy of the other and is promptly struck; or his toy may be broken; or if the injured child have a little more foresight, he will appropriate his playmate's toy to make good his loss. Practically the world has no other principles in all its laws, for the protection of property. Among children the compensation idea is usually the last to manifest itself, while the mere angry destruction of the other party's property is generally recognised as peculiarly childish; or, among men, as peculiarly savage. In law this method has never become recognised as a wise principle; and there is no legislation that punishes a man by burning his crops or maiming his beasts. Only where the property itself is a nuisance or source of peril does law generally demand its destruction, as in the case of a savage dog or unruly ox. The two largely used principles then are punishment inflicted upon the person of the offender, and the exaction of damages from him. In Aryan law the former principle is the more largely applied, though the very modern Aryan peoples do not now kill, burn, maim, or mutilate petty offenders against property rights so generally as they once did. In the Hammurabi code, on the other hand, restitution is the great principle almost everywhere applied. All sorts of failures to fulfill contracts, all sorts of petty thefts or attempts at fraud, seem regarded as creating petty debts, which stand against

the offender. The primal purpose seems always to restore to the injured property-owner all that he had been deprived of, with some compensation for his annoyance. Beyond this the code does not seem to go. There is no conception of a wrong to the dignity and peace of the state, of which we hear in our own formal indictments, In a single case we find maiming—that of the penniless fellow who is dependent upon the *kêpu* for the opportunity to raise a crop. If he steal any of the equipment entrusted him, he has no means of repayment, and personal injury is resorted to: he has his fingers cut off. The death penalty that appears in the early sections of the code in a case of disputed property, we must consider as really aimed at the perjury, not at the theft. The offense has been greatly aggravated: the false claim persisted in, and sworn to. The offender has violated the sanctity of the temple as much as he who has broken into it and robbed the gods. Each offender meets the same fate.

As in the case of the earlier *lex talio* for personal injuries, we cannot affirm that there are any necessary moral ideas in the conduct or impulses of the children used above for purposes of illustration. And the idea of restitution must be reached only after much discussion of the problem in clan life. It is not everywhere dominant in savage law: rather does it seem exceptional. In African law it is notably rare: mutilation, slavery, or death are the usual penalties. In the Hammurabi code, however, the religious feeling in regard to restitution is very strong. All losses or injuries must be attested by oath; and the gods are in this way given great prominence as the protectors of property.

The moral ideas of the people are much more definitely discernible in another direction. It is apparent to every one that a people who begin to regulate society by the application of a rigid *lex talionis* or restitution-principle will in time discover that the method has most pronounced limitations: that there are many of the most serious offenses to which the principle is totally inapplicable. That so many of these remain outside the provisions of all early codes may be taken as evidence that the *lex talionis* is, as we have suggested, the primal impulse of law: the offenses beyond its

powers are most probably recognised later, and in consequence of a considerable religious development. How far taboos are responsible for them we cannot discuss at this place. Suffice it to say that the cuneiform literature reveals to us a large number of offenses which immediately entail a species of taboo upon the offender. None may eat of his table, drink of his cup, or associate with him in any way, without being tainted thereby and subjected to similar excommunication. The banned person is shunned as if infected by the plague. We have the theory of the temporal rewards of evil-doing reduced to a minute and logical series of details. The person is solemnly declared accursed; or the curse is formally invoked upon him. Such a person, among primitive races, is "cut off from among his people." In the code we find this excommunication in the case of the person guilty of incest with his son's wife; and the same idea is really involved in the disinheritance of a son who has lain with his stepmother. The curse of Jacob upon Reuben is a direct application of the law of Hammurabi. Beyond these principles the code does not go: leaving to the domain of religion or to social discipline some offenses that are within the provisions of more modern secular codes. In this respect the Babylonian law is paralleled by the Hebrew, with its large list of accursed offenses. The Aryan law is in the same condition. The main difference is that the list of curses in the Hebrew code apparently antedates the largest ceremonial development, while in the Babylonian banning texts the list of ceremonial infractions involving excommunication for a longer or shorter period, is larger; and in Menu it is simply prodigious. We have relative stages of development thereby suggested.

But this method of punishing one's enemy, when the courts could not deal with the case, by pronouncing an excommunicative curse upon him, was capable of large abuse: and all early codes show the effort to limit it. In the code of Hammurabi, the imprecator must show that the case is one recognised as deserving a curse. In the early Aryan code, certain devices must not be used: apparently the effort is to stop the practice altogether. In the Hebrew code, curses may be invoked in the name of Yahveh; but there must not be invocation of the spirits of the dead, or strange divinities, or the

supposed spirits of evil. Such cursing is not in the name of Yahveh, and witchcraft is accordingly viewed as idolatry. A childlike confidence in the potency of such imprecations or incantations belongs to all branches of the human family: the practice is not, in any of its phases, purely Semitic. The witch is believed to have real power, and using it to slay or maim, is to all intents and purposes a murderer.

It is a fundamental principle of the code of Hammurabi that the presumption is always in favor of the innocence of the accused: the burden of proof is thrown upon the accuser. This but parallels the moderately developed judicial procedure of all peoples. But the fact that the laws are not yet conceived as expressing the will of a corporate body known as the state results in there being no such personage as a state's attorney to conduct the prosecution. Nor is there a royal prosecuting attorney: while Hammurabi is the actual compiler, he conceives the laws to be really from Shamash. There is no grand jury to find a true bill: no penitentiary representing outraged society; for while primitive society has really made the laws, it is not yet fully conscious of the fact and in consequence attributes to them a different origin. Not merely is the burden of proof upon the accuser, but in all primitive society the entire burden of accusation or indictment falls upon him. In this respect the legal procedure of Babylonia seems to have been that of all early nations. Even Aryan peoples have known no other till a relatively recent period.

It is very early apparent that under such a system the more plausible speaker may have too distinct an advantage in his presentation of his own case; and there is too much advantage with the popular favorite, in case the matter is argued before the popular assembly, as in ancient Greece or modern Africa. The balance of personal factors that was partially established in primitive society by control of the *lex talionis,* is seriously disturbed. Hence a delegated judicial body of some sort may appear very early; usually in the form of a council of the chiefs or elders, as among the North American Indians. It remains the essential feature of early Semitic

courts; it remains in Babylonia in a highly developed form, and is but slightly modified in the more advanced Aryan procedure.

But we find other things are needed to meet the difficulty and the idea of so framing the judicial administration that it may prevent crime rather than punish, seems to be attained very early. We may feel sure that this is one reason of the early development of the law in Babylonia, that every sort of transaction concerning which dispute might arise should be committed to writing. The court's task is largely reduced to the examination of documents: there is an insuperable barrier to forensic eloquence, and the plaintiff without documents, when they were possible, is nonsuited. Possibly no other judicial system so thoroughly eliminated prejudice and passion. But we have no Babylonian oratory.

The conducting one's own case does not appear to have been superseded among the early Hebrews. We have not, however, the insistence upon carefully prepared and attested documents, which we find in Babylonia; but in the Babylonian Talmud they become prominent. In Greece, on the other hand, we find the paid attorney developing: but he is a product of the rights of the popular assembly; there is no delegation of popular authority to a senate, and any one may speak upon any case. This is also the practice of the African popular assembly. The sheer love of speechmaking, of intellectual combat, soon produced men whom litigants endeavored to retain, as champions of their interests. The Greek advocate was a great orator, rather than a technical, methodical lawyer. And there is no provision for the prevention of a wrong.

But in Rome the early inhabitants show the powerful clans or *gentes* collecting in a single city, with the same complaint of the *plebs* against the clan-lords that we find so frequently voiced in Israel. The assembly of clan-chiefs is soon modified by an elective system, and early experiences convince the Roman state that it would be better to thwart the oppressors of the *plebs,* than to punish them after the wrong was done. The situations in Rome, Babylon, and Palestine are closely parallel. Rome meets the situation by creating the great tribune of the people. His prohibitive authority is all but unlimited. His person is sacred, and made

so by the law. The great principle here established remains in our vetos and restraining injunctions. The Hebrew also had his great tribune of the people. But he had no legal standing. The elders, the primitive courts, had not recognised the necessity of his existence: the Babylonian document was unknown in this legal procedure: the only legislation upon his position eventually put him under the control of the formalists he had ever opposed, and placed no power whatever in his own hands. He was compelled, by the very nature of the case, to adopt the Greek method, to betake himself to public oratory: but to direct it to the Roman ideal: to the prevention of wrong. Hence his repeated protests in behalf of the plebeians are based upon purely moral and religious grounds. He must find, if possible, the conscience of the people; there was neither secular organisation, nor constitution, nor publicly posted code, to which he could appeal: he could quote no codal law for many of the evils he assailed, for legislation upon the subject did not exist, nor was there a legislative assembly through which he could secure such law. This "speaker" of the Hebrews is the *nab'î*. He is parallel to the Roman tribune in his battle against oppression. Each was a social necessity, as was the dispassionate appeal to records in Babylonia. As an immediately effective agency the Hebrew prophet was the least valuable, and his unorganised state went down soonest. As the creator of a public conscience essential to the perpetuity of the effectiveness of the systems of Rome and of Babylon, he is indispensable. Greece, with neither of the methods, soonest lost her political pre-eminence.

But the Roman lawyer really antedates the tribune of the people, though the latter is an expression of the principle from which the Roman lawyer grew. Cæsar, describing certain powerful Gallic clans, tells us that the clan chief held himself responsible for the protection of each member of the clan, which he thinks peculiar; yet it was the earlier Roman practice and survives to-day in the Italian *padrone*. But the worldwide custom of assembling the heads of *gentes* or clans to adjust differences quickly developed, after the founding of the Roman state, the principle of delegated authority; and this soon carried with it the growth of a body of men

skilled in the law, to whom the adjustment of all difficulties is delegated by the plaintiff and defendant.

Now at this point the Babylonian law shows some tendency to the delegate-principle. In later contracts we deal repeatedly with cases that but suggest the agent or client of a large firm, handling business by power of attorney. In reference to the method used to prevent fraud and diminish litigation, we should observe that the Babylonian law appeals at every stage to the religious impulses. A solemn oath binds all contracts. Parties to a suit in like manner bind themselves to accept the decision of the court: apparently a reminiscence of the purely advisory powers of the early *melek,* or sheik. In Aryan development we have the same thing, in the derivation of the "king": like the Semitic *'melek,* he was "the wise one," or "adviser." But while the religious obligation seems to have been powerful in Babylonia to the end, in Assyria there certainly was degeneracy. We have judicial decisions from the Sargonid period, which indicate that penalties solemnly invoked in an earlier age were actually undergone in the later age to induce a god or a court to release a man from his oath. The gross obscenity of certain late Assyrian oath formulæ points in the same direction: to a "bloody city, full of lies and robbery."

That the owner of any piece of property shall be held responsible for any mischief done by it is a generally recognised principle of law in all lands. The degree of such responsibility is much larger in the primitive stages of law than in the later era. Public sentiment in civilised lands would not sustain a verdict of murder in the first degree against the man whose vicious ox had gored some one to death, though it would demand heavy punishment. Measured by modern ideas, and the tendencies in such laws, we should decide that the Babylonian law was in this respect a stage in advance of the Hebrew.

This principle again is involved in the responsibility for trust funds and safe deposits. Here, however, limitations occur. The Babylonian trustee is held responsible for the keeping of his own house: and if the property of another man be stolen from his house, the loss falls upon the trustee. But on the other hand, if the

robbery take place upon the highway, the carrier, or agent, or peddler is blameless, and nothing can be collected from him. But in such case the loser may be indemnified by the city or magistrate within whose jurisdiction the robbery took place. Early Hebrew practice reversed this latter procedure. The elders of a settlement by a ceremonial observance repudiated all responsibility for a secret murder in their district: but the repudiation was, in reality, a species of admission, and merely illustrates the very primitive state of the administrative or police organisation. But the Babylonian official was required to keep the highways clear of robbers. The intra-mural requirements were perhaps not different. The robbed trustee was expected to pursue the thief and recover; however, it is hardly warrantable to assert that the burden of detection and arrest lay solely upon him. We may rather suppose that his method of recovery lay in reporting the loss to the city authorities. That the general public interested itself to a certain extent in such matters is illustrated in a letter in which two men report that a golden tablet which was stolen from a temple they have observed in the possession of a certain stone-cutter.

Now, this principle of clan-responsibility for deaths or injuries is familiar among all primitive peoples, and as an inter-clan principle has never ceased to be active: giving us to-day the principle of indemnities known to international law from time immemorial.

But as intra-national law, it has been a strong factor in empire-building, as in ancient Babylonia; clan cities being made to realise the necessity of a common code to eliminate constant internal friction. In the extent to which the responsibility is attached to the chief officer of the district, we have a suggestion of Sumerian or Mongolian origin: akin to the large application of the principle still known in China. The individual responsibility for dykes and levees is unique: in other ancient peoples the levee system seems public, or communal; and the principle of individual responsibility is not emphasised as in the Hammurabi code. But the laws concerning trust funds and deposits are not essentially different from those of other ancient codes.

Marriage seems viewed by the code purely as a civil institution.

Priests may have been prominent in the ceremony, but we do not know of them. The essential legal features are the carefully drawn documents, and the attestation of consent by representatives of both families. We have in the code and decisions a survival of the time when all marriages were arranged by the parents of the bride and groom. Their consent is still technically essential to marriage, though they cannot separate a young couple who unite in spite of them. We have decisions concerning cases where the parents of one or the other of the contracting parties complained that the marriage had been without their consent. The judges decide that the young woman must then wear the badge of a concubine, instead of that of a matron. But parental displeasure can go no further: and this state of affairs is terminated by the death of the objecting parent. The brothers of the stigmatised woman must formally recognise and endow their sister's marriage.

At this point then we may recognise a marked diminution of the ancient *patria potestas*: a compromise between the authority of the parents and the inclinations of the young people. After the first marriage there is no restraint upon the woman's freedom of action, save such as may be necessary to guard the property-rights of her children. She may marry where she will, none of the family having any legal right of protest; and the widow's authority in her own house certainly is above that of the widow in the Arab tribe in Mohammed's day, or in the days of Hebrew corruption when the prophets urged justice to the fatherless and widow; when all Hebrew codes put together had but four enactments concerning the rights of married women.

We may not be sure of the source or cause of this modification of parental powers. It cannot be due to primitive Semitic influences, for the early Hebrew recognises the right of life and death as vested in the parent. The father could sacrifice his son or daughter; he could offer the lives of his sons, as Judah did, as security for faithful fulfilment of a bargain. He could marry his daughter to whom he would; he could take his daughter, as Saul did, from her husband, and give her to another; he could sell his daughter, (Exodus xxi. 7,)as Rachel complained she was sold: both of which we have

seen that the angry Babylonian parent could not do. Even in Deuteronomy the power of life and death is reaffirmed, in the case of a troublesome son: the offended parent in Babylon could go no further than disinheritance: and even that step could not be taken without the consent of the court. The Talmud also recognises that a parent can legally take away his daughter, though it insists it should not be done: adopting practically the Babylonian law, while admitting Hebrew theory. So in ancient Roman law, the *patria potestas* was absolute. Virginius was perfectly within the law in slaying Virginia. So was the King of Moab in sacrificing his son: though like sentiments seem to have been aroused against Appius Claudius and Jehoshaphat. The Roman father also could take his daughter from her husband, as Saul did Michal; and this forced separation could be construed as legal divorce. So in the fragments of old Sumerian legislation we find this same paternal power: the father could sell his son as a slave, and seems to have had the right to put him to death as well. The same law remains in China still, cases being common enough. The prevalence of infanticide among the heathen Arabians cannot be certainly construed as mere *patria potestas,* for it was offset by the practice of killing the aged and feeble. On the other hand, the Greek parent does not appear to have had such absolute powers; nor do we certainly recognise it in primitive Aryan laws. This rigid principle may then have been Mongolian in origin. The Etruscans and Sumerians are alike suspected to be Mongols; and Etruscan domination certainly affected early Roman institutions. We might thus explain the sterner laws of both regions, in their earlier years; but the humanisation of the code of Hammurabi we must evidently consider to be a result of the general development of civilisation and public sentiment, rather than of peculiarly Semitic ideas.

Neither the code nor any other Babylonian remains at present show us any trace of the levirate marriage. This was well known to the early Romans, and to the early laws of the Aryans; it remains even in Menu. It is familiar in the Hebrew records, even in the time of Tobit; it is provided for in Deuteronomy. If we regard it as a relic of polyandry, we shall be compelled to admit the

Sumerian had developed very highly, to eliminate an institution so familiar to the primitive Mongol, and so prominent in Thibet to this day. If the idea is merely that of abandoning one clan for another, we may understand its loss is due to the displacement of blood-clans by labor-clans. The great guilds of Babylonia have displaced the old social divisions based upon kinship. Such industrial development would logically eliminate the levirate; a widow would marry then within her guild.

Divorce is far less easy in the code than in the Koran, or in the Hebrew codes. There is no opportunity for divorce at the mere whim of the man, by a mere verbal dismissal. Courts are in charge, and charges must be investigated. But among the heathen Arabians, the utmost laxity prevailed. Mohammed's law to control the abuses is rather ludicrous. As the same woman was often divorced and remarried by her whimsical husband, the curious measure was adopted that such husband could not reclaim his wife till she had first been married to another man: precisely the reverse of the Deuteronomic law (xxiv. 1-4). The Deuteronomic law provides for a written certificate; the patriarchal law, like the Roman, did not require such. But the Chinese law has from extremely ancient times demanded that a husband give the parents of his divorced wife a written statement of the reasons for the divorce: which document may become the basis of legal procedures. And such legal procedures, with forfeits of property, were inevitable in Babylonia.

The Babylonian Talmud considers that a marriage is legal and binding when the contracts are drawn up. In the earlier times of the Hebrew people we do not find this; and the rabbins who have held this up as an evidence of the superior character of the Hebrew law have simply been innocent of any remembrance of the land whence they derived it.

Though the formal bonds and contracts were essential to the full title of wife or matron in Babylonia, children were regarded as an end of marriage; and the fruitless marriage might be amended in various ways. But barrenness constituted no ground for divorce. Penalty for unreasonable divorce, seven years' earnings for a skilled laborer, was so heavy as to render divorce impossible to the masses.

There was far more latitude in ancient Rome and Greece as among ancient Semites; though as a practice the earlier Romans had a horror of divorce. Spurius Cavilius Ruga, A. U. C. 523, has been asserted to be the first Roman who formally divorced his wife; but the practice was disgracefully common in the days of Rome's luxury. Nor was there in the Babylonian husband's hands the supreme power that was granted to the Roman husband. The tradition has been left that Roman wives were accustomed to absent themselves from home three days in the year, as a precaution; one year's continuous residence under the husband's roof transferring to him the power of life and death formerly held by the father. In primitive Aryan law we seem to miss this masculine domination: it develops later under Brahminism. Woman's position was apparently higher with the early Aryas than at many later periods. We may consider that there was degeneracy even in Europe, till the rise of feudalism and the development of the standards of chivalry. In the Homeric songs woman is the prize of war as completely as among the later nomad Semites. In widowhood especially woman's position through all the East became one of peculiar hardships. But in all these less advanced social systems, as with the higher Babylonian, there is one common feature: the man marries the woman, divorces the woman. She does not take a husband, nor divorce one. She merely compels the man to grant her a divorce. The *sadiqa* marriage lies far back of the era of Hammurabi.

Very striking is the high rank accorded to the agriculturist, in the Babylonian social system. This is certainly non-Semitic: the high place of the farmer dates from old Sumerian days. Literati develop their standing later. Mechanics rank after the farmer; merchants lower still. In the Hammurabi code, we may observe in the wage scale that the highest wages are those of the first-class farm laborer, though the code dates from the days of the pastoral Semites. In the list of officials, K.4395, the merchant still ranks below the gardener. This is the more striking in that it comes from the Sargonid age, when the Babylonian merchant had made the city famed for centuries throughout the world. Even the kings of the pre-Semitic age seemed to rejoice in the title "servant of Adar,"

(the god of agriculture,) or "farmer." In far later times the "Farmer Prince" or "Great Farmer" is the title of a great official; and it seems to have been borne occasionally by the king himself. Semitic kings, however, preferred the title of "Faithful Shepherd": thus perpetuating the tradition of their pastoral origin. In this actual collision of two modes of life we may perceive an historic basis for the tradition of Cain and Abel. We may compare with these facts the title of the Hindu Prince, the *Gai-kwar* or "Cowherd" of Baroda. But we are most forcibly reminded of the high rank theoretically accorded to the farmer in China, and of the fact that the "Son of Heaven" must there guide a plough around a field with his own hands, to emphasise the high place of agriculture. The secondary position of the Chinese merchant, with his painstaking, methodical honesty, also forcibly remind us of the great city of the ancient East, with its great early development of commercial supremacy. All this commercial law, like the position of the agriculturist, seems to have been fully developed ere the political dominion of the Semite. Such is the legitimate inference from the habitual use of the Sumerian in the critical phrases of early Semitic contracts.

Edwin Markham has drawn us the picture of the "Man with the Hoe" in all the ancient world. We may observe its marked contrast with the social position of the Babylonian farmer. We cannot then find any trace of Ur-Semitic affinities in this ancient land. The law is not only unlike the Hebrew, and his gradual pauperisation of the wretched Canaanite tiller of the soil; it is still more unlike the system of the nomadic Arab shepherd patriarchs. Not only is the farmer awarded the highest place in the industrial world, but the debtor-laws give him the largest possible protection. We may contrast Egypt, where the wretched fellah has ever been what he still is. Amenemun writes to Pentaour, court poet of Rameses II: "Have you ever represented to yourself the state of the rustic who tills the ground? Before he has put sickle to the crop, the locusts have blasted part of it; then come the rats and the birds. If he is slack in housing his grain, the thieves are upon him. His horse dies of weariness as it drags the wain. Anon the tax-gatherer arrives; his agents are armed with clubs; he has negroes with him

who carry whips of palm branches. They all cry, 'Give us your grain,' and he has no easy way of avoiding their extortionate demands. Next the wretch is caught, bound, and sent off to work without wage at the canals; his wife is taken and chained, his children are stripped and plundered." In the *Praise of Learning* we read, "The little laborer having a field, passes his life among rustics; he is worn down for vines and pigs, to make his kitchen of what his fields have; his clothes are heavy with their weight; he is bound as a forced laborer; if he goes forth into the open air he suffers, having to quit his warm fireplace; he is bastinadoed with a stick upon the legs, and seeks to save himself: but shut against him is the hall of every house; locked are all the chambers." Such was Egyptian bondage.

We need not detail the situation of the wretched field laborer, or serf, during the Middle Ages. The parallel is plain to all. It is clear that we cannot find the Babylonian system paralleled among the highly developed Aryans, even though their name signify "ploughmen," till we reach the most democratic of modern nations. From the agriculturist's view-point, America might most nearly stand for the modern equivalent of Babylon.

As has been previously remarked, a chief excellence of the law of Babylon was its thorough protection of the debtor. We have as yet nothing to equal Hammurabi's safeguarding of his rights in any other ancient code. His situation was decidedly better than under many modern systems. As compared with the Hebrew, the Babylonian code is immeasurably superior. No claim could be pressed against the debtor without documentary proof. The right of levying upon him or of attaching his property without his consent was not granted. Risks on crops were divided. The failure of a crop or its destruction by floods when the rental contract gave the landlord a share in the crop, or when a loan in cash was made to a struggling farmer, did not mean that the loss would fall solely upon the debtor. In the case of renting on shares, the landlord was held to the letter of the contract: he got nothing. In the case of the loan, interest due for that year was cancelled, and the time extended a year. If a loan had been made secured by a lien on the

crop, the handling of the harvested grain was not permitted the creditor. Nor could he take advantage of the debtor's straits and secure bargains by forcing a sale of the debtor's property for a fraction of its value and buying it in. The crop conditions were carefully noted each year, and the standard price for the season, "the king's price," was publicly posted everywhere. Any creditor taking a part of the crop for his debt took it at "king's price." Nor could the creditor help himself from corn in field or in store. The principle of exemption was known. The work-ox of a peasant could not be levied upon: he must not be rendered unable to till his land.

Every reader of the Old Testament recognises how all this contrasts with the Hebrew law, and with Hebrew practice as criticised by the prophets. The Hebrew creditor could take everything from the struggling peasant, save his coat. No laws existed, restricting the powers of the creditor, or thwarting his rapacity. In an instant the wretched debtor could be seized for the pettiest claim; the price of a pair of flimsy sandals, and sold into life-long servitude. Worse still, he might raise a family while in such servitude: the children, because of their father's need of a pair of sandals in the remote past, are perpetual slaves. Not even in the grave could the debtor rest. He might have been the greatest prophet of his time, yet if he died owing a petty debt, he might be sure his relentless creditor could seize his children and sell them as slaves. We have the record of a prophet's distressed widow appealing to Elisha under just such circumstances. Even as late as Nehemiah's time, poor Jews who wished to help in the rebuilding of the city were compelled eventually to sell themselves, their families, and all their belongings, for a bare sustenance. An old claim could be revived, and a freed bondsman re-enslaved: no law forbade. This infuriated Jeremiah.

All this was impossible in Babylonia. From her Israel could have learned all that she most needed to learn. The Babylonian debtor, as already stated, had the line of exemption clearly drawn; and the claim of the creditor was confined to the estate and person of the debtor. The latter might hire out a member of his family to work on account of some debt, but this could not be for longer

than three years. Even if he were himself reduced to servitude, it did not enslave his children, nor make a slave of his wife, nor prevent his marriage with a free woman. If he were capable he might enter business upon his own account, merely handing over to his master annual interest on the amount invested in him. His wife retains her freedom, and takes one-half of their jointly acquired property for herself and the children. No claim can be made upon the latter by the creditor-master. An account once closed could not be reopened; the fine for such attempt was from three to sixfold the amount claimed.

We may add also the condition of the Aryan peasant: the law holds him for the debts of his ancestors, as the Hebrew law did; and the Hindu to-day may be born hopelessly in debt for the expenses of his grandfather's wedding; and the enormous rates of interest will result in his paying upon the claim all his life, only to bequeath a still heavier debt to his children. We must grasp all this in order to appreciate the full import of the previously mentioned new law of Deuteronomy and Ezekiel, the close student of Babylon: the son should no longer be punished for the father. "Ye shall no more use this proverb in Israel!"

We do not at present know of any effort to regulate rates of interest in the code: though such sections may have existed in the portion now defaced. The same is true with regard to rental rates. These are referred to in the code as familiar, in the case of agriculture and horticulture; but we cannot say whether they were controlled by law or not. In the code the crop-rent percentage is identical with that customary in America to-day. But as to interest, the large number of contracts showing considerable loans for a short period, with the stipulation that there should be no interest unless the sum was not repaid by a certain date: the sum to draw interest thereafter—these suggest that interest was originally regarded in the nature of a penalty for tardiness. Especially does this seem to be the case where the contracts so often say, "if he does not pay by a certain time he shall add one-fourth to it," without reference to the amount of time that elapses after the money is due. As the contracts between merchant and peddler merely indicate a division

of profits as the final basis of settlement, it is possible that a certain sentiment may have existed against interest or usury. Certainly the rates remained high—twenty to twenty-five per cent. usually, for 2000 years. We do find efforts to regulate the labor and transportation problems, by a fixed scale of prices: and we know in later times of royal efforts to regulate the prices of necessities by the "king's price," that there might be no extortion, or "cornering" the market. The effort most nearly resembling this in other lands we should find in the Roman fixing of a commutation price upon certain staples, in case a tributary wished to pay taxes in produce instead of cash. But the transportation tariff is fixed in Babylonia on a chartering basis; supposing a man to hire a vessel by the day. The intricacies of the per-ton per-mile schedule had not found place at the earlier period, though the general question of such expense must have been carefully estimated: for we find in later contracts choice allowed a debtor. He may pay a certain quantity of ripe dates in his orchard at one time, or, F. O. B. at Nippur or Babylon, during the next month, a much smaller quantity; or a still smaller quantity if delivered later at Susa. The details of commercial fluctuation, transportation, and local valuation seem then perfectly understood, and contracts embodying such calculations are made months ahead. We know of no necessity for an inter-state commerce law, though the length of the life and the ramifications of great business houses give reason to suspect that the later Babylonians eventually had the trust problem before them. But it certainly did not exist in the times of Hammurabi: the loans of that period are notably minute, as compared with those in Persian times; and the trust problem must have grown from the powerful guilds or wealthy clans. In all this field we are practically without Hebrew legislation, but with much prophetic preaching.

We can not observe in the code, in the disposition of property, anything that answers precisely to a will, in our sense. The apparent suggestion is that if there are any special dispositions of property, the recipient must be put in possession by the donor in his lifetime. This would preclude the possibility of forgery, imposture, or pleas of mental incapacity in regard to wills. But where special

gifts are not made, by either parent—as they may be—, there seems no right of primogeniture recognised. In this we have a fundamental difference from Hebrew law, and from pure Semitic law in general, so far as we know it. But from the various banning texts we learn that an elder brother or elder sister ranked next to the parents in the matter of reverence and respect required; and a deficiency in such respect entails a heavy *kišpu* or ban upon the delinquent. This feature again reminds us strongly of Mongolian—of Chinese standards. In early Aryan law we find a degree of uncertainty concerning the proper apportionment of property, though the elder brother seems to be regarded as the head of the undivided family; but this very uncertainty is so inherent from the beginning that all Aryan systems of a later time, varied as they are, can claim to have something in common with the primitive stage. And in such division of goods in Babylonia the daughters must share: their portion taking the form of dowry at marriage; if not married, a daughter obtains a son's share. This again does not seem to be the early state of Semitic law, and certainly is not the law of the Koran. In that age, in any circumstances, whether as witnesses or as sharers of an estate, two women were assumed to be the equivalent of one man. A woman's property in Babylonia could not be claimed by her husband at her death, in which respect the code is decidedly in advance of the Koran legislation; we are not so clear as to the early Hebrew practice at this point. In case of death without children, whatever property was held reverted to the respective families that had endowed the marriage in the beginning; but property independently acquired was bestowed at the woman's pleasure. In this detail again we find the Sumero-Semitic practice superior to any other ancient code, and to most modern codes. We can hardly esteem this to be Semitic law.

This comparative sketch of legal principles is hardly complete without a statement of one fundamental difference between all Semitic law and all modern Aryan law, of which the Romans are recognised as the founders. We can then understand the more clearly the real failure of the Semite to influence Western law in

any essential: a failure the more marked when we reflect upon his dominance in religion.

Already has been mentioned the fact that the Semite does not possess the abstract conception of the state, or of society, in the sense in which we use the words in connection with law. He has not formed the habit of thinking in abstract terms. Law is to him, as to all Oriental peoples, the expression of a personal will, a personal authority. We cannot conceive a Semite setting up abstract principles of justice and proceeding to assail the very gods with them, as Æschylus or Euripides could do. If the god or king decreed a thing, that was law and right, for the ordinary Semite, though it might be really distasteful to him. The king of the land, the gods of the land,—these were also the law of the land. What was right in Moab might be wrong for the same case in Aram. Decisions might be diametrically opposed in the two lands, and pronounced just in each, as expressing in each the personal will from which all local law came.

The Roman mind could shake off such limitations, and generalise, and think more abstractly. It could readily recognise some general principles or sentiments operant in each province or people, irrespective of race, or creed, or social organisation. Its lawyers soon grasped the idea of a *jus gentium,* contained in the summary *Quod semper, quod ab omnibus, quod ubique.* The Greek dared to storm heaven itself with such a weapon. But where he would have advanced upon the past by openly assailing Zeus, the Hebrew prophet would have said that the masses did not really know Zeus. The Roman reached a system of universal law by eliminating personality, creeds, and local interests and prejudices; producing an abstract, unyielding, inerrant justice. This the Semite could not do: unable to separate law from personal will, he could create a world-system of law only by the extension of one personal will to all the world, to all the universe. And relation to this becomes not law, in the jurist's sense, but religion. We may understand then why the laws of Hammurabi are given by Shamash, the Sun God, the All-seeing Eye, God of Justice, as those of Moses are given by Yahveh. The codes have developed alike, the same explanation is

offered by the lawyers and codifiers for each. They know no other explanation for law. This is to be remembered in discussing the problems of inspiration.

We must take one step further: the peculiarity mentioned is not a trait found in the Semite alone, though he has given it the highest development. This conception of law as the expression of some personal will is just as much a peculiarity of the Filipino or the Polynesian. It is seemingly common to mankind in earlier stages: it but marks the period when impersonal abstract thought is not yet possible. There is at last a parting of the ways, and necessarily so. No satisfactory secular law and judicial system can be established so long as every perplexity means that men must consult the oracle of The Personal Will, instead of thinking: just as no satisfactory religion can be established by banishing a personality and dealing in intellectual abstractions. Law and religion but represent two stages, two branches, two modes of thinking upon the same problems. And thus we may conclude that the code of Hammurabi belongs not peculiarly to the history of the Semite, but to the history of man; and that it represents the highest secular law attained by way of the earlier method of defining and expanding law.

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A SCIENTIFIC VIEW OF CONSCIOUSNESS.

SO many attempts have been made to give a clear explanation of consciousness that it may appear superfluous to make another; there is, however, a constant human desire to know everything new and reliable on the subject, and this desire seeks to be gratified. Consciousness is one of a great number of "mysteries" by which we are surrounded, it is like a "certain something in the air, that all men feel, but no man can describe," its mystery arises largely from its complexity and the smallness of our comprehension, and as long as we act upon the unscientific idea that belief is not to be controlled by facts or that we can safely believe without evidence, we shall be confused by such mysteries. The mode of action of any one of the senses, especially that of vision, is nearly as great a mystery as that of consciousness. The chief explanation of the large failure of attempts to explain consciousness is, that they have usually been made without the aid of sufficient familiarity with the fundamental principles or methods of science:—the entire history of mankind proves that without extensive and varied knowledge of science it is hardly possible to obtain truthful ideas of the mysteries of nature. Consciousness is a wider subject than that of the ordinary senses because it includes all kinds of feelings from all parts of the body. As the subject is large, only an outline of it is attempted in this article, and as it is complex, the article requires attentive reading.

I. DEFINITION OF CONSCIOUSNESS.

We cannot clearly understand a subject unless we define its chief terms; undefined terms are used as means of evasion in dis-

cussion:—a true definition of it must be one which agrees with all facts relating to the subject, and may be conveniently stated as a clear perception of existences within and around us. According to to a large amount and variety of scientific evidence, ordinary consciousness is essentially a high degree of activity of the cerebellum or "litttle brain," and this organ is generally recognised by physiologists as being the "sensorium" or seat of feeling. We have no proof that consciousness can exist without nervous substance.

Consciousness and unconsciousness differ only in degree, and merge into each other by imperceptible differences. Consciousness is a part of mental action, and the terms "consciousness" and "perception" are nearly synonymous: it is a complex nervous action superadded to vitality, thus trees live but do not feel; it is a part of life in all animals, and rudiments of it exist in certain plants. It is essentially the same in all nations and all ages; all human beings experience substantially the same joys, griefs, pains, and pleasures in consequence of possessing the same cerebral structures and being acted upon by the same general powers and circumstances; at the same time the varieties of consciousness are as numerous as those of human beings.

II. MYSTERY OF THE SUBJECT.

The subject of consciousness has been greatly mystified by an undue desire to know "the inmost nature of things," but this is beyond our powers; we cannot "realise" the "inmost nature" of any thing, simply because it is so extremely profound, and our consciousness and intellect are so very finite; however much we discover, there always remains a vast amount more to be found; our nearest approach to that of consciousness is, that it is a special kind of motion which only occurs in living nervous substance. To ask what it is "in itself" is an irrational desire; in such profound subjects we must be content to learn all we can, and wait for further discoveries. Its "first cause" is equally inscrutable, for the simple reason that in all cases there must be an earlier cause, and so on without end. When we know more deeply the nature

of the senses we shall more nearly know that of consciousness, because the senses and their organs are the immediate basis of it.

It has also been mystified by an assumption of the existence of a "second self" within us, distinct from our ordinary "self," but the probably true explanation of this "second self" is the occasional separate excitement of one only of our two cerebral hemispheres. We know that memory, perception, observation, attention, comparison, inference, and imagination, are all more or less acts of consciousness:—we also know that by means of dreams, illusions, etc., and inferences from them, that similar phenomena frequently occur but are barely observed within us, and that these slightly noticed cerebral actions tend to influence our conduct in a similar manner to the fully noticed ones:—we have often a faint degree of consciousness of our dreams on waking, but such faintly conscious dreamy phenomena are far more consistently explained by unequal cerebral action than by the hypothesis of a "second self." Such sensorial actions are often unnoticed, either because they too feebly excite the cerebellum, or the latter is either too obtuse or too preoccupied to perceive them: but they are occasionally so strong and persistent in some persons as to haunt them after waking. Dreams are often fortuitous medleys of ideas uncontrolled by comparison and inference, and are probably produced by the cerebral circulation exciting latent imprints of the sensorium in an irregular manner:—they are not, however, always medleys, but are in rare cases consistent series of thoughts and tendencies to action automatically produced under undisturbed conditions. We have in a slender degree occasionally the power of observing and criticising our dreams during their occurrence, but only at great risk of the dreams themselves being interrupted and of this power being disconcerted by the dreams, and this indicates that the dreaming and observing organs are in some degree separate but very nearly related, similarly to the sensorial and cerebral hemispheres by means of their "commisures." Through deficiency of suitable knowledge the ordinary waking thoughts of some persons are much like those of dreamers. The idea of consciousness has been still further mystified by the assertion that it still exists in some occult

form eternally after death:—but if the existence of myriads of "souls" in space is a reality, the omnipresent radiations in space should be affected, and we are far more likely to detect their existence by means of scientific appliances than by our unaided consciousness, because the former are very much more sensitive than the latter.

III. DEPENDENCE OF CONSCIOUSNESS UPON NATURAL CAUSES.

Consciousness depends upon a number of conditions and circumstances, the chief of which is the presence of nervous living matter in a state of motion. The fundamental cause of it is the natural energy of our environments acting through the senses, but the immediate cause is the action of the senses themselves. Nearly all parts of our body, and especially its outer surfaces, are supplied with sensory nerves, and the sensorium is automatically excited through these nerves by numberless external and internal influences; and as these influences are of various degrees of strength, and the sensorium varies greatly in sensitiveness, consciousness is of all degrees of intensity, varying from the faintest perception to the greatest pain or pleasure, from peaceful sleep to raving madness. Its degree depends upon the physical state of the brain, the extent of its excited surface, and the intensity and suddenness of the excitation:—it is the loudest sounds, the strongest lights, the greatest pains and pleasures, and the most sudden of all these, which most excite it; in inflammation of the brain or of its membranes the least sound or light excites it greatly. It is often increased when several senses are simultaneously excited, thus lightning accompanied by thunder is very impressive. The perception of optic images by the eye may be regarded as a part of consciousness.

Consciousness is aroused by a great variety of influences, usually by all those which excite the brain or senses, its most common cases being hunger, thirst, and desire. In consequence of the multitude of causes which affect it, it varies from minute to minute, and each man's brain is in a number of different conscious states in

succession, thus the man asleep and awake, drunk and sober, are very different persons. In ordinary cases the actions of the two halves of the brain blend together similarly to those of the two eyes, but in some cases the same individual appears in inconsistent characters at different times in consequence of inharmonious cerebral action. The degrees of this variation of consciousness in the same human body has in some cases been so great that the "original self" and the "second self" have entirely forgotten each other, and the changes from one state of the sensorium to the other have happened suddenly:—such great changes as these nearly always occur in emotional persons, and are regarded as signs of insanity. As consciousness is not an independent entity, but an active sate of nervous substance, its changes in such extreme cases cannot be reliably ascribed to the existence of two different persons in the same body, but to inharmonious action of the two cerebral hemispheres. Great bodily changes cause great alterations of consciousness: the change from grub to butterfly must be an extreme one.

IV. MODE OF EXAMINING THE SUBJECT.

Further, the rise and fall of consciousness entails other changes, thus the series of cerebral alterations attending an act of perception does not end with it, but leads to other occurrences:—it gives rise to trains of thought, reflex muscular actions, changes in the viscera, etc., or its energy is stored up like the heat of the sun in coal, and accumulates in the system, ready to be expended in action when liberated. In such a very complex subject the human brain is too small to grasp all the phenomena, their causes, relations, and effects, and the best way to arrive at truth in it is not to accumulate a large number of complex personal narratives, but to examine it by the aid of such a theory as agrees with all known facts and all their logical consequences. A suitable theory is supplied by the great principles of universal causation, evolution, motion, radiation, automatism, action and reaction, etc. It has been proved, largely by means of the spectra of substances and by astronomy, that all bodies, human beings included, are in a state of incessant motion,

both internally and in their masses, that they are in a state of continual change of motion, of increase and decrease, growth and decay; that these movements and variations of movement are the essential causes of other changes in all living and dead substances: that all bodies more or less automatically act and react upon each other; that even the different invisible movements in bodies influence each other, thus every substance, whether living or dead, is always sending rays of heat and of other forms of motion to, and receiving such rays from, all other substances, and is thus continually influencing, and being influenced by them; the sun, radium, and magnets are familiar examples:—we know that rays of light exert pressure on solid bodies; and it has been shown by experiments with a cube of lead weighing seventy-four hundredweight that a variety of substances emit rays which affect a voltic cell (see *Philosophical Magazine*, 1897). In these and many other ways every different substance and creature behaves as a different aggregate of movements and as a different machine.

V. DEPENDENCE OF CONSCIOUSNESS UPON NATURAL ENERGY.

We may conclude from these facts and a multitude of others that nervous matter is always moving:—that cerebral motion is essential to consciousness, that automatic action and reaction are universal, that the human machine is largely automatic, and that automatic action in the human body is essentially the same as that in inanimate substances. There is continued action and re-action between man and all things around and within him; all his organs act and re-act upon each other; we are all of us influenced by food, weather, our servants, neighbors, creditors, the tax-collector, by all who know us, and by all kinds of circumstances within and without, and we re-act upon them from birth until death. Our feelings influence our intellect and our intellect re-acts and restrains our feelings: we feel, and by reasoning we know; we know and consequently we feel.

Some of these powers act upon us without our directly perceiving it, thus by influence of food and air we grow, but we do

not feel the act of growth; by that of gravity we are carried through space at the rate of more than eighty thousand miles an hour, without feeling it. Even our volition is no exception to automatic action and re-action, thus we cannot by an effort of will alone prevent feeling cramp, colic, or toothache. The chief natural energies are vastly stronger than man: under their dominion he is like "clay in the hands of the potter," they move him before he knows why, even when he commands he must first obey, and although action and re-action are equivalent in every case, stronger power universally overcomes weaker: in this way man submits to all sorts of pains and calamities, and individual consciousness is governed by national. We fancy that we are governed by a "spiritual ego" within us, because the effects we wish follow so certainly our volitional desires and we cannot detect their origin, but as we cannot create energy we only act when we are acted upon, as when our stored-up energy is transferred or set free by some unnoticed natural change. In nearly every act of volition there is some influence so feeble, or our attention is so preoccupied, that our consciousness does not perceive it, but that does not prove that it is a spirit producing energy out of nothing. The error of believing that "mind" is a spiritual entity is so extremely insidious and tenacious that it deceives millions, including many of the most learned persons. Natural energy acts throngh us as it does through all animate and inanimate bodies, and it is only when our volitions happen to agree with its operations that they succeed; usually we only try to carry them out when the natural conditions are favorable because we know that it is useless to try when they are not. But although we cannot directly overcome natural powers greater than our own, we are stimulated by our failure to indirectly render them subservient to our desires by the aid of suitable knowledge, and this is strikingly shown by the numerous triumphs of science and art.

VI. RELATION OF AUTOMATIC ACTION TO CONSCIOUSNESS.

Various parts of our nervous system may be automatically active without exciting the sensorium, thus the nerves which regu-

late our internal organs are always active, our lungs breathe automatically, the heart beats unceasingly, the stomach digests during day and night, each without exciting consciousness except when diseased, and we even walk to a large extent automatically. Each sense acts automatically when acted upon by its own special causes, and appears to have a locality of its own in the sensorium. Spontaneity and persistency of consciousness, so necessary to professional eminence, depend largely upon training, education, and state of bodily health. The great perfection of expression, direction, and sense-action, which occasionally occurs in our dreams shows how perfect even mere automatic brain-action may be when undisturbed.

Inanimate natural energy is the most fundamental prime-mover in human conduct; it acts whether we feel it or not: consciousness comes next, and intellect the last. We are usually impelled more powerfully by our environments, poverty, lack of food, etc., than by feeling, and more often by feeling and sentiment than by intellect; life is too short to allow us to reason out every action before performing it. Why is intellect so generally weaker than feeling? Simply because it is evolved out of it, and that during this transformation some energy is converted into heat and and lost by diffusion: we know that thinking makes the head hot, and that nearly all transformations of energy are attended by loss. That the origin of consciousness is automatic is proved by the fact that when all its causes and conditions are present and its preventives absent, we cannot by our strongest desire prevent its occurrence; thus we must feel the cold of winter and the heat of summer whether we are willing or not. Consciousness, similar to all other forms of motion, is subject to neutralisation and inhibition by opposing influences; one of the conditions of our being conscious of any particular feeling or idea is that the brain be not preoccupied by a contradictory or a stronger one; thus we cannot attend to a trifling matter whilst fully occupied by an opposite or a serious one; similarly a substance cannot be in two contradictory states, such as hot and cold, at the same instant. This inhibition of feelings and ideas by each other explains the seeming fortitude

of warlike Indians, sectarian martyrs, and others, whilst being tortured; their brains being filled with stronger and opposite feelings and ideas.

Automatic physical action underlies prospective as well as immediate consciousness, "we live, and move, and have our being" in the ever-moving ether; probably everything within and around us, by its motion and properties, produces more or less permanent impressions upon our nervous ganglia; these impressions remain latent, and the strongly fixed ones are always ready to be excited by various causes. The number of such latent imprints must be enormous: it has been estimated that the total number of nerve-cells in the *grey* surface-matter of the human brain capable of receiving such imprints is about 2000 millions, but only a small proportion of these are considered to be used in dreams and conscious thoughts, the others being idle. Memory is aroused by the action of various external and internal influences upon these impressions: and during association of ideas, different parts of the cerebrum and sensorium act upon each other through an endless number of microscopically fine connecting nerve fibres which compose the *white* portions of the two organs. As nervous matter is a very soft solid substance it is specially fitted for receiving impressions, and as it is very mobile and the white nervous masses are full of nerve-fibres, it is highly capable of transmitting them. Of the multitudes of our bodily actions and surroundings continually existing and changing, only a very small proportion distinctly excite our consciousness, and the great bulk of them pass by without notice, though probably not without producing some latent impressions upon our sensorium; these impressions constitute the initiating material of our dreams and of many of our waking ideas.

VII. NERVE SUBSTANCE INDISPENSABLE.

That consciousness is really a nervous action is shown by the circumstance that where nervous matter first appears in the long series of living plants and animals there also consciousness commences: it is further proved by the fact that the greater the degree

of excitability of the sensory nerves and ganglia the greater is that of consciousness. As it only occurs when the excitement of of the sensory-nerves and centres is sufficiently strong, it is essentially a certain degree of sensorial activity. It varies greatly in different individuals; the nerves of some persons are so sensitive that their consciousness, hopes, and fears, vary with each passing cloud. General consciousness is greater and more varied in man than in any other animal, and is more reliable in trained than in untrained persons.

VIII. LIMITATIONS OF ALL HUMAN POWERS.

Man is a very minute part of the universe (all mankind are only about a 100 million millionth part of the earth) nearly all his powers are extremely small in comparison with those of inanimate nature; his nervous system is only a part of his body, his consciousness only occurs in his brain, and fully only during his waking-state. Under the most favorable conditions his perception of sound only extends through a few octaves, and of light not beyond the mere red and violet rays of the solar spectrum. His power of scent is much less than that of the dog, of vision not equal to that of a hawk, and of rays of magnetism, wireless telegraphy, or gravitation, he has no direct perception. The smallness of his consciousness is chiefly due to that of his organism, and that of his intellect is partly occasioned by losses of energy during its transformations from that of his food to that of his judgments. During sound sleep none of his actions or surroundings excite his sensorium, and during his waking-state the greater portion of them are not perceived. He requires time to perceive things, because inertia of the organs has to be overcome, or their excitement to subside; certain periods of time are required to transmit nervous influence to the cerebellum, to feel a sensation, to think an idea, to compare ideas, to form a conclusion, or decide upon an action. It has been found by means of experiments that the period of time required to perform a single act of thought is about a twenty-fifth part of a second. We neither lose consciousness nor regain it all at once, we gradually fall asleep

and we wake gradually from it, and consciousness increases by degrees as our various organs enter into action, similar to motion spreading through a large mass of machinery. We cannot instantly realise all the details of a landscape.

We cannot have all we want, nor simultaneously possess contradictory attributes:—in consequence of the smallness of his cerebellum, even the the most learned man is unable to fully imagine the infinite, the absolute, or the perfect: he fails to perceive the vastness of the universe, or his own immeasurable littleness or feebleness in it: of the immensity of time, space, or energy, he has barely a perception, he cannot even realise the idea of a million years, a million miles, or the millionth of an inch. This extreme narrowness of consciousness entails an immensity of ignorance which affects all our thoughts and actions and is a source of innumerable "evils": In consequence of ignorance we overvalue trifles which stimulate our feelings, and underestimate great things which do not excite us:—a great majority of mankind knows very little about their own bodies, and this ignorance largely results in producing disease, shortening human life, and limiting human progress and population.

In addition to the influence of *size* of the sensorium upon the extent and variety of consciousness, that of its *quality* must be important, because we know that favorable heredity, training, and education tend to produce intellectual ability, refined sentiment, and perception of truth; it is well known that a healthy state of the brain and well-balanced consciousness are necessary to proper conduct. Better quality may more than compensate for smaller quantity and surface of the brain, and a smaller brain may do more good work than a larger one. Great size and surface of brain promote ability by affording a larger receptacle for knowledge, whilst superior quality accompanies better selection and use of it; wisdom is a nobler possession than knowledge. Some persons of very great ability have had very large brains, and some who have possessed large brains have had very erroneous ideas through deficiency of truthful principles.

IX. UNRELIABILITY OF CONSCIOUSNESS.

Consciousness, when imperfectly corrected by training and knowledge, is essentially crude and unreliable, and often a dangerous faculty; it is subject to a great variety of illusions, delusions, and hallucinations: thus a stick seems bent when thrust obliquely into water, and the sun appears to revolve around the earth. The human sensorium occasionally sees, hears, and feels, things which do not exist, and which are merely illusions excited in it by natural causes, such as habit, expectancy, desire, nervous excitement, etc., thus we occasionally hear our alarm clock ring or a knock at our bedroom door, when they do not really occur; or a man whose leg has been cut off, still feels sensations of his toes. We all of us suffer more or less from uncorrected feeling, and the number of human errors, delusions, illusions, failures of memory, accidents and crimes, due to untrained consciousness, is immense. The frequency of disordered consciousness is shown by the great number of lunatics. The only fundamental remedy for these "evils" is discovery and diffusion of new knowledge.

Consciousness is largely modified by our dual anatomical structure, especially by that of our chief nervous ganglia. The human organism is largely double: its limbs and most of its internal organs are in pairs; the sense organs, brain, cerebellum, and spinal cord are each divided vertically into two similar organs or halves, and in each case the single organ or the half one usually acts in place of, supplements, or corrects, the actions of the other: thus a man having only one lung, kidney, or leg, may live:—we can hear better with two ears and see better with two eyes than with one. Similarly we feel and think more fully and correctly with the two halves of the sensorium and cerebellum than with one, provided they are alike and healthy; and it has been observed that "persons suffering from disease of one-half of the brain only, often lose the power of comparing and reasoning correctly." In consequence of the duality of its nervous system, "the chameleon is able to allow one side of its body to lie torpid in deep sleep, while the other side is perfectly

awake," and as its two eyes and optic lobes can act independently it is able to look in opposite directions at the same instant.

Discordant action of the two halves of the human brain largely affords an explanation of the peculiar phenomena of the "second self," double consciousness, and somnambulism. The cerebral hemispheres are not always alike in size or condition, in some cases one is diseased, or is at intervals stronger or more excited than the other. In consequence of this occasional unbalanced power of the brain, the individual is at one period governed more in his thoughts and actions by one hemisphere than by the other, and at other periods the reverse, and his conduct is inconsistent.

The consciousness produced by comprehensive ideas is often less exciting than that due to small personal matters, because the feelings are not involved, and because the greatest truths are frequently inconspicuous:—whilst it is the noisy, violent, and sudden phenomenon which most excites, it is the long-continued, incessant, and feeble ones, which ultimately produce the greatest effect; and small habits, by long continuance form human character. It is similar throughout inanimate nature; given unlimited time, the smallest cause produces infinite effect: thus mountains are washed away by mere drops of rain.

Our unnoticed bodily changes bring us gradually to death; multitudes of persons die prematurely, or become insane by the slow progress of insidious disease, and this is one of the ways by which the powerful influences of nature limit the world's population. We exaggerate the effects of alcoholic over-drinking because they are so palpable to our consciousness, whilst we minimise the more serious ones of over-eating because it requires more intellect to perceive them. In various ways we live in a state of false security through the narrow limits of our sensorium and consciousness; thus national decay is so slow that many persons doubt its existence, or only perceive it after it has largely advanced. As we are largely compelled to be ignorant by circumstances and by our limited consciousness we cannot be fully expected to believe or understand the greatest conclusions of science, and hence we find many persons quite impervious to clear scientific truths. In the midst of all this

the painful effects of ignorance compel us to seek knowledge, but even in producing new impressions on our sensorium by means of scientific research we do not actually create new knowledge but only evolve it out of the evidence existing within and around us, and had we sufficiently extensive and comprehensive faculties we might reliably predict all that will be from all that is:—we already do so in the subject of eclipses and others. Successful prediction is the most certain test of truth.

X. GENERAL BASIS OF CONSCIOUSNESS.

Consciousness is manifestly based upon the actions of the senses:—the senses are founded upon the mechanical, physical, chemical, and vital properties of their organs, and are intimately related to the great scientific principle of universal natural causation, the ever-present conditions of time, space, and motion, and to all the modes of motion, known as heat, light, electricity, radiation, etc. We are conscious because our sensorium and our organs of sense move, and they move because their excitants move, and the stronger the movements of the excitants and of our senses, the greater, usually is the degree of consciousness. We perceive things because they act upon and move us, and we move because we perceive; we are painfully moved by witnessing distress. Throughout nature motion is not created, but only transferred, transformed, diffused, or stored-up; the only cause of motion is some previous motion, and so on without end so far as we know; that which has no motion cannot move our senses nor our muscles. Human consciousness is excited by the same universal motion which incessantly moves all inanimate bodies. All life is motion, and the only way to keep alive is to keep in motion: when we fall asleep we lose movement and are less alive. Heat is a species of internal motion, and the human body produces about three times as much heat during the day as during the night when we are not conscious. All light, heat, and sound are vibrations, they affect our consciousness even when they appear to be uniform.

XI. RELATION OF CONSCIOUSNESS TO CAUSATION AND MOTION.

The relation of consciousness to motion and to change of motion is very profound: the fact that exclusion of light and sound quiets the brain, proves that cerebral movement is intimately related to them. Similar to every other action of material substances, consciousness is inseparable from universal natural causation; i. e., it always happens a minute period after its immediate cause, and this is owing to inertia of the sensorium, etc., having to be overcome:—to arouse it, a movement must be sufficiently fast, but not too rapid, thus the movement of the hour-hand of a watch is not immediately perceptible, and that of a very rapidly revolving axle is also not perceived. Simple unvarying motion has but little effect upon our sensorium; it is only when some sudden change of motion (which is itself a movement) occurs within or around us, and produces an alteration in that organ, that consciousness happens. A mother wakes when her infant cries, but a miller wakes when his mill stops; we only know two new shillings from each other when we can detect some slight difference between them. Very uniform influences make but little impression upon our consciousness; thus we cannot directly perceive the existence of time or space, the great velocity of the earth in its orbit, nor even the influence of atmospheric pressure or of gravitation upon us, and we only know with certainty of their existence by comparing impressions and drawing inferences from their differences. A perfectly uniform electric current is but little perceived, whilst even a feeble one, if slowly intermittent, produces a strong sensation; suddenly varying strong light also strains the sensorium. An electric current varying with immense frequency in opposite directions, as in Tesla's experiments, but little excites the sensorium, because each successive opposite wave neutralises the effect of the immediately previous one before the inertia of the nervous matter has been overcome. The inhibitory effect of opposite phenomena upon each other is universal, and indicates the essential mechanical nature of all action, whether conscious or unconscious.

The very foundation of consciousness, and of all human conduct, whether conscious or unconscious, moral or immoral, lies deep in the movements, properties, and capacities of bodies. All our actions, whether bodily or cerebral, appear to be capable of being represented as in harmony with a perfect mechanical system: and parallels of all of them may be found in mechanics, but the labor of showing this clearly would be great. The neutralising and conflicting effects of opposite movements of masses or molecules upon each other, are essentially similar to the inhibition of feelings and ideas by contradictory ones. If all material bodies were perfectly alike in properties, they would have very little effect upon each other, but as they are all different, and as no two men are entirely alike there is continual conflict. It is differences of conscious impressions and ideas that largely keep mankind in motion, and which cause collision between the advancing and retarding sections, the intelligent and the ignorant, the scientific and sectarian: and we know that bodies moving at different rates or in different directions, cannot remain united.

XII. RELATION OF CONSCIOUSNESS TO CHEMICAL ACTION.

That consciousness is within the domain of scientific experiment is proved by the fact that it can be increased, decreased, or destroyed, by various natural agents; thus alcohol, strong tea, quinine, strychnine, or rise of bodily temperature, increase it:—chloroform, morphia, chloral, trional, etc., decrease it;—whilst a small quantity of prussic acid, or a concussion of the brain, destroy it altogether:—great thirst, or cerebral inflammation produces intense consciousness. That it is intimately related chemically to the oxygen dissolved in the arterial blood of the brain is shown by the circumstances that during excitement of mania, there is great oxidation and waste of brain, the products of which, in form of phosphates, are found in the urine:—the rapid waste of brain also during deep meditation limits the duration of our power of attention. One of the methods of reducing consciousness is by diminished the oxygen in the circulation: thus many animals pro-

mote sleep by covering their noses and breathing the impure deoxygenised air from their lungs. The circulation of duly oxygenised blood through our arteries during the waking-state is a constant cause or condition of feeling, thought, and action. The great fact that consciousness is dependent upon many natural conditions proves that it is itself natural; and we are not morally justified in fixedly believing without evidence that it is supernatural.

Farther:—there is a systematic order of relation between it and other natural phenomena:—thus the sense-organs are evolved out of material food by vital processes, the senses out of the particular structures of those organs, consciousness out of the senses, comparison out of dual acts of consciousness, and inference and reasoning out of comparison. During this series of changes the stored-up energy of food is transformed into vital energy of the sense-organs, that into the energy of the senses; the energy of the senses becomes that of consciousness, and that of consciousness turns into that of reasoning-power through the medium of comparison, which is itself essentially dual perception. In this order energy of intellect is produced, and some heat is lost during the process.

XIII. SENSORIAL IMPRESSIONS.

The sensorium is a storehouse of memory, and an incomplete register of our pains and pleasures. The latent impressions made upon it are fixed by repetition and habit, ready to be revivified by associated ideas, and by the oxygen dissolved in the blood, Much of our happiness and misery depends upon these imprints; if they are untruthful they are liable to produce pain because they contradict each other, and those persons who have a mixture of truthful and untruthful ones, often do not know what course to pursue.

Multitudes of persons suffer in this manner, and are driven to seek consolation in irrational hopes and unprovable ideas, by the clamor of their desires. Under the influence of cerebral excitement and memory malicious persons are rendered liable to suffer from uncontrollable malicious dreams and ideas, and in some cases

have even committed murder and suicide whilst under their influence. The foregoing and a multitude of other "evil" effects due to unregulated consciousness, show the necessity of truthful ideas, proper food, pure air, judicious exercise, and pure blood, to healthy consciousness. It is well known that gout makes the sensorium irritable.

XIV. DEPENDENCE OF MORALITY UPON CONSCIOUSNESS.

The relation of consciousness to morality is very extensive. "As we feel, so we act," unless intellect prevents it. All moral acts are conscious ones, and the conscious state is a requisite condition of all moral action; we are not considered morally responsible for acts performed by us whilst we are unconscious, nor even for those we commit during dreams or somnambulism, nor whilst we are insane:—the compulsory influence of natural causes is usually recognised in such cases, but how far a person is allowed to injure his fellows even when compelled to do so by internal or external circumstances, differs in every different case and depends upon a variety of conditions. Our feelings compel us not only to commit "evil" but also to resist it.

Simple automatic consciousness, uncorrected by knowledge and inference, is frequently a great deceiver, thus we often wrongly estimate magnitudes, numbers, distances, periods, volumes, and weights; we make mistakes with regard to existences, events, persons, forms, colors, and appearances, and this gives rise to innumerable false beliefs, lawsuits, sectarian and political conflicts, wars, diseases, accidents, and crimes. Our senses and feelings afford us a mixture of truth and error, from which we have to sift the truth by means of experiments, comparison, inference, and analysis. The actions of all our limbs, organs, and faculties, are similarly more or less unreliable, and even our most highly corrected scientific knowledge is frequently only approximate. We are all of us in different degrees "blind leaders of the blind," and a large proportion of the pains we suffer and inflict is due to the circumstance that we are kept in ignorance by our very limited powers. Similar to moths flying into the flame of a candle, so we are compelled by our instincts to

hasten unknowingly toward disease, insanity, crime and death. Untruthful consciousness misleads millions, and we are compelled by natural influences to expend much of our time in elaborating and diffusing untruths and illusions, and but little in discovering new knowledge.

XV. DEPENDENCE OF BELIEF UPON CONSCIOUSNESS.

Consciousness and belief are closely allied, as we feel, so we usually believe, especially in difficult subjects: internal and external influences cause our feelings, and these, with or without correction by intellect, determine our opinions; we cannot always stay to investigate. The great advantage of consciousness in causing us to believe and act is its quickness, and that of intellect is its greater reliability; it needs more time to reason than to feel because reasoning requires us to compare two or more feelings or impressions. Consciousness alone produces only blind belief, but reason produces reliable conviction. As reason is frequently weaker than feeling, it is our higher faculties rather than our lower ones which most require stimulating. Consciousness is fallible because it does not compare its impressions but acts immediately upon them; it determines our conduct more frequently than our intellect because it acts wholly automatically; but when it has been properly trained it is often our best guide and produces similar results. Automatic consciousness is like a "ready reckoner," it saves us the trouble of calculating:

> "Reason, however able, cool at best,
> Cares not for service, or but serves when prest,
> Stays till we call, and then not often near
> But honest instinct comes a volunteer."
>
> —Pope.

XVI. LIMITED SENSITIVENESS OF HUMAN CONSCIOUSNSSS.

Our senses and consciousness are very dull in comparison with inanimate agents, a wave of light travels 700,000 times faster than one of nerve-energy, a photographic surface detects thousands of heavenly bodies which we cannot even see with the aid of a telescope;

a bolometer is estimated to be about 200,000 times more sensitive to heat than our skin; a galvanometer can show the influence of one part of chlorine in 500,000 million parts of water, whilst our taste cannot with certainty distinguish one part in a million; a photograph is a much more extensive, minute, and certain record than our brain; and even the process of reasoning can be mechanically performed by means of Jevous's "logical machine." We depend very largely upon the properties of scientific appliances for our beliefs; the microscope, spectroscope, telescope, photography, the kinematograph, etc., have brought a new world of impressions into our consciousness, and as such instruments, processes, and methods are free from personal prejudice, and vastly surpass in delicacy and reliability our senses and perception, it appears highly desirable that they be used for testing the idea of telepathy and the hypothesis of the existence of human spirits in space.

XVII. RELATION OF CONSCIOUSNESS TO TRUTHFULNESS.

The relations of the sensorium and consciousness to truthfulness are of a most practical kind; immovable false beliefs, fixed impressions without evidence, and ignorance or lack of cerebral impressions, are dangerous, and contradictory ones destroy peace of mind. As the sensorium of criminals and insane persons is moved and governed by the same natural influences and laws as those of the wisest men, we are all of us compelled to believe more or less untruth, and are largely unable to get rid of false impressions. Consciousness includes both truthful and untruthful impressions; we often believe, though we cannot really know, that which is untrue; and without proper and sufficient evidence we cannot with certainty know anything. The properly trained sensorium can contain a much larger number of impressions than the untrained one, because its impressions do not contradict each other, and are systematically united together by truthful principles. The phenomena of false belief, unprovable belief, belief without evidence, delusions and illusions, belong to the subject of mental disorders; and the question as to how far we are morally justified in believing

serious statements without evidence, or believing and diffusing unprovable statements in such matters, belongs to the subject of scientific morality. The moral duty of improving our minds by receiving the truths of science is already to some extent recognised. The hopes of the human race depend largely upon scientific correction and extension of consciousness:—the discovery of new knowledge is the starting-point of human progress, and as the possession and application of great truths is the chief remedy for the pains and "evils" of life, original scientific research is a very practical matter, but the process entails a vast amount of labor.

As consciousness and all our faculties are so extremely limited in comparison with the contents and powers of the universe, it is not surprising that only a few persons can fully realise the idea of universal natural causation, or "whatever is, must be" under all the conditions and circumstances, and consequently the necessity of crime, "evil," and conflict. In the continual presence of so much pain and misery in nearly all directions, it is almost beyond human power to even faintly imagine the still further truth that "whatever is, is right," yet both these conclusions must be come to if we scientifically and thoroughly examine the subject.

The chief claims of the foregoing "view of consciousness" upon our attention are:—it agrees with the principle of universal natural causation and with all well-verified knowledge:—it involves no real self-contradictions:—by its agreement with these, and by its self-consistency it gives us confidence in the natural powers which govern us, and imparts greater confidence, courage, and carefulness to all our thoughts and actions:—it affords us consolation by showing that our trials, if properly accepted, are often our greatest blessings;—and by its truthful explanation of the real cause of the shortcomings of mankind it makes us reasonably tolerant towards all men:—but as this view is a comprehensive one, it cannot be accepted, nor its advantages secured without the labor of acquiring sufficient suitable knowledge.

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THE PRAGMATIC INTERPRETATION OF THE CHRISTIAN DOGMA.

A SUGGESTION AS TO THE NATURE OF REALITY.

WHILE the pragmatic point of view is suggestive to many as a working hypothesis, it seems that there is much uncertainty as to the consequences if it is taken as an ultimate statement of reality. It is felt to be a view of things that has a measure of truth but which is at the same time subject to serious limitations. In a word, it is doubtful what sort of a reality it presupposes and with what sort of a reality it is able to satisfy those who follow it consistently. I do not presume to hold any of the illustrious expounders of pragmatism responsible for the interpretation here offered. It is simply an attempt to explain what pragmatism means to me. It is no doubt an inadequate and onesided statement, but this is an evil inherent in all our philosophy and from which there is not the slightest possibility of our escaping. If there is any one point that seems to be a fundamental one pragmatically it is that every thing and all things that we can possibly say are essentially abstractions from and hence inadequate to the reality of what we know in immediate experience.

As a philosophical method pragmatism seems to be primarily an attempt to interpret consistently the world of expereience, its movement and its moments, It is thus that it is distinguished from science, which is concerned with the contents of experience. It is distinct from previous philosophy in that it does not seek to construct by logical processes a reality that lies partially or completely beyond the world of experience. In so far as philosophy has been

concerned with things or contents, as such, its field has not been different in kind from that of science. It has been rather mediæval science, vaguely guessing at what science failed to discover, and finding, as science extended its outposts, that its only ultimate and secure ground was in the sphere entirely beyond all possible experience. It is needless to say that the pragmatist stands for something radically different from this. He proposes to deal with a reality but not one that the progress of science will eventually take from him. His realities are the moments and movements of experience as it deals with the realities of science.

As suggested above, the real, whatever it is, is a great deal larger than can be stated in any formula or series of formulas. Our philosophies as well as our sciences are abstractions, and are therefore true only relatively. We shall try in this paper to illustrate by means of a particular abstraction, the nature and limitations of the real that a pragmatic view of things seems to afford us, and further to show that it is a case typical of all our attempted formulations of experience. By experience we mean not that of the empiricist, nor something present to some absolute consciousness after the manner of the idealist, but rather experience as it is naïvely understood when one says he knows that this task is hard because he has tried it, or as when one says that he can sympathise with us because he has already experienced sorrow. It may roughly be called the world that appeals to us directly, the world in which are our values and in which we work, struggle, aspire, win and fail. No philosophic system or science has ever given us an adequate description of it, nor have they ever stated its meaning as a whole. When the last word has been said we feel that it has all been extremely inadequate as compared with concrete experience. The condition under which alone a scientific or philosophic statement can appeal to us with any force is that it be taken in a context similar to that in which it arose. To take an extreme case, the theory of Thales that all things are made of water, would not seem as unilluminating to us as it probably does, if we could reproduce a concrete situation similar to the one that led him to make his famous hypothesis. Philosophic and scientific systems are then simply formulations of some

particular aspects of experience that have for some reason come acutely to attention. The reality of immediate experience seems to fall apart, its elements to be in conflict. We seek a statement to bring together the conflicting elements and the statement is valid in so far as it does this and no farther.

It is a matter of indifference what we have to say about the more ultimate meaning of our working hypotheses. We may say, if we choose, that because this or that hypothesis works, in so far it is a correct statement of the nature of the ultimately real. Functionally the working hypothesis has no claim to being a statement of ultimate reality beyond its meeting this crisis or others similar to it. It may also be noted that there is no appeal from immediate experience or from that which resolves its tensions. The only way to discredit the former is to bring forth another experience that is more immediate or of wider extent.

Suppose for a moment we assume that there is a reality beyond that of our stream of experience, or possible experiences; a reality that is supernatural or at least greater than our experience but of which our experience is in some way a part. Concerning this hypothetical larger reality we may make a certain supposition on the basis of which there is sought a control of some present tension. It is assumed that there is something real that does not fully enter into experience but which must nevertheless be acted upon if that which is in experience is to be dealt with adequately. The theories of atoms and their modes of combination within the molecule are illustrations of the legitimacy and necessity of this type of assumption in physical science. The religious consciousness furnishes a similar illustration. Here also there is the hypostatising of an order of existence that does not enter into immediate experience. There is a supposition of a universal moral order, of a supernatural being or beings that have some connnection with the process of our experience. Particular things are undertaken on the strength of such moral order or of such a supreme being. A crisis or problem arises which to the religious consciousness seems inexplicable except on the supposition of a God who is just, or jealous, or loving. It is clear that the only basis for such an assumption is the presence

of a real experience which seems to demand some hypothesis to make it intelligible. All may not agree that the particular hypothesis offered is a satisfactory one, but that is immaterial here. Manifestly the point of emphasis is the experience that is to be made intelligible and only secondarily is a more ultimate form of existence implied. It is because the emphasis is where we have indicated that it is maintained that the true function of philosophy is to attempt a description, not of some more ultimate reality than that present in our finite experience, but rather the exact and objective conditions under which hypotheses appear and their relation to the onward movement of experience. Strictly speaking, aside from our world of experience and its successful hypotheses there is no more ultimate existence as far as philosophy is concerned. We may here recur to the fundamental limitation of all thinking to which reference was made above. Restated briefly it is this: thought and the products of thought are to be interpreted, and hence are valid only, with reference to certain crises or tensions that arise in action. It is not permissible to take the conceptual machinery thus evolved and hold that it gives us a cue to the construction of a reality beyond experience. The concepts of the chemist are true because they enable him to control his reactions, but he has not the least right to assume that he has therefore in them an account of the ultimate nature of matter. They give an account of it only as it is concerned in practical experiences of the sort with which the chemist deals. It is an almost universal tendency, however, to take these statements that seem to give us definite control under specific conditions and to generalise them into dicta about absolute existence. As opposed to this tendency it is here maintained that our concepts are only functionally valid and do not refer to ontological realities. All our realities are of the functional variety. They *are* realities *because* they serve these definite functions, and for no other reason. Some of them have a wider variety of uses than others and hence appear in a greater number of our practical experiences. As such they seem to have a high degree of objectivity. "Objective reality" is in fact our name for those elements which appear in the greatest variety of situations and mediate the most varied experiences. Such

a statement does not dispute the reality of the world but simply tells in what it consists. It amounts simply to this, that whatever else reality may be, as far as we are concerned, it is something involved in the onward movement of our experience and all our descriptions of it are with reference to its function in this onward movement.

This functional view of reality is very suggestive when applied to the facts of the religious consciousness. The religious attitude is of all others pre-eminently a practical one, that is, it is primarily concerned with the conduct of life. An examination of it, from this view-point, should be practically suggestive in these days of religious reconstruction. It should throw light upon the vexed question as to the place and authority of the dogmas of past ages in the modern religious consciousness. It is worth while to inquire whether they should be rejected *in toto* as false or whether they have a certain validity, and if so, what. Does the dogma of the Trinity, for instance, have any claim from this point of view to being a valid statement of the being of God? We should note first the context in which some of these dogmas originated.

It is well known that New Testament Christianity was not dogmatic but practical. That is, it did not promulgate the dogmas of a system of religion but was the exponent of a certain manner of life. "The teachings of Jesus do not appear in a systematic form, but in terms of life and social relations. It requires laborious research and reconstruction to formulate them into scientific statements. Neither do the apostles present the Gospel in a theology, although doubtless they come nearer to it than Jesus does, and that is why theology took its point of departure from them rather than from Christ. But still, even with them, while the theological material is more accessible, there is no systematic arrangement nor attempt at true philosophical explanation. They wrote for specific practical purposes, and always massed their teachings so as to bear upon the end in view.... The New Testament is a book of religious truth, not of theological science; and it is content to state this truth in its practical aspects, upon the sole authority of Jesus Christ, and

not because its philosophical foundations have been worked out and approved."[1]

"The distinctively theological interest which first began to make itself strongly felt in the church during the second century centered immediately in Christology and the doctrine of the Trinity. These doctrines were converted into dogmas by the first six general councils....They are justly called the Greek contribution to Christianity, for they were born of the Greek spirit, and their form and development were decisively determined by Greek philosophy. That these dogmas soon ceased to be living issues and to find a place in the interests of men, did not disturb their theological authority, but rather strengthened it. The fact that they became petrified made them an all the more satisfactory, because unshakable, foundation for a church that was built upon the traditions of the past."[2]

It is this development of practical belief into dogmas that we wish to examine. There are a number of problems involved in such an examination. One of them is our tendency to generalise our practical concepts into statements of ultimate reality. Does such a procedure render them of more practical significance, or does it rather indicate that the practical need that called them forth has vanished, and that new needs have taken their place? We hold that it was not merely because the Church came into contact with Greek thought that its practical concepts were turned into dogmas but that it was due to a certain peculiarity of the development of experience. Another problem is as to the legitimacy of such a generalisation and the implication as to the reality of the resulting concepts.

We may use the doctrine of the Trinity as our first illustration. As we have seen, it does not appear as a dogma in the New Testament, for primitive Christianity was concerned with the concrete problems of life. Thus the concepts on which the dogma was later founded and which are to-day interpreted in the light of the dogma, were essentially the expression of definite practical situations and problems. It is true the idea of the Trinity was present, but purely

[1] Osborn, *The Recovery and Restatement of the Gospel*, pp. 171, 172.

[2] Osborn, p. 75.

as a practical concept. It had developed in the centuries immediately preceding the Chrisian era under the influence of Greek thought. It grew out of the notion that God could not act directly upon the world but only through certain intermediaries, as angels, his word, his spirit, etc. Hence when anything occurred which seemed to demand the explanation of supernatural influence, it was natural to attribute it to the spirit of God or to his angels. In this form it is not a dogma but simply a working concept that is in harmony with the current notion of God.

This is certainly the context of its appearance in the New Testament. Wherever the Spirit is mentioned it is with reference to just such practical problems or crises within experience, problems that demanded some sort of explanation. For example the mysterious conception of Mary is explained thus. The baptism of Jesus differs from that of John by the presence in it of this divine element. Certain peculiar states of mind, or changes of mental attitude that seem to transcend experience come to attention, and these are interpreted as caused by the Holy Ghost.[3] That it is essentially a practical concept comes out most clearly when Jesus seeks to allay the sorrow of the disciples over his departure by promising the Holy Ghost as a comforter in his place. In no case do we find reference to the Spirit except when some real or conceived situation of life is in the foreground. If with their peculiar heritage of thought these practical situations were met in the light of such a concept of the relation of God to man, we shall certainly not wish to deny its validity, but to maintain that it was essentially illogical to turn this doctrine into a dogma and postulate as ontologically real what

[3] As examples note the case of Zacharias cited in Luke i. 15, 35; that of Elizabeth in the same chapter, 41, 67; that of Simeon, Luke ii. 35. So also through the concept of the Holy Ghost is explained the state of mind that lay back of otherwise unaccountable actions. Thus in Acts iv. 31, "They were all filled with the Holy Ghost." It is a means by which one may be endowed with wisdom, Luke xii. 12; an assistance in defending the faith, Mark xii. 36. It is the agency by which one's entire mental attitude may be changed, as in Acts viii. 15, 17, 18, 19; x. 44, 45, 46; xi. 15-16; xv. 8; xix. 2-6; Titus iii. 5. Prophetic power is to be explained by its presence, Luke ii. 26; iii. 22. Our own attitude of life is modified by it, Romans xiv. 17; xv. 13; 1 Thes. i. 6.

had reality only as it served certain functions in concrete life. How could its practical significance be enhanced by its being generalised into an ultimate view as to the nature of the person of God? Every thinker must feel that the reality of God is far greater than can be crystallised in any such relation of son, spirit, and father. Such concepts are simply ways of making his infinitude come into working contact with our life. If the concept is recognised as a working one then succeeding generations with a different intellectual heritage and a different practical conception of God are not so likely to have the older point of view forced upon them. As we change, and our problems with us, it certainly is by all means likely that our interpretations of events should change also.

As with the question of the spirit of God, so with that of the Son. His significance was certainly a functional one. Whether we take the standpoint of those of his time who expected a Messiah or that of the Christian world of to-day, we must admit that he was significant to them and is significant to us primarily because he is conceived as the mediator of certain definite experiences. With the modern Christian the significance of Christ is certainly as an interpretor of God. The phrase, "What would Jesus do," however objectionable it may be, is at least evidence of this attitude. The dogma as to his metaphysical relation to God is meaningless except in so far as he is also functionally real. If the orthodox could only realise that this is the point of primary import, there would be less useless controversy with the more liberal believers. On the other hand, the liberal needs to realise that this tendency to crystallise a functional reality into a dogma is not mere perversity but itself needs to be explained and located and is no doubt an unavoidable peculiarity of the movement of thought.

In the New Testament times it is of course true, as every one knows, that the followers of Christ conceived him rather in terms of a definite earthly mission, more or less, of course, in the light of the earlier Jewish notions, and by no means as bearing a certain metaphysical relation to God. He bore a definite relation to the glory of Israel, if not temporarily, at least in a spiritual sense. The conclusion is then that both the son and the spirit were originally

the embodiments of certain practical attitudes related in a certain way to the tendency that became prominent among the Alexandrian Jews to exalt God infinitely above all that is earthly, human, and imperfect, even above all human conception. "From the idea that God is absolutely incomprehensible and infinitely exalted flows the other that man cannot enter into direct relations with him, that he can neither know nor tell what he is."[4]

"This idea that God is infinitely exalted above the world and without direct relations with it, necessarily led to the recognition of intermediate beings, through whom relations might be made possible."[5]

The point of the whole discussion is simply that there existed at that time a certain attitude of mind that could best view its onward movement in terms of son and spirit, and God himself could likwise be best conceived, and no doubt always can be for that matter, as a father. It is further held that these concepts interpreted to the believer certain practical situations, gave him their value, so to speak, and hence freed him for further action in similar directions. We do not question but that such an attitude may still exist and hence demand such concepts for its expression. But the point of emphasis, in any case, is upon the tension within a certain type of experience, rather than upon any reality outside this tension. It is only when the specific need has passed, or at least is no longer realised acutely that the conceptual tools are brought into clear consciousness and come to be regarded as having a reality of their own. It is then that the functional reality ceases and the dogma takes its place. If a certain type of mind finds the concept of the Trinity significant, it is certainly a significant point of view, but it does not follow, as has already been said, that because it is true functionally it is also true without reference to any function, that is, ontologically. To hold that it is, is to commit, as it seems to me, a supreme philosophical fallacy. Our only realities are functional realities. If there are others we know not of them.

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[4] Piepenbring, *Theology of the Old Testament*, p. 250.

[5] *Ibid.*, p. 250.

This point of view may be applied with profit to a number of other Christian doctrines. I quote directly from an article by H. Barker in the eleventh volume of the *Intern. Journal of Ethics.* Traditional religion embodied "a great religious or ethical conception, that of a suffering saviour-god. Such a conception appealed directly to faith; it was a gospel of salvation that told of a divine love and pity greater than it was possible to hope for, and summoned men to strive with all their energies to be worthy of their God. Such a gospel was worth believing. It was a true object of faith, and its moral grandeur was a legitimate motive for faith. On the other hand the traditional creed set forth certain miraculous or supernatural facts which guaranteed the reality of its ethical conception." Barker ilustrates the above point as follows: The essence of the belief in the resurrection of Christ on the religious side is the conviction that the personality of Christ has a spiritual value which constrains us to think of it as eternal. A universe in which it passed away and lesser things remained, would for the Christian be irrational. Now this conviction can as little be proved by any ghost-like appearances of Christ after his death as it can be refuted by their absence. If such appearances counted for anything they would be as important in the case of any other man of whom they have been asserted....The truth is that the Christian's religious conviction about Christ craves for some visible sign and confirmation of its truth, and the resurrection seems to faith to be such a sign. The error lies in turning a symbol which only faith can apprehend into the very premise by which the faith itself is proved.... Thus when the symbol begins to be used as a logical premise we may be sure that the faith has lost its intrinsic certainty and is seeking to quiet itself in some outward and inferior guarantee." Putting this point in the terms that we have been using, we shall say that when the practical situations cease to be acutely felt the mental attitude that belonged with them in a manner holds over and finds its guarantee, no longer in its practical efficiency in a certain type of experience, but in the unconditioned reality of that which before had been real only because it had proved itself practically valuable. The intrinsic certainty referred to in this state-

ment of Barker's is the same point we have made regarding all practical attitudes. Intrinsic certainty is the fundamental characteristic of all practical experience. Abstract the experience from the situation that caused it to differentiate and these specialised parts are left as it were in the air. Hence the attention is fixed upon them and they are held to be valid in themselves. This attitude is represented in many types of emotional experience. The virtuoso in the sphere of emotion has abstracted his feelings from the situations in which they belong, in which they have been in consciousness only as contributing to an end toward which the whole experience is moving. He has abstracted them, we repeat, and brought them to the focus of attention, in other words given them a validity of their own. It seems to me that this procedure is strictly parallel to the one we have been discussing in the religious sphere.

Barker continues, "Consider the belief in the miraculous birth of Christ. The absence of any strictly logical relation between the supernatural event and the religious doctrine which is connected with it is here more patent than ever. That Christ was born into the world in a preternatural way is in itself no proof at all that he was an incarnation of the deity, although, of course, to one already convinced of his divinity the miraculous birth has a certain fitness as a symbol." As Barker further points out the symbol has a certain function, for faith comes in pulsations, that is the practical situations in which the symbol is significant are not always at hand, but the attitude of readiness to meet them must be preserved intact and this is the more possible if the tools of the attitude can continue to be held in the foreground. The mind is thus kept accessible to the influences by which faith can be revived. "The Christian whose faith had grown weak attributed the lack of faith to himself as a fault, because he did not doubt that the objects of faith were there to be apprehended, although he could no longer feel their reality and truth for himself." In other words, we represent the values of our past experiences by means of the conceptual machinery they involve, apparently because it can be most easily isolated. The mental concomitants of a practical attitude can never be isolated and still be expected to retain their original nature. It may be the

only way we can represent to ourselves that we have had the experience but we must nevertheless not forget that this conceptual framework is not the original experience. The only reality the conceptual structure or system of dogmas has, its only validity is, in pointing to a time when practical situations *were* very acutely felt.

The significant characteristic of the practical situation is that it is immediate and its reality needs no logical proof. No theory of the universe, no philosophy, can disprove this fact of the immediate appeal of the practical crisis, and its total independence of the necessity of any logical support. As soon as there is felt to be necessity for proving the attitudes involved, the situation itself has passed away. The whole force and significance of the concepts and attitudes depended upon the undisputed presence of the practical situation. Thus "the supernatural facts embodied in the creed do not need to be *disproved* to lose their peculiar value. This value is already lost when they can be reasonably *doubted*. Their peculiar function is gone from the moment they appear to be doubtful."[6] That they are doubted means that they are isolated from their functional place in experience, that practical needs have changed, and hence that different systems of concepts are now needed. The only way to prove any claim of theology is to show its vital relation to the crises of life. No one was ever convinced of the truths of religion in any other way, nor has any one who has believed them from this side lost his faith by mere ratiocination. If such an one has lost his faith, it has been because its vital contact with his life has had ceased and the work of reason is simply to show that what is left was dead. Our point, in a word, is this, that the reality of a practical situation is recognised immediately, and its tools are in the same immediate manner regarded as valid solely because of their functional connection with the situation. There is no other way to prove their truth and to attempt to do it otherwise is to admit that they have lost their functional value and hence are false.

It is suggestive to apply this point of view to the doctrine of the second coming of Christ. There is no question but that the expec-

[6] *Ibid.*, Barker.

tation of this had a very important place in the thought of New Testament times. It is an excellent illustration of the evolution of a belief according to the theory here presented. The Church of to-day, obliged to admit that the early Church was mistaken in the particular form in which it held to this belief, holds it now in a modified form. But in a sense the early Church was *not* in error. This belief in the second coming of Christ was a part of a more general attitude toward the world and human conduct, and as such it served to mediate a definite practical attitude which was then significant. When this appropriate context disappeared the belief was left stranded and in the eyes of later ages it was manifestly a mistaken one as far as ontological fulfilment went. But the conviction that it stood for an ontological reality has led each generation to reconstruct the belief on a basis that at least offered a possibility of fulfilment. What is true of this particular belief is true of all others referred to above, except that in this one its falsity when taken out of its context was so self-evident that it had to be reconstructed if it were to continue to be believed. Of the other dogmas it was not so evident that they were meaningless when thus isolated, and hence they were more easily adhered to in unreconstructed form.

It is likewise as regards the doctrine of inspiration. The individual who finds in the Scriptures a key that interprets his ethical life asks for no other proof that they are inspired. But the so-called logical proofs of inspiration never convince any one because when such proofs are offered it is evidence that inspiration is now taken as a fact out of connection with the actual unfolding of experience. It is notorious that no argument for the inspiration of the Scriptures, for immortality, or for the divinity of Christ is convincing to any one who does not believe in them already as facts of immediate experience.

In conclusion we may repeat what was stated at the outset, that there is a fundamental limitation to all our thinking. This limitation, however, in no wise invalidates it as some have assumed. There is no better proof of the validity of thinking than that it *does* solve the crises that arise within experience, and that experience

does move on. Thinking is for no other purpose. There is no such thing as absolute thought, for thought is essentially a process of abstraction from an undefined matrix of possible experiences for the solution of particular crises. It means by its very nature that some things are slighted and some overemphasised, but it is justifiable because of the particular tension of the situation that demands solution. If this is the nature of thought it is manifestly invalid to hold that the tools that it creates for the solution of this tension are valid instruments for reality as a whole. That which relieves the tension is undoubtedly an aspect of reality, but it is true of the whole only as the whole is in contact with the particular. We have illustrated this limitation by the evolution of some of the Christian dogmas. The field of religion offers excellent material for such illustration because its attitude is primarily so immediate and practical, and because in it more than in any other there has been a tendency to give the conceptual machinery of this practical attitude an independent validity, thus imposing upon one age the tools that were useful only in ages long past. The evil of such a procedure is, of course, that the new generation mistakes the meaningless intellectual machinery for the essence of religion itself and is in danger of rejecting both together. Respecting this view of truth in its general significance, the words of Barker are significant. "It will hardly be disputed that whatever may have been the shortcomings of primitive Christianity, it was sufficient for the needs of the early Christians."[7] This is the most that can be said of any attitude of mind, of any system of concepts, of any theory of things, and this only can be said. If we attempt more, we drift into speculations of which it can only be said, "They may be true, for aught we know, but we certainly do not know."

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[7] *Ibid.*

ON THE NOTION OF ORDER IN THE UNIVERSE.

MEN have always been struck by the fact of the regularity of astronomic occurrences, and also, though in less degree, by the alternation of the seasons on the earth, which depends upon these celestial movements, by the reproduction of living creatures, whether vegetable or animal, in conformity to their specific type, and, finally, by the repetition of a thousand common phenomena of heat, light, electricity, or affinity under similar or analogous circumstances.

Through the observation of these phenomena there is introduced to our minds the idea of order, and at first this idea signifies periodicity, constant recurrence, because of the aspect of phenomena which impress their first or most obvious mark upon it. But analysis soon shows that this is only a crude and superficial mark; an appearance of stability hides from our short sight the incessant changes of the universe.

Even in the movements of the heavens we discover inequalities and perturbations. The solar system, to which we belong, is but a dab of matter wandering among millions of systems which people space. Imperceptible internal modifications in the course of time alter the relations of velocity and mass within it so as to disturb the economy of the whole; nothing recurs constantly in the same number and form, and we are forced to recognise that the periodicity of these astronomic movements, regular as they seem to our brief observation, is only relative and depends probably on wider systems of periodicity whose rhythms and times we know not,

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*Translated from the original manuscript by W. H. Carruth, University of Kansas.

In physical and chemical phenomena,—and in the end everything is reduced to the relations comprised under these two names, that is, to the laws of the constitution of matter,—things present themselves to us under this same double aspect; on the one hand, the constancy of the qualities of matter and the permanence of its laws; on the other hand, the diversity of circumstances, the accidental conjunction of the conditions which cause this quality to manifest itself or that combination to result; here the most rigorous determination, by which every fact is what it is; there the contingent element, that is to say, the seemingly fortuitous concourse of series of events which might not have come about in this particular point of space and at this particular moment of time.

The notion of order would be reduced, then, to this: that the same causes always produce the same results. It would mean the necessity of the consequences under equality of conditions. But it would not do to understand this in the narrow sense of periodicity, as implying the inevitable recurrence of the same conditions, the recommencement of the same phenomena without assignable or possible limit.

As far as we can comprehend it, the world seems to us to be organised for the sake, in a word, of variety, rather than for repetition. The very constancy of the laws permits all the possibilities. When we consider that every substance has its particular properties of density, expansibility, radiation, conductivity, etc., and its fixed equivalent of combination; that for every gas, for instance, there is a critical temperature, below which this gas resists all pressure, and then, that at this temperature pressure on the contrary turns it into a liquid; if we reflect upon the interdependence of all facts, so that the very least action is re-echoed throughout the universe, then we shall comprehend without difficulty that the possibility of new arrangements in it is indefinite and so enormous as to transcend all efforts of the imagination.

And yet, science succeeds none the less in its generalisations. The three domains of light, electricity, and magnetism, which formerly were separated, are to-day united. Thermodynamics, limited at first to the study of the expansion of bodies and to their changes

of condition, now comprises the theory of thermo-electrical phenomena. Immutability, which was formerly regarded as a mark of the class of chemical facts, is doubtless so only in appearance, and the difficulty of finding a mechanical explanation for these facts is due solely to the extreme complexity of the elements under consideration. Moreover, the essential point for the success of our theory is that the relations established among objects supposed to be simple remain the same when their complexity is recognised.[1]

Thus the great variety of possibilities is not a lack of order, since human intelligence manages to find its way among them, being guided by the permanence of elementary qualities and by certain simple principles, such as that of the conservation of energy and that of least action. It is not a lack of order, since the success of our hypothesis depends on their very simplicity. The scientist, after the manner of the poet, imagines analogies, and only those are fruitful which enable him to figure out a connection between series of facts which had appeared to be disconnected.

II.

The living world presents the same contrast. A miracle, which is repeated every day, strikes our attention here at once: I refer to the constant reproduction of beings by generation. In spite of accidents, this is accomplished with regularity for each species. From every fertilised egg there comes forth a new animal of complex organism whose acts are spontaneously co-ordinated with reference to its purpose, which is to live. And the typical form of each creature is so indelibly fixed in the egg or in the seed, faintly differentiated as their germs are to our eyes, that it always develops as the same in its essential characteristics as soon as the favorable conditions of æration and temperature coincide.

As a consequence of these very facts, when we consider the variety of structures of the vast number of creatures and their succession in time, in which is revealed in the whole the growing complexity of their mechanisms, the hypothesis is forced upon us

[1] Poincaré.

that the successive,—if not progressive,—variations of these mechanisms could not fail to correspond to mutations in the conditions of existence. Definite variations, although of limited scope, are produced under our very eyes: the probable causes of them are known to us,—modifications of the environment, the struggle of the organism to adjust itself to new conditions, selection, the inheritance of acquired characteristics. It is even possible for us to add to the work of nature, by making these means serve us in our own experiences.

Over against a relative constancy, here also appears the accidental, the casual. Whether it be transformation or creation, the spectacle is the same in both cases. But the intervention of the casual, that is to say, of the new, of realised possibilities, is subject here in the living world to the law of constant development comprised within the limits of a definite periodicity, which is the life of the planet itself, whatever be the actions which have supervened in the course of this development.

Low temperatures, as has become known lately, diminish the resistance of metals to the transmission of electricity in such proportion that an extremely strong current has been successfully made to pass over a conductor of the smallest diameter, after it had been cooled by plunging it into liquid air. This fact helps us to comprehend how, in an egg, a little vesicle of only a few hundredths of a millimeter in diameter nevertheless contains all the properties necessary to the development of a living being, and at the same time holds in concentrated form all the states of being of previous generations. Furthermore, since such an extremely small quantity of matter suffices for the development of vital energy, it enables us to realise what varied aspects life in other planets may present, what superiority of organism other humanities peopling other worlds might possess.[2]

Moreover, is it not a sufficient explanation of such a variety, that the life of higher organisms results from the harmonious activity of hundreds of thousands of living elements, while these ele-

[2] D'Arsonval.

ments are in their turn the result of reactions of hundreds of thousands of atoms?

Thus in their realm the domain of the possible is equally unlimited. At the same time that she is repeating herself, Nature does not weary of producing anew. A like law of simplicity is found, as one may well believe, in this diversity. Science succeeds here also, in guiding herself by a principle which is analogous to the principles of the least action and the conservation of energy, that of finality or teleology.

The more one studies at close range the physiological machinery, the more one is struck by the adaptation which exists between the various organs and their function. From vegetables to animals, from the humblest creatures to the highest, there are revealed delicate adjustments and proportions which one might consider intentional. Teleology, one may say, is a hypothesis inseparable from the investigation of life; it is a monster which we exorcise but do not kill. Science cannot dispense with it, even when she rejects it under this name; if she is ignorant of the use of a piece of organism, she applies herself to discover it; and these precise determinations of vital adaptation constitute physiology itself.

It is doubtless possible to reverse the proposition and say that the eye was not made to enable the animal to see, but that the animal sees because eyes came to it. At bottom this is only a childish equivocation, for the miracle then consists in attributing to the predestined or fortuitous play of physical and chemical laws the formation of an apparatus so complicated as that of vision, with its parts so specialised and so precisely adjusted: the transparent and lenticular media, the retina, the motor muscles, the specialised nerve, the rods and cones, the sclerotic and choroid membranes. And this miracle is renewed in constant variety for each of our senses, for our apparatus of locomotion, for our viscera, up to the ultimate marvel of the brain, in which is produced the consciousness of self.

No less striking is the picture of the adjustments of life if we consider the ways of animals, the curious habits of bees, for example. They all adapt themselves to one end, which is the success of the hive and the preservation of the species. They do not repeat

themselves in an automatic way; they vary according to circumstances, and their keepers know how to arouse, or to utilise to their own profit, these intelligent variations of instinct.

It is true that we are dealing here with machines already perfected. The aspect of the matter is different if we consider the phenomena of elementary life. Teleology in cells or plastids seems reduced to simple reactions. But the sequence of these reactions in the course of development is none the less worthy of remark. It will be useless for us to trace back the intelligent act to the instinctive, instinct to the simple reflex, the reflex to the chemical reaction, and to imagine the successive stages of this astonishing evolution; we shall not have eliminated for all that the essential problem of the co-ordination of the reflexes with reference to an end which is the same in every instance, and whose interpretative value is never zero or negligeable for the scientist.

In sum, and without wishing to draw any premature inferences from this principle, it remains true that the biologist in his turn, in beginning the study of life by studying its elements, takes for granted the unity of the living world, as does the physicist the unity of the physical world. Between these two worlds there exists without doubt a hiatus; the gulf appears impassable when we consider only the phenomena of the life of higher organisms. It is less profound when we descend to origins; science does not despair of connecting the facts of elementary life with the general properties of matter, and the success of such an attempt will be the clearest testimony that can be furnished of order in nature. For we can suppose and affirm it to exist there definitely only in proportion as it exists for our minds and is formulated in our knowledge.

III.

The reactions which constitute the life of a plant, even if they can be reduced to laws of physics and chemistry, are none the less a unique phenomenon compared with the simple reactions of inorganic matter. Still more delicate are the reactions of animate beings, in proportion as they depart more and more from the type

of vegetative life: sensibility, consciousness, volition, increase with complexity of organism and abundance of forms, and here we have an ultimate transmutation of energy whose scope is assuredly considerable in the economy of the universe.

The results of co-operation, so remarkable even in the communal life of the lower animals, take on their true importance in communities of human beings. Here we see individuals springing from one another yet retaining more or less resemblance, in the same manner as plants and animals. Something, however, changes in them, their morals or their mentality, and these inward changes are expressed outwardly by entirely new relations which are made effective in some other way. The same aim which governs the animal world has impelled man to his social arrangements, and this aim is living, the satisfaction of all demands of life. But we also see how in society he becomes more the master of the conditions of his existence.

Something of initiative seems, then, to be thereby introduced into the necessary train of events; a great complexity of facts is met by an increasing contingency whose maximum is found in the thought of man; necessity, if I may say so, is transformed to a free and reflex action in passing through our consciousness.

One of our most learned philosophers[3] recently opposed to the theory of evolution that of dissolution. He very ingeniously showed, supporting his argument frequently with strong proofs, that all things in the psychological and social order as well as in the mechanical tend toward assimilation, not to differentiation. The actual course of events in the world would nevertheless be such that we should still be permitted to predicate an opposite course. Dissolution and evolution doubtless represent only phases of a universal rythm whose ultimate reason we do not know, and it remains admissible to postulate periodicities of immense duration, into which would fit our phenomenal world, perpetual new beginnings offering constantly new combinations regulated by the same general laws, the same determinism which perpetually governs other contingencies.

[3] M. André Lalade.

To resume, the constitution of the world appears to us to be such that the domain of the possible has no limits there. The variety of phenomena is so bewildering even to the human mind, that the success of science in this field has been doubted. It is undermined on one side even while it is being built up on the other.

In truth, science would be impossible if there were not, in spite of all, stable relations in nature. It would be impossible, furthermore, if there did not exist a general system, a direction of evolution, reaching even to communities of human beings, and it is upon the hypothesis of such an order spontaneously sprung from common observation, that the knowledge of psychological and social facts is founded.

IV.

Death is necessary to life. We see creatures, from the least to the greatest, struggling among themselves for the means of existence, devouring one another for food, or destroying one another for the sake of gaining more room. The economy of our world is as hard to comprehend without this law as it would be without the equilibrium of seasons, winds, and waters. But our sensibilities revolt at that which our reason explains: and this disagreement enters into our judgments. Justice, goodness,—whence do we derive these ideas which rise above the mere resistance to pain? How does it happen that we are constituted so that we oppose our ideals to the fatality of things and labor to subdue the forces that govern us? In whatever way this attempt is interpreted, it remains true that man is also a part of nature and that his reason, weak as it is, can and must have its place therein. The laws of our sentiments and of our understanding are not our work; they constitute a part of the great whole. Our inner logic must conform to the logic of this universe in order that it should be depicted thus in our brains. The consciousness of self cannot be pure accident, the individual a nullity, the intelligence which reflects the world a fleeting gleam; and hence our attention is fixed upon the vast extent of an horizon which one cannot narrow down without lessening his own function as a thinking man.

In the class of physical and chemical phenomena we have seen only constant and necessary relations: no system seemed invariable except alternating and compensating destruction and recomposition.

In the phenomena of life we have perceived a law of adaptation: a development, or progressive course, across specific or individual cycles; the action of an internal finality which groups and directs for a time the uncertainties of general conditions. But the purpose is perceived only from without, interpreted with reference to the needs of the mind which conceives it; and the purely psychological problem of teleology remains to ascertain whether consciousness precedes adaptation, or whether it follows and accompanies it.

In the class of social phenomena there appears, over and above an end perceived and desired and a perceptible order, the consciousness of a plan, the idea of a higher control exceeding the limitations of simply biological beings. But the conception of such a plan is founded only upon an analogy between our thoughts and a thought in the world; nevertheless it is permissible, since it is innate, since it is realised in part by our own efforts, and since we ourselves are comprised in this universe. It is the definition of the plan, of the desired order, which remains impossible and chimerical, apart from what we conjecture and imagine concerning our own destiny.

Constant relations, an order, a plan, such, then, would be the stages of the philosophical hypothesis. We follow them up to the last, in spite of our reservations, when once we have reached this critical point where our inductions exceed our data, and the mind with difficulty resigns itself to not crossing this indeterminate frontier which separates verifiable conjecture from that which cannot be verified.

LUCIEN ARRÉAT.

PARIS, FRANCE, 1904.

CHINESE SCRIPT AND THOUGHT.

COMMUNICATION OF THOUGHT.

IN China the most ancient mode of recording thought was accomplished by *chieh shêng* (結繩) or "knotted cords," which is alluded to by Lao-Tze in his *Tao Teh King*, 道德經,[1] (written in the sixth century before Christ) as the ancient and venerable, though awkward, mode of writing, and also by Confucius in the third appendix to the *Yih King*.[2]

All detailed knowledge of the use of knotted cords in China has been entirely lost, but we can easily understand that it was a mnemo-technic method of remembering data of various kinds and communicating ideas. The same practice prevailed in ancient Peru as well as among the islanders of Oceania, and seems to have been common all over the globe among the peoples of a primitive civilisation.

In South America the knotted cords are called "quippu" and some that are still preserved in ethnological collections were used to indicate the tribute to be paid to the Incas by the several tribes. They consist of woolen threads, the different colors of which represent different kinds of produce: corn, wheat, fruits, furs, etc., while the number of knots register the amount or measure.[3]

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[1] See *Lao-Tze's Tao Teh King*, Chapter 80.

[2] Section 23. See James Legge's translation in *Sacred Books of the East*, Vol. XVI, p. 385.

[3] What can be done with knotted strings is well illustrated by the fact that a string alphabet has been invented for the use of the blind in which the letters are indicated by form or arrangement. The knots are easily made

Herodotus informs us that King Darius when fighting the Scythians gave his orders to the Ionians in the form of a leathern thong with sixty knots in it, thereby indicating the number of days in which they should expect his return. We thus see that the Persians employed the same mnemo-technic means that have been discovered in several South Sea islands as well as in America, and we may assume that the ancient Chinese knotted cords (*chieh shêng*) also were in principle the same.

Knotted cords were replaced by notched bamboo sticks, and the incised characters may in olden times have been as primitive as are mnemotechnic communications of the American Indians, such as prayer-sticks and such other pictorial writings as are still extant.

* * *

The invention of writing in the proper sense of the word is credited to Ts'ang Hieh (蒼頡), also called Shih 'Huang (史皇), the "Record Sovereign" because he is the protector and patron saint of history and archival documents. He is said to have lived in the twenty-eighth century B. C., and having ascended a mountain overlooking the river Loh, he saw a divine tortoise rising from the water. It exhibited on its back mysterious tracings of letters which "lay bare the permutations of nature to devise a system of written records,"[6]—a report which imputes that he saw the characters of the five elements on the tortoise's back.

It is not impossible that Chinese writing has been introduced from ancient Mesopotamia, a theory vigorously advocated by M. Terrien de Lacouperie, rejected by many, but, after all, sufficiently probable to deserve serious consideration, for we cannot deny that many Chinese symbols exhibit a remarkable similarity to the ideograms of both ancient Babylonia and ancient Egypt, and remembering the fact that Chinese bottles have been discovered in Egyptian tombs and also in Asia minor, we cannot help granting that in prehistoric days there must have been more trade, and more travel, and a greater exchange of thought than is generally assumed.

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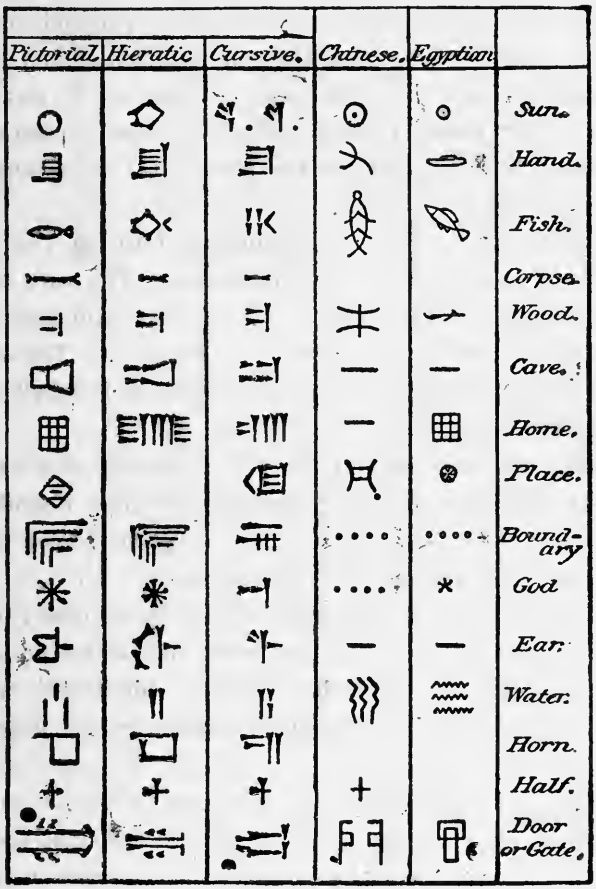
and sufficiently different to be easily deciphered. The *Standard Dictionary*, II, p. 1780, contains an illustration of the string alphabet.

[6] Myers's *Chinese Reader's Manual*, p. 228, I, No. 758.

We here reproduce from Garrick Mallery's work on *Picture Writing of the American Indians,*[1] a table of symbols which shows the cuneiform signs in three forms; pictorial, hieratic, and cursive, the Chinese and the Egyptian in parallel columns.



MALLERY'S TABLE.

A Comparison of the Cuneiform, Chinese, and Egyptian Systems of Writing.

The words omitted in the Chinese column of Mr. Mallery's

[1] *Ann. Rep. of the B. of Ethn.*, 1888-9, p. 675. Mr. Mallery does not state the source from which it is taken. It may be from W. St. Chad, Boscawen, or M. T. Lacouperie.

table (God, ear, home) are not less remarkable instances than the others.

The word "God" is more similar than it appears if we were to judge merely from its external shape. In cuneiform writing as well as in Egyptian it is a star, and the Chinese word *shih* (示) shows a horizontal dash and underneath three perpendicular wave lines. This seems very different from the Babylonian and Egyptian conceptions, but the Chinese character is explained to mean "light from the sky" or "celestial manifestation," the dash on top meaning "the heavens," and the three vertical lines depict the emanations in the form of rays.

The character for "ear," in its present form 耳 (*'rh*), might very well have originated from the Babylonian. The same is true of the Chinese character that denotes "field," or "farm land," which may very well be used in the sense of "homestead." The character *t'ien* (田) is in principle the same as the pictorial Babylonian and the hieroglyphic Egyptian.

Further, we have to add theat the Chinese word meaning "corpse" is explained as "body lying" and thus resembles the Egyptian word for "mummy" which in different senses is represented either as a standing or a lying mummy.

We have to correct a mistake in Mr. Mallery's table; the word "half" in Chinese is not a cross, but either half a tree or the ideogram "cow" combined with the character "division." A cross means "completion" and the complete number of our fingers, viz. "ten."

Whether or not the theory of Lacouperie be tenable, one thing is sure, that all three systems of writing, the Babylonian, the Egyptian, and the Chinese, have begun with pictorial representations of the objects which, according to circumstances, were conventionalised in different ways.

The writing material always influences the character of a script. Thus, after the invention of brush and paper, the method of writing down from top to bottom was naturally retained, but the script acquired that peculiar picturesque character of brush dashes which it still possesses.

The hair brush is called *mao-pi,* or simply *pi* (bamboo pencil),* and tradition states that General Meng T'ien was the inventor of writing with a brush,—a statement which is not impossible but

PICTORIAL WRITING CONVENTIONALISED.*

strange, for he was the most faithful servant of Shih Hwang Ti, the great hater of ancient literature, who on capital punishment ordered all the ancient books burned. Shih Hwang was a warlike emperor who ruled from 259 until 210 B. C., and for the first time (in 222 B. C.) united the entire Chinese empire under one scepter. He is the same who erected the great wall, so expensive and at the same time so useless, and General Meng T'ien was in command of the laborers. When the Emperor died, General Meng T'ien is said to have committed suicide.[8]

We here reproduce a list of ornamental Chinese characters which are commonly, and without doubt rightly, assumed to represent the most ancient forms of Chinese writing with a brush.


Boundary (口)


To wrap (包)


To revolve (回)


Mountain (山)

* Reproduced from Williams's *Middle Kingdom.*

* The character 筆 *pi* consists of the radical "bamboo" and the word "brush" or "stylus."

[8] See Myers, *loc. cit.,* Nos. 597 and 497.


Water (水)


River (川)


Rain


Rain (later character) } 雨


Earth (土)


Elephant, Idea (象)


Bird (鳥)


Island (州)


Wings (羽)


Wheel, Carriage (車)


Field (田)


Boundary (畺)


Grass


Grass } 艸


Boy, Child (子)


Constellation (星)


Star (星)


Thread


Thread (another form) } 糸


Wheat (麥)


Tree (木)


Wood (林)


Forest (森)


One-half (half a tree) (片)


Fruit (果)


Sun (日)


Moon (月)


Bright (Sun and Moon)


Bright (Moon shining in window)

明


Evening (夕)


Many (多)


Ear (耳)


Heart (心)


Flesh (肉)


Mouth (口)


Teeth


Teeth (later form)

齒


Muscle (力)


Infant, Feeble (幺)


Weak (infant muscle) (幼)


Male (muscle working in field) (男)


Complete, ten (十)


Middle (中)


Above (上)


Below (下)


Gate (門)


Between (間)


Divide, (八) Eight


To cut (分)


Crooked (亞)


Hatred (Crookedness of heart) (惡)


Cow (牛)


Half (Cow divided) (半)


Horns*


Sheep (羊)


Justice (my sheep) (義)


Beauty (large sheep) (美)


Man (人)


Humaneness (仁)


Compare


Compare

比


Invert, change (匕)


Conversion (化)


Looking backward, To flee before enemy (North) (北)


Many†


Multitude (衆)

Most of the symbols of the list explain themselves. A "boundary" is a simple line of enclosure. "Revolve" is a curve. The meaning of the signs "to wrap," "mountain," "water," "river," "rain," "horns," "grass," "child," "constellation" or "star," "thread," "wheat," "tree," "fruit," "sun," "moon," is obvious enough. The symbols "elephant," "bird," "heart" require more imagination; but

* This character does not exist in modern Chinese.
† Not used in modern Chinese.

the original picture is still recognisable in them. The word "flesh" is meant as a slice of meat. "Mouth," "teeth," "eye," are also intended to depict the objects. The word "muscle" represents the upper arm, and in connection with the word "weak" which originally means also "infant," it denotes "lack of strength." A character consisting of two lines, representing two pieces cut off, means "to divide." Later the character "knife," as the instrument by which the division is to be made, was added. Crooked roads mean "crooked" or "evil," and in combination with the word "heart" we have the word "hatred." In the symbol "cow" the horns form the most prominent part, the body being reduced to a mere cross. The symbol "cow" combined with the symbol "division" means "half." The picture of a sheep shows the symbol "horns" on the top while the rest is scarcely recognisable. The symbol "sheep" in combination with the symbol "mine" represents the character "justice," because the ancient Chinese were shepherds, and their main quarrels in courts of justice were disputes about the ownership of sheep; and their idea of beauty was expressed by "a sheep" that is "great." The symbol "middle" is easily understood and so are the symbols "below" and "above." The character "gate" is a picture of a double doorway, and the character "between" shows a mark between the two posts of the gate. The character "sun" or "moon" and a picture of a "window" means "bright," for if the moon shines into the window it denotes "brightness," and "sun and moon" in their combination mean the same, viz., the best light there is in the world. The ideogram "moon," if written in a special way, is read "evening," and if "moon" is repeated it means "many evenings," or simply "many." The earth is represented by a horizontal line on which a cross stands, implying that the soil of the earth is stable; it is the place on which to take a stand. Two trees mean "wood," three trees "forest." If the tree is cut in two, it originally denotes "one-half," later on it acquired the meaning "part or parcel," and finally "piece."

The outline map of a field means "field" or "farm," and lines limiting two fields mean "frontier" or "boundary."

If the character "man," of which only the legs are left, has the

symbol "two" attached to it, it means the relation which obtains between two or several people, viz., "humanity," "humaneness," or "kindness." One man or two men turned the other way means "to compare." A man upside down means "to invert," "to change." One man in his normal position, and the other upside down acquires the sense of "transformation" or "conversion." One man in a normal position and another man looking the other way means "north," for the Chinese determine directions by looking south; hence, to look backward means "north." The symbol consisting of three men means "many." To this symbol is frequently attached the character "eye," and thereby it acquires the meaning "many as a unit," i. e., "a multitude."

A pretty instance of Chinese word formation is the word *shu* (書), which means "book" or "treatise," and is composed of the characters "brush" and "speak," the idea being that it is a thing in which "the brush speaks."

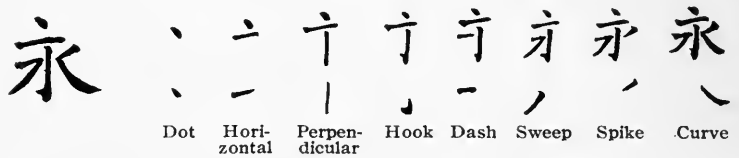
There are several styles of Chinese script (*shu*), and we here reproduce from Professor Williams's *Middle Kingdom* (Vol. II, p. 594) a table which shows at a glance their similarities and differences. The most old-fashioned style is called "the seal script," or, after the name of the inventor, *Chuen Shu.* The second is the official style, or *Lieh Shu,* used for engrossing documents and commonly considered the most elegant form of writing. The third is called the pattern or normal style (*Kiai Shu*); because it preserves most clearly the essential character of Chinese writing. The fourth is a shorthand and demotic style called cursive script or *Hing*[10] *Shu,* much used in practical life. It is the most difficult for foreigners to read, as many lines are run together, thus obliterating the distinctness of the original character. The fifth style is called the grass script or *Tsao Shu.* It is almost an approach to the easy hand of the Japanese, and its name may be translated "fancy style." Under the Sung dynasty a new style was adopted which is practically the same as the normal style, only showing more regularity, and it is

[10] *Hing* means "to walk," "to run"; and as a noun the same character means "element."

SIX DIFFERENT STYLES OF CHINESE WRITING.
(Reproduced from Williams's *Middle Kingdom.*)

commonly called *Sung Shu* which has become the pattern of modern Chinese print.

The writing of Chinese requires eight different kinds of dashes, and the word *yung* (永), "eternal," contains all of them. This significant character accordingly has become the typical word with which Chinese scholars start their calligraphic lessons.



THE ELEMENTS OF CHINESE SCRIPT.

The little mark like a fat upward comma is called *dot*. Among the lines we have a *horizontal* and a *perpendicular*. Further there is a *hook*, which latter is added to the perpendicular by joining to its lower end a dot line. A *dash* is a short horizontal line. A tapering line downward is called a *sweep*, upward a *spike*, and a smaller sweep in the shape of a big downward comma, *stroke*. A crooked line is called a *curve*.

STOCK PHRASES AND STAPLE THOUGHTS.

The Chinese are in the habit of propounding their favorite notions and beliefs in enumerations. They are so accustomed to the mathematical conception of Yang and Yin that they would agree with Pythagoras who finds in number the explanation of the world.

The Chinese speak of the *liang i*, i. e., the two primary forms representing the positive and negative principles. Further they speak of the two great luminaries, sun and moon; the two divinities presiding over war and peace, the two emperors of antiquity, the two first dynasties, viz., the Hsia and Yin; and the two venerable men that hailed the advent of the Chow dynasty, etc.

The number "three" plays an important part in Chinese enumerations. There are three systems of religion authorised by the government: Confucianism, or the system of the Literati (儒); Bud-

dhism, or the system of Shakya Muni (釋); Taoism or the system of Lao Tze (道). There are three kinds of heavenly light: of the sun, the moon, and the stars. In Chinese ethics there are three forms of obedience: of a subject toward his sovereign, of the son toward his father, of a wife toward her husband. There are three mental qualities (性) of a student: application (讀), memory (記), understanding (悟). There are the three gems worshipped by Buddhists, the Buddha, the Dharma, and the Sangha. There are

THE THREE GEMS OF BUDDHISM.

three pure ones or precious ones worshipped in the Taoist temples, probably in imitation of the Buddhist trinity. There are three ceremonial rituals; one in worshipping heavenly spirits, another in worshipping spirits of the earth, and the third one in worshipping the spirits of ancestors. There are three sacrificial animals: the ox, the goat, the pig. There are three holy men: Yao, Shun, and Yü. There are three auspicious constellations: the constellation of happiness, the constellation of emolument, and the constellation of

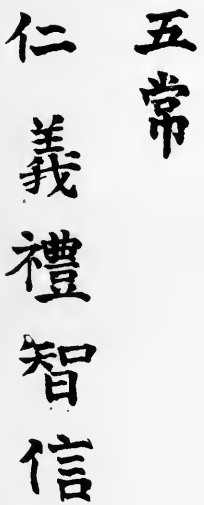
longevity. There are three kinds of abundance that is desirable: abundance of good fortune, abundance of years, abundance of sons. There are three powers (三才) of nature: heaven (天), earth (地), man (人). There are three regions of existence, the heavens, the earth and the waters. There are three degrees of kinship. Further there are three penal sentences: the death penalty, corporeal punishment, and imprisonment. There are three tribunals of justice: the board of punishments, the court of judicature or appellate court, and the censorate or supreme court. There are three forms of taxation: land taxation, a service of twenty days labor each year, and tithes of the produce. There are three great rivers: the Yellow River, the Loh, and the I. There are three great river defiles: Kwang Tung, the Valley of the Yang Tse Kiang, and the defiles of the Si Ling on the Yellow River. There are three primordial sovereigns: Fuh Hi, Shen Nung, and Hwang Ti. In addition there are innumerable sets of three in the literature of the Confucianists, the Buddhists, the Taoists, and also in history.

The number "four" is not less frequent. We have four quadrants and four divisions of the heavens; the East is the division of the azure dragon, the North of the somber warrior, the South of the vermillion bird, and the West of the white tiger. There are four supernatural creatures considered as endowed with spirituality: *lin* (麟) or unicorn, *feng* (鳳) or phœnix, *kwei* (龜) or tortoise, and *lung* (龍) or dragon. The scholar possesses four treasures (寶): ink (墨), paper (紙), brush (筆), and ink slab (硯).[11] There are four figures which originate by combining the two primordial essences in groups of two, the great *yang*, the small *yang*, the great *yin* and the small *yin*. There are four cardinal points and four members of the human frame.

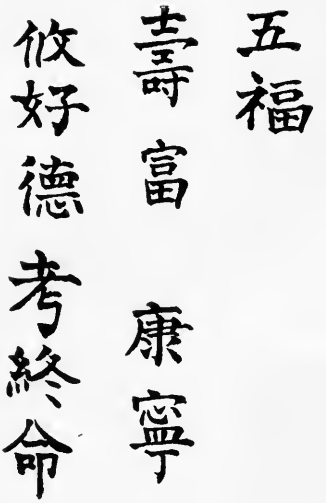
Instances of the number "five" are above all the five blessings (五福): longevity (壽), riches (富), peacefulness (康) and serenity (寧), the love of virtue (攸好德), and a happy consummation of life (考終命). There are five eternal ideals (常): humaneness

[11] The Chinese have no ink stand but use a slab upon which they rub their ink, taking it as does a painter from a palette.

(仁), uprightness (義), propriety (禮), insight (智), and faithfulness (信). There are five elements (五行): water, fire, wood, metal, earth. There are five cardinal relations among mankind: between sovereign and subject (君臣), between father and son (父子), between elder brother and younger brother (兄弟), between husband and wife (夫婦), between friend and friend (朋友). There are five genii: of spring, of summer, of mid-year, of autumn, and of winter. There are five beasts used for offerings: the ox, the goat, the pig, the dog, the fowl. There are five colors: black, red, azure, white, yellow. There are five classes of spiritual beings:



THE FIVE IDEALS.



THE FIVE BLESSINGS.

ghosts or disembodied human spirits, spiritual men, immortalised beings living in this world, deified spirits who have departed from the material world and live in the islands of the blest, and the celestial gods who enjoy perpetual life in heaven, There are five planets: Venus, Jupiter, Mercury, Mars, and Saturn. Further the Buddhists enumerate five attributes of existence: form, perception, consciousness, action, and knowledge. There are five degrees of feudal rank, five tastes, five notes of harmony in music, five sacred mountains, five kinds of charioteering, five colors of clouds, five ancient emperors, five imperial courts, five kinds of mourning, etc., etc.

The characters which stand for the five blessings, and also the five eternal ideals, are naturally the most popular symbols all over

五蝠

THE FIVE BATS.

(After a Tibetan picture.)

THE LONGEVITY GARMENT.*

China. They are used for congratulations and are inscribed upon wall pendants as ornaments. Among them the characters "longev-

* Reproduced from Professor De Groot's *Religious Systems of China,* page 60.

ity" and "blessing" are most used of all. They appear upon the decanters of convivial meetings; they are written on the bottom of tea cups; they are wrought into artistic forms of furniture; they

CRANE AND TORTOISE.*
Symbols of long life. (Bronze candlestick.)

are used for buckles, on pins, on dresses, and as ornaments of every description.

* The tortoise drags along the moss that has grown on its back.

Blessing is called *fu* in Chinese, which is an exact homophone of *fu* meaning "bat," and so the five blessings, *wu fu*, are frequently represented by five bats.

The meaning of the symbol "longevity" is not limited to the secular meaning of long life in this world, but is endowed with

THE LONGEVITY SYMBOL IN DIFFERENT STYLES.

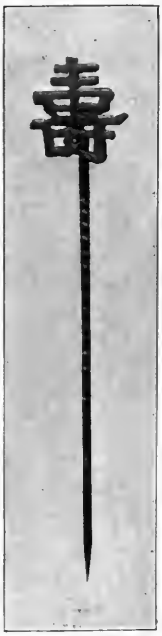
religious signification verging on the idea of immortality among Western peoples.

Ancient traditions tell us that Si Wang Mu, the Royal Mother of the West, who lives in the Kwun Lun Mountains, possesses a

peach-tree bearing fruit but once in three thousand years. From the peaches of this tree the elixir of life can be distilled, and this is the reason why the peach symbolises longevity. Other symbols of longevity are the pine-tree, the crane, and the tortoise.*

Of enumerations in sets of six we will only mention the six accomplishments: intelligence, humanity, holiness, sincerity, moderation (keeping the middle path), and benignity; further the six

THE CHARACTER 樂 ON CUFF BUTTON.



LONGEVITY PIN.

forms of writing: the seal character, the ancient official style, the normal style, the cursive style, the grass style, and the printer's style.

There are fewer enumerations of seven than might be expected. We mention the seven sages in the bamboo grove, the seven precious things (Sapta Ratna) of the Buddhists, the seven primary

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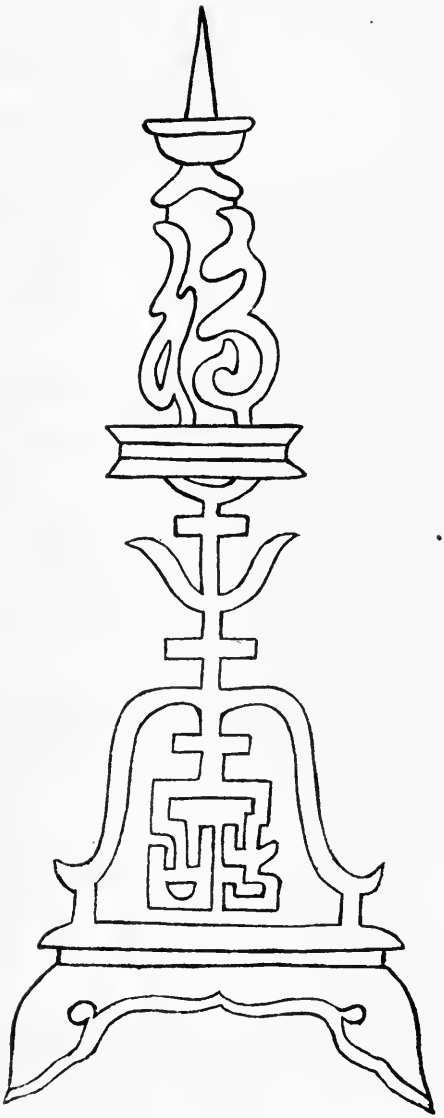
* For special reference see De Groot's *Religious Systems of China,* pp. 56-57.

notes of music, the seven stars of Ursa Major commonly called "the dipper," the seven apertures of the head: ears, eyes, nostrils, and



CANDELABRUM WITH "LONGEVITY" AND "HAPPINESS" SYMBOLS.

"LONGEVITY" DECANTER.

"LONGEVITY" CHOPSTICK HOLDER.

mouth; the seven luminaries: sun, moon, and the five planets; the seven emotions: joy, anger, grief, fear, love, hatred, desire.

The most important set of eight is the eight *kwa* or trigrams.

The figure "nine" is represented as the nine heavens, situated, one in the center, and the eight remaining ones in the eight divisions of the compass. There are further nine degrees of official rank, and nine divisions of the Great Plan, an ancient Chinese state document.

There are ten canonical books: the Book of Changes, the Book of History, the Book of Odes, the Record of Rites, the Ritual of the Chow Dynasty, the Decorum Ritual, the Annals of Confucius, the Three Commentaries, the Conversations of Confucius (*Lun Yü*),

BUCKLE WITH CHARACTERS "LONGEVITY" AND "BLESSING."

and the Book of Filial Piety. There are ten commandments and ten heinous offences.

Of twelve we have the twelve animals of the duodenary cycle called rat, ox, tiger, hare, dragon, serpent, horse, goat, monkey, cock, dog, and pig. They preside, each one over a special hour of the day and the night and are supposed to exercise an influence peculiar to the character of the several animals. There are further twelve months, corresponding to the twelve divisions of the ecliptic, and the Buddhists speak of the twelve Nidanas or links in the chain of causation.

The figure "twenty-eight" is important as the number of days of a lunar month. Accordingly, the heavens are divided into twenty-eight constellations or stellar mansions, and it is noteworthy that four days in the twenty-eight, corresponding to the Christian Sunday, have been signified as resting-days and are denoted by the character *mi* (密 日) which has been traced to the Persian Mithra and proves that, in remote antiquity, Mithraism must have exercised an influence upon Chinese habits.[12]

NORMAL STYLE.

GRASS STYLE.

A NEW YEAR'S CARD.*

THE CHARACTER "BLESSING."

These enumerations are not accidental and indifferent notions, but form the staple thoughts of Chinese ethics. They have become fundamental principles of Chinese morality and constitute the backbone of the convictions of every half-way educated inhabitant of

[12] See Mr. A. Wylie's article on the subject in the *Chinese Recorder*, Foo Chow, June and July numbers, 1871.

* The deity Wen Ch'ang points upward, indicating that all blessings come from heaven.

China. Whatever their station in life may be, all Chinese people know these ideas, they bear them in mind and allow their lives to be determined by the conception of the five eternal ideals, the five virtues, the five blessings, etc. They recognise in nature the fundamental contrast of Yang and Yin as having originated from the great origin and believe that the moral world of social conditions

CHINESE SAUCER WITH PHOENIX AND DRAGON.
The centre contains the character *fu* "blessing."

is governed by the same law. Their highest ambition is to fulfil all the demands of *hsiao,* i. e., "filial piety." Scholarship is highly respected, and even the lower classes are punctilious in the observance of all rules of propriety.

EDITOR.

CRITICISMS AND DISCUSSIONS.

SUBSTITUTION IN LOGIC.

To the Editor of The Monist.

In the *Journal of Philosophy, Psychology, and Scientific Methods* (Vol. I, p. 541) Professor James, the eminent Harvard psychologist, makes the following positive assertion:

"In Taine's brilliant book on 'Intelligence,' substitution was for the first time named as a cardinal logical function, though of course the facts had always been familiar enough."

Now I should like to put this question to your readers: Are not the statements contained in the following sentences what may fairly be called "the naming of substitution as a cardinal logical function"?

"Every conclusion may be regarded as a statement substituted for either of its premises, the substitution being justified by the other premises. Nothing is relevant to the other premises except what is requisite to justify this substitution. Every substitution of one proposition for another must consist in the substitution of term for term. Such substitution can be justified only so far as the first term represents what is represented by the second."

These sentences occur in a pamphlet entitled *Three Papers on Logis,* by C. S. Peirce, which was, as I am informed, widely distributed in the summer of 1867. The same papers were also printed early in 1868 in Vol. VII of the *Proceedings of the American Academy of Arts and Sciences,* pp. 250 to 298, as having been presented to that society in March, April, and May, 1867. Taine's work *De l'intelligence* is dated, in its preface, December, 1869.

Since Ockham, Hobbes, and Leibnitz, who all regarded mind from the same general standpoint as Taine, like him, spoke of thoughts as signs *substituted* for things and for other signs, the question as to whether or not any great step in logic was made in thus regarding substitution as *the* "cardinal function," is one of too large a scope to be here entered upon; but I subjoin a few more sentences from the papers referred to to show that the conception was not left undeveloped by Mr. Peirce.

"The objects of the understanding, considered as representations, are symbols, that is, signs that are at least potentially general. But the rules of logic hold good of any symbols, of those that are written or spoken, as well as of those that are thought."

"Symbols which directly determine only their imputed qualities are but sums of marks, or *terms;*

"Symbols which further independently determine their objects by means of other term or terms, and thus, expressing their own objective validity, become capable of truth or falsehood, are *propositions;*

"Symbols which still further independently determine their interpretants, and thus the minds to which they appeal, by premising a proposition or propositions which such a mind is to admit, are *arguments.*"

Mr. Peirce seems to have regarded it as *essential* to an argument that it should appeal to the interpreting mind to judge of it independently. Thus, he says, "an argument will here denote a body of premises considered as such," for it must distinctly show what the interpretation of the premises is expected to be, yet, in so far as the argument is a rational appeal, the conclusion which embodies this interpretation is not put as an *assertion,* but is only formulated and submitted to the interpreting mind to judge.

Mr. Peirce has always been careful to exclude from logic, matter that he considers psychological, and therefore it is not surprising that he did not explain to what mind the appeal of the argument is addressed when one reasons with oneself. But it would seem to be plain from the above extracts, and is rendered perfectly clear in the papers referred to, that he not only considered all logical thought as an operation upon symbols consisting in substitution, but that he undertook to demonstrate this and to show *how* the same is true.

I may add that Peirce does not in the papers referred to say that substitution, which he makes the one hinge of all reasoning, is an *indecomposable* operation, and that in Baldwin's *Dictionary of Philosophy and Psychology,* Article "Symbolic Logic," he shows that no operation of substitution is valid unless the operations of insertion and subsequent omission into which it can be resolved are both valid.

FRANCIS C. RUSSELL.

THE PLACE OF MATHEMATICS IN EDUCATION.

The present rector of the University of Munich, Professor Ferdinand Lindemann, has devoted his official rectorate lecture to the important subject of the significance of mathematics in the higher schools. At present the curriculum of the German gymnasia is based upon the principle that education consists first of all in a knowledge of classical philology and history. Pro-

fessor Lindemann is fully convinced that a knowledge of Greek thought is indispensable for any educated man. But we must not forget that the leading philosopher of ancient Greece wrote over his school the significant words

μηδεὶς ἀγεωμέτρητος εἰσίτω,

and Melanchthon quotes this famous maxim of Plato in his preface to the Latin edition of Euclid (Basel, 1537). How different is the classical conception from the modern treatment which mathematics receives! It is now considered dry, monotonous and tedious, and the mathematician is generally eschewed, being stigmatised by the saying, *mathematicus non est collega,* "the mathematician is unsocial."

In order to point out the value of carefully elaborated mathematical exercises, Professor Lindemann quotes Helmholtz as saying, "In my judgment, a true comprehension of mathematics is attained by working out mathematical propositions on paper and accurately revising each statement that is given. When one simply thinks out something in his mind, there is always a possibility of error, of disregarding some important term which he will never notice until he writes it down. I consider this most excellent practice in order to arrive at really clear logical thought, and to understand mathematics. For if students do not work out their mathematics and write it down they will never positively understand it."

How little consideration is given mathematics among leading experts on ancient and classical times, appears from Mommsen's famous dictum to which he gave utterance in his speech before the Royal Academy of Sciences, Berlin, in 1884. "We shall, furthermore, continue to call the ideal culture of mankind in good Latin, humanity; and the man who would in time replace Homer by the doctrines of conic sections, in good Greek, banausic." In answer, Professor Lindemann says, "Mommsen misunderstands the facts. We agree with him perfectly that Greek reflection and Roman thought continue to sway even to-day, consciously and unconsciously, our humanistic culture, and we too designate the ideal of human civilisation as humanism, but this ideal comprehends not only the development of art, politics, literature and history, but of the exact sciences as well. The innumerable theorems of conic sections certainly consitute mathematics as little as the recitation of Homeric songs can pass for classical scholarship. But if elements of the theory of conic sections have lately been introduced into the program of our higher schools, this step has an ulterior purpose. The treatment of conic sections in methods of analytical geometry familiarises the student with an instance of the general laws of interdependence; it is the general idea of functions as here introduced in geometrical form, which has directed and controlled the development of mathematics during these latter centuries, and upon which rest the great discoveries of Newton and Leibnitz.

Professor Lindemann further calls attention to the application of mathematics in technical occupations and sciences, especially in astronomy, physics, and of late even in chemistry. He points out that the only road to success in the sciences in modern times passes through the gate of higher mathematics, and mentions in connection therewith such names as Kepler, Newton, Comte, Mayer, Helmholtz, Clifford, Hertz, Mach, Pearson, Poincaré, and Herbart.

Wilamovitz has made progress in his method of teaching the classics by introducing bits of Euclid in his textbooks; but, argues Professor Lindemann, will a classical philologist be able to explain the subject-matter of the seemingly most simple statements of mathematics referring to definitions, axioms, etc.? Do the philologists have an idea of the vast literature which of late has grown out of the discussion of these simple propositions, since Bolyai, Lobatchevsky, and Gauss? There are quite a number of mathematical textbooks which still retain the false ground that it is possible to improve upon Euclid, and in spite of the discussions and lectures held at almost every University on the subject, they continue to offer definitions and even demonstrations which long since have been shown to be insufficient.

Professor Lindemann declares that mathematical instruction in gymnasia, corresponding in America to undergraduate courses in college and university, should not cover all the details of mathematical branches, but should be so arranged as to enable the student to gain a proper comprehension of the grand edifice of mathematics and its solid foundation. Teachers of mathematics should be equipped to satisfy these conditions and should be familiar with the methods by which the science of mathematics has been worked out. They should know its history, not only in general, but some of its main problems; for instance, how mankind happened to be interested in the trisection of the angle and the squaring of the circle. He should have a command of the basic ideas of analytic mechanics; should at least have become acquainted with the exact execution of certain experiments, such as the motion of the pendulum; and should also have clear ideas concerning the field of applied mathematics and its significance in practical life. It is these aims that the leading mathematicians have had in mind since the beginning of the last century.

THE SLAV INVASION.

MR. FRANK JULIAN WARNE'S VIEW OF THE SITUATION.

While other nations are waging wars, causing loss of life, property, and money, the United States is passing through industrial struggles which are not less expensive. The anthracite strike commission estimated the loss of the last strike at one hundred million dollars. Mr. Frank Julian Warne,

Ph. D., who is correspondent for the *Philadelphia Ledger* and contributor to *The Outlook,* and who was in the Pennsylvania coal fields in 1900 and 1902, has published his views of this great struggle, and it may be surprising to many that he regards the industrial phase of the strike as a mere incident and insists that it is above all a struggle between the Slavs and the Saxons. He has published his views in a book entitled *The Slav Invasion and the Mine Workers, a Study in Immigration,* (J. B. Lippincott Company, Philadelphia. $1.00 net,) and suggests at the end of the book the advisability of the amendment of our immigration laws. His view may be onesided but it contains much valuable information, presented by an impartial observer. It is characterised in the Preface as follows:

"This book shows how the competition of the so-called Slav races, including the Italian, for the places in and about the hard-coal mines of the English-speaking mine-workers—the Irish, English, Welsh, Germans, Scotch, etc.—has resulted in a conflict between these two distinct groups for industrial supremacy in hard-coal mining, and how this is forcing the English-speaking nationalities out of this industry and out of that section. The strikes of 1900 and 1902 were mere surface indications of the wide-spread industrial unrest which naturally accompanies this struggle; they should be regarded as mere episodes in this great conflict of races."

Mr. Warne has great faith in the United Mine Workers of America, and he believes that though the Union may pass away, it has accomplished a work that otherwise might have seriously endangered the healthy development of the nation. The United States has shown an enormous power of assimilation, but the Slavs are so different from the Teutons, who really give character to our nation, that the usual methods proved insufficient. Mr. Warne says:

"The power of assimilation in Northeastern Pennsylvania is being weakened by the heavy task thrust upon it, and unless aid comes from other sources it may be questioned whether American ideals and institutions are to be equal to the work of making the Slav immigrant into an American citizen. The one bright ray of hope lighting up the uncertain future is shed from the activity in the coal-fields of the United Mine Workers of America. With this organisation, to a much greater degree than most of us realise, rests the solution of many of the problems presented in the hard-coal producing communities. Its power of uniting the mine-workers of all nationalities and creeds and tongues—of bringing together the Slav and the English-speaking employees on the common ground of industrial self-interest—has only recently been demonstrated. Through this it is breaking down the strong racial ties which until its entrance into the region kept the two groups apart. In brief, this organisation is socialising the heterogeneous mass."

There are three causes which have primarily contributed to the ultimate

failure of the trades union movement in the anthracite coal region. They are: (1) the inability to control all the workers in the three several fields; (2) the railway ownership of the mines; and (3) the "Molly Maguires."

The first two causes are sufficiently well known and stand in need of no further comment. The "Molly Maguires" were a secret oath-bound organisation which flourished in the regions from 1866 to 1876. Their history is described by Mr. Warne as follows:

"The 'Molly Maguires' were principally Irish immigrants, who brought the society with them from Ireland, where it had been formed as the Ancient Order of Hibernians, under Robert Emmet, for the purpose of freeing their native land from the British control. None but Catholics were eligible to membership, and, despite the opposition of the Catholic Church and its priests in the anthracite region, the society continued in existence nearly ten years with the worst possible elements opposed to law and order in control. Its secret meetings, which planned murder and incendiarism, were conducted with solemn religious rites, and its vengeance seemed to be directed mainly against mine superintendents and bosses. A number of murders of such officials was traced to the society, but in every case alibis would be sworn to in the trial by other members of the society, and convictions were rare. So daring did they become, and so atrocious were the crimes committed, that detectives were employed to ferret out the criminals. One of these was John McParlan, an Irishman and a Catholic, who in 1873 succeeded in becoming a member of the society under the name of James McKenna. He played his part so well that he continued a member for three years before his real purpose was discovered and he was forced to flee. He had gained the confidence of the leaders, however, and had become secretary of the Shenandoah branch of the society. The evidence of the operations of the society he was thus able to furnish, led to the arrest of seventy members. With his mass of undisputed testimony, and through some of the prisoners turning State's evidence, twelve members of the society were convicted of murder in the first degree, four of murder in the second degree, four of being accessory to murder, and six of perjury."

Mr. Warne fully appreciates the work of the United Mine Workers of America in breaking down the inherited sources of separation and binding the heretofore antagonistic groups and races into a new relation:

"The racial and religious and social forces which heretofore tended to divide the mine-workers into innumerable groups antagonistic one to the other are being bridged over by the much more powerful force of industrial self-interest."

Mr. Warne describes the meeting which was called by President Roosevelt on October 1, 1902, in which the miners were represented as well as the operators. While Mr. Mitchell disclaimed the responsibility for the terrible

state of affairs and suggested that the questions in dispute between the mine-workers and the operators be submitted to a tribunal to be appointed by the President of the United States, Mr. Baer accused the unions of interference with their competitors, the "scab" element. He said:

"There are from fifteen to twenty thousand men at work mining and preparing coal. They are abused, assaulted, injured, and maltreated by the United Mine Workers. They can only work under the protection of armed guards. Thousands of other workmen are deterred from working by the intimidation, violence, and crimes inaugurated by the United Mine Workers, over whom John Mitchell, whom you invited to meet you, is chief. I need not picture the daily crimes committed by the members of this organisation."

In Mr. Warne's opinion the danger of further trouble will continue so long as the Slavic immigration is not stopped. At present, however, immigration continues, and the Slav element is increasing rapidly.

"In politics the Slavs are already a factor that must be reckoned with. They are becoming naturalised in an ever-increasing number. In Schuylkill County they are rushing into the naturalisation courts at the rate of sixty a month."

Yet, while Mr. Warne points out the danger and the trouble which is still in sight, he is not blind to the fact that the final solution of the problem must come through the education of the Slavs, for he says:

"Yesterday the Slav was a pauper immigrant; to-day he is what the English, Welsh, Irish, and German miner was a quarter of a century ago—on the way to becoming an American citizen. What sort of a citizen he may be will depend upon the influences that are brought to bear upon him. It is too early to judge him finally; certainly he should not be judged too harshly, especially as he has shown himself adaptable. But we may not blink the fact that the Slav offers at present a problem of much complexity and danger."

"All children of Slav parentage—and the Slav races are very prolific—do not attend the parochial schools. Many of them are in regular attendance at the public schools, and in general they are diligent and painstaking students. Invariably one hears good reports of them from teachers and superintendents—in fact, not a few public school teachers report the Slav children to be more proficient and in many ways more progressive in their studies than children of the English-speaking races. Under the public school system many of the Slav children are being trained into good American citizens. This educational force is, perhaps, the one bright promise lighting up the uncertain future."

BOOK REVIEWS.

VORTRÄGE ÜBER DIE DESZEDENZTHEORIE. Gehalten an der Universität zu Freiburg im Breisgau von *August Weismann.* Zweite, verbesserte Auflage. 2 Vols. in 1. Jena: Gustav Fischer. 1904. Pp. xiii, 340; v, 344.

Professor Weismann's *Theory of Descent,* which is a carefully revised report of lectures actually delivered at the University of Freiburg i. B., is intended by its distinguished author to be a résumé of his life's work, and we are glad to notice that within a short time it has already reached the second edition. He calls it his *Hauptergebnisse,* the chief results of his labors, and it constitutes a condensed statement of his theory on heredity.

Professor Weismann was one of the first among the naturalists of Germany to indorse Darwin's views, for which he made a strong plea in his inaugural address in 1867; but he thought at the time that Darwin's theories could be enlarged and deepened, and so he worked out his own theory of selection, in which he insisted on the significance of the selection that takes place in the domain of germs. He may be accused of exaggerating the importance of this principle, and of one-sidedness in deriving from it all his explanations. But, he answers, one might as well accuse physicists of one-sidedness when they claim that the law of gravitation is possessed of universality. He says:

"In this application of the principle of selection to all stages of living units, lies the nucleus of my views. To this thought all these lectures lead, and I am convinced that it constitutes the import of this book. It will last even if everything else in the work should prove temporary." In another place he says: "In spite of many contradictions, I take the fundamental ideas of my views to be right, and among them are the propositions of the existence of the determining units of life called determinants, and their combination into ids. Upon the doctrine of determinants rests the theory of germinal selection; and, according to my conviction, without this, the great thought as to the guidance of the transformation process of the forms of life through selection, by discarding the unfit and by favoring the better adapted, will remain a mere torso, a tree without roots."

Whatever may be just in the objection of exaggeration and one-sidedness that is made to Professor Weismann's theory of germinal selection, even his adversaries must admit that he has done good work, and that his investigations have contributed considerably to the progress of our comprehension of the theory of evolution. If we consider all the replies that have been made to Weismann, and if we consider, too, the innumerable new facts brought to light in controversy, partly by himself and partly by his adversaries in their anxiety to refute him, we may fairly say, even from the standpoint of his severest opponents, that the impulse which he has given to science is invaluable.

Within the last two decades biological science has penetrated more deeply into the mysteries of life than ever before, and at this period, Weismann has been the moving spirit, eliciting new data and utilising everything to its best advantage. Naegeli proposed his theory of the idioplasm—that substance which determines the form of a being. Professor Weismann developed this idea by entering into details and showing that such idioplasms should not be sought (as Naegeli wanted) in the body of the whole cell, but in the nucleus which contained all the determinants for the structure of the organism, called by Weismann *Anlagesubstanz,* a word which has caused translators much trouble, and which we will briefly define as the substance which contains a disposition of the organism. Every cell contains its idioplasm which was discovered in a colorable substance, whence the terms chromatin and chromosome. Professor Weismann calls the idioplasm of the germ cell, germ plasm, and any complex of germ plasm which forms a biological unit he calls an "id." Further, chromosomes that contain several ids he calls "idants," the existence of which, although invisible on account of the smallness of the germs, Professor Weismann deems established on account of his observations of the salamander.

From Professor Roux's investigations in regard to the struggle of the parts, we became familiar with the existence of the germ plasm, which is, as it were, a special substance of heredity. Roux discovered it in the chromosome and traced its continuity through generations. We know now the potential immortality which single cells and germ cells possess in contrast to all higher forms of life. We have observed the mitotic division of the nucleus and the actions of the centersphere which constitutes that marvelous organ of division of the cell and allows us to look deeper into the unfathomable mystery of the minute and complicated details in the structure of living cells.

How much more advanced are our views now as to fecundation and the details of that two-fold process, propagation and amphimixis; that is, the mixture which takes place in the fusion of male and female germs. Further, we have new facts as to the phenomena of growth and the significant reduc-

tion of heredity, units of which according to Professor Weismann lead to an abandonment of Lamarck's principle of selection and point out that ultimately selection is a selection of germs.

Although the present work is a defence of Professor Weismann's theory of germinal selection, the nineteen lectures which it contains are by no means polemical. He has avoided all personal expostulations with his adversaries, and has limited himself to plain objective statements of differences. He has not burdened his book with all details of biological facts, because he intended it to be a book to be read, and not an encyclopedia for reference. In spite of his modest intentions, however, the work possesses the stately size of 684 pages, with numerable illustrations in the text, besides colored tables in the Appendix. It is not Weismannism, but an exposition of the theory of descent, which presents each link of the argument in a complete yet popular form from the standpoint of Weismann, who feels confident that if we have to explain the teleology of nature without falling back upon the assumption of teleological forces, his method is the only way to success.

P. C.

ADOLESCENCE: ITS PSYCHOLOGY AND ITS RELATIONS TO PHYSIOLOGY, ANTHROPOLOGY, SOCIOLOGY, SEX, CRIME, RELIGION, AND EDUCATION. By *G. Stanley Hall.* New York: Appleton & Co. 1904. 2 Vols. Pp. xx, 589, 784.

Dr. G. Stanley Hall, the President of Clark University, is rightly deemed one of the foremost authorities on psychology, and the present work in two stately octavo volumes deals with the practical problems of adolescence in its varsious aspects, always keeping in mind the need of the teacher, the educator, and also the parent. It is scarcely possible to exhaust this important book in one review, and we do not mean to attempt it here. We venture only to characterise its contents and thus allow our reader to form a judgement of his own. In one passage of the preface the author says:

"The book attempts a pretty full survey of pedagogic matter and method for the age treated, and also, to some extent, for earlier and later years. To motor education, grouped under four great divisions, and will-training, one of the longest chapters (III) is devoted. The last part of Chapter XV and Chapter XVI treats of the pedagogy of the English literature and language, history, drawing, normal and high schools, colleges and universities, and philosophy, and Chapter XII is devoted to that of nature and the sciences most commonly taught. Menstruation and the education of girls occupies two chapters (VII and XVII), hygiene, crime, and secret vice one each (IV, V, VI), social and religious training have each a chapter (XV and XIV, respectively), and the education of the heart is described not only in XI, but in XV, XII, and elsewhere."

The psychology underlying Hall's investigations will be treated in a forthcoming work which we may expect to be as thorough as his *Adolescence,* in Chapter X of which, however, he offers a statement of his psychological views. He takes decided stand against those psychologists of both the past and present time whose interest in man's fate after death almost obliterates the interest in man's soul in the past. In fact this is the main burden of Dr. Hall's message to the psychological world, that the genesis of the soul can teach us more than the vague speculations as to its ultimate destiny, and so he insists that his book "embodies a new idea of profound scientific and practical importance."

Dr. Hall's description of the nature of the soul is as follows:

"The psyche is a quantum and direction of vital energy, the processes of which most need exploration and description, ordering and directing. By looking inward, we see for the most part only the topmost twigs of the buried tree of mind. The real ego is a spark struck off from the central source of all being, freighted with meanings that, could we interpret them, would give us the salient facts of its development history. Its essence is its processes of becoming. It is not a fixed, abiding thing, but grew out of antecedent soul states as different from its present forms as protoplasm is from the mature body. It tends to vary constantly and to depart indefinitely from what it is at any given moment."

"The soul is a product of heredity. As such, it has been hammered, molded, shocked, and worked by the stern law of labor and suffering into its present crude form. It is covered with scars and wounds not yet healed. It is still in the rough, and patchworky, full of contradictions, although the most marvelous of all the products of nature. Where most educated and polished externally, it still has inner veins where barbaric and animal impulses are felt. Every individual soul is marked by limitations, defects, and arrests, often beside traits of marvelous beauty and virtue. None are complete, perfect, typical. Collective soul, however, is a sensorium of wondrous subtlety that reflects in its multipersonal facets most, perhaps all, that has been in the world."

As to the underlying philosophy of his methods, he says:

"It may be roughly characterised as in some sense a new and higher monism and an evolutionism more evolved, with a method which has already yielded some promising results hitherto unattained and a program of far more work yet to be done, which is little in harmony with the complacent sense of finality and completeness so often manifest. From this standpoint it becomes plain how gross have been the errors in both conceiving and practically training the soul, which are due to the inexpugnable and all-dominant interest in its future state and the insistent and, to our thinking, not only unscientific but almost abnormal aversion to consider its past. This geneto-

phobia pervades, consciously or often unconsciously, much of the best ancient and contemporary philosophical and theological thought, and is one of the greatest and most inveterate obstacles to a truly scientific psychology. The problem of the nature of the soul has also rarely, save in forms of materialism now generally discarded, been separated from that of a future life, has led to a horror of materialism that is almost misophobia, and has betrayed many able professors to take an attitude toward genetic psychology like that of Agassiz toward evolution."

It is interesting to read Dr. Hall's views on Christianity in its relation to psychology:

"Christianity has shown little interest in the past of the soul, save for that of its founder and in order to account for sin. Its emphasis on personal immortality gave the soul immense and unprecedented dignity, but focused attention and endeavor upon its future. Even the traducianism of Tertullian, who taught that the soul was in some sense hereditary and had a somatic continuity with previous generations back to Adam, found little vogue, helpful as it was in explaining the mystery of transmitted sin and guilt, and was twice condemned as a heresy, although Luther seems to have held it. Some form of creationism, or the view that at a certain age of the embryo a newly and miraculously made soul joined the body *ab extra,* has been the prevailing one. The soul of the natural man is tainted, corrupt, and children depraved perhaps totally at birth, and the supreme work of life is to save it from eternal woe."

"The ethical value of the idea of a future life of rewards and punishments has, of course, been incalculable. If it has brought in cosmo-heteronymous motives of morality unknown to the Stoics and disallowed by Kant; if it has sometimes engendered a transcendental selfishness that may become gross, and in neurotic ages, races, or persons, favored fears and anxieties that were hysterical; if formal, external, and even mechanical ways and means of salvation have often been relied on—all these things concern us here only as products and illustrations of the evils of a too exclusive interest in the soul's future, which is, in fact, still unknowable save to faith, and of excessive neglect of its past, which is really now increasingly accessible and which is proverbially the best means of judging of its future."

Psychologists know Dr. Hall as a strictly scientific and conservative man, and so it will be interesting to learn his views on the New Thought movement and all that is concerned with it. Here is a passage both of appreciation and criticism of the significance of the Society for Psychical Research, and it will be noticed that the professors alluded to are portrayed so minutely that no one can be in doubt about their identity:

"One striking example of the havoc which this lust to pierce the secrets of the future makes with science is seen in the English Psychic Research

Society. It has collected masses of precious and hitherto neglected borderland phenomena between waking and sleep, sanity and insanity, on trancoidal states, automatisms of body and mind, illusions, hypnotism, etc. But almost the sole interest of this large and cultured society in these data is what contribution they make to what its able leader calls the most insistent question of the human heart, If a man die, shall he live again? Is there a land of disembodied spirits, and can communication be established and demonstrated between them and us? Possession, apparitions, phantoms of the dead, messages from the ghost world, or transcendental as well as mundane telepathy, and in general an inductive demonstration of a survival of the soul after death, are thus the themes or conclusions, directly or indirectly, inspiring all this work. Now the folly and pathos of all this is that every fact and group of facts relied on point for their explanation directly and only to the past of the individual or the race and not to the future, to the ab- and sub- and not to the super-normal, or perhaps to the body even more than to the spirit. Greatly indebted as our guild is for facts, suggestive *apercus,* and new interests to these students, their service is, as I have elsewhere tried to point out in some detail, not unlike that of the alchemists who sought the elixir of life for chemistry, of astrologists in quest of the influence of the stars on human life for astronomy, and just as the desire to locate heaven and faith in planetary influences and modes of attaining physical immortality had to be cast out of these fields before science could really do its great work in them, so similar purgation must be made here.

"How profoundly contemporary psychologists and philosophers of the highest academic rank, even those who shrink from all such extreme conclusions, are influenced by this bias, consciously or unconsciously, in the deeper motivations of their work, its direction, methods, and conclusions, we see on every hand. One professor of great learning and acumen has been apparently almost unpivoted by the prolonged and acute study of the revelations of a noted trance medium, which he is convinced are from relatives in the spirit world. Another profound and acute leader of American metaphysical thought attains as his consummate conclusion the conviction of an eternal world of many monadic minds or selves, in a republic or city of God, the free members of which control the natural world and are the sources of all its law. The supreme fact in his world is 'the eternal reality of the individual.' Creation itself is not an event, but a symbol, and these personal spirits never fully and completely enter the real world, for they are out of time and of the chain of causality. Another of no less power and eminence makes the goal of philosophy the demonstration of an individuality deeper, more permanent, and real than that of persons as they appear to us, because knowledge and love are stronger than life, and so, if our nature is not a lie, the actuality of our dead friends transcends sense. Such instances might be

multiplied. The great majority of people, expert as well as lay, think and speak of soul in the future tense, and to very few does the word suggest any connotation with the past. Ask the very man on the street what he thinks of the soul, and he assumes that you speak of another life or of preparation for it."

THE SOCIALIZATION OF HUMANITY. A System of Monistic Philosophy. By *Charles Kendall Franklin.* Chicago: Charles H. Kerr & Company, 1904. Pp. x, 481.

Mr. Franklin says in the Preface:

"The object of this investigation is to trace physical, organic, and social phenomena to their sources in order to discover their laws, so that the subsequent expenditure of energy in nature, life, mind, and society may be determined for human welfare. It will necessitate reviewing all of the great concepts of the race, matter, motion, life, mind, and society,—and will result in an attempt at a complete orientation of the race and the establishment of the principles which will lead to the democratisation and socialisation of humanity. The magnitude of the undertaking need not deter us, for it is by attempting the impossible that we accomplish what we are capable of."

The author attaches great significance to what naturalists would call uniformity, as it appears first of all in the phenomena of chemistry. He says:

"The spectrum analysis shows that all identical substances, not only here on earth, but in the heavenly bodies throughout the visible universe, are identical in composition. The law of definite proportions in chemistry shows that all identical chemical compounds are the same in composition. Whenever a substance is produced, it is but a repetition of all other substances of a like kind. Wherever a chemical compound is reproduced, it is a repetition of all identical compounds, but owing to external energies being different there are some slight variations."

While in plant life and in the animal kingdom the variations are greater than in the domain of chemistry, still we find there too the selfsame law of repetition which does seem to dominate all nature. Bearing in mind this law of repetition, Mr. Franklin discusses the origin of life; the physics of the senses and the intellect; the chemistry of the senses, the emotions and the will; animal mechanics; realism and idealism; naturalism versus supernaturalism, and the expenditure of energy controlled by mind. In Chapters 19 and 20 our author forestalls criticisms that might be made to his system, and in Chapter 21 offers his applications and conclusions.

His monism is expressed on page 237 in these words:

"All nature is one. We can interpret all nature in terms of our life, and our life in terms of nature; thus we are akin to everything and every-

thing is akin to us. This is monism. And nature, including everything, is due to the unversal process of the eternal adjustment and readjustment of the radiant and gravitant energies constituting the universe."

The most important application of his system lies in the domain of social ethics. Mr. Franklin says:

"At vast intervals of time in the history of the race there have occurred great epochs of improvement in civilisation with prophecies of a perfect existence yet to come. In the East, Brahminism was followed by Buddhism with a promise of Nirvana; in the West, Judaism was followed by Christianity with a promise of heaven. It is this perfect existence, dreamed of by the race since its beginning, the socialisation of man, that we enter upon to-day. And the step we take, whether it be large or small, is left to the world to judge."

DIE LEBENSWUNDER. Gemeinverständliche Studien über biologische Philosophie. Ergänzungsband zu dem Buche über die Welträthsel. By *Ernst Haeckel,* Professor in the University of Jena. Stuttgart: Alfred Kröner. 1904. Pp. xii, 567. Price, 9 marks.

THE WONDERS OF LIFE. A Popular Study of Biological Philosophy. Supplementary Volume to "The Riddle of the Universe." By *Ernst Haeckel.* Translated by *Joseph McCabe.* London: Watts & Co. 1904. Pp. xiv, 501. New York: Harper & Brothers. 1905. Pp.485. Price $1.50 net.

Our indefatigable Haeckel has published another book of 567 pages devoted to the fascinating subject of the miracle of life. Professor Haeckel had declared that his *Riddle of the Universe* should be his last writing, but having inquiries concerning many statements made in it, he feels that an answer is due his many admirers as to his position concerning the one and only miracle of this world, to the solution of which the science of biology is devoted. The biological studies of the present volume are intended as a popular treatment of the subject, and they make a fascinating writing indeed. They are treated in six parts and twenty chapters which, after the laudable practice of our ingenious author, are preceded by brief summaries so as to enable any one of his readers to look up those points in which he would be specially interested. The book abounds in tables and is supplied with a good index. The author would gladly have added illustrations which in some parts will be sadly missed by many readers, but he did not yield to the temptation of satisfying this natural craving, for fear that the book would become too expensive and be beyond the reach of the large masses for whose information it is intended. In every line of the book we feel the joy of work which has animated the strenuous Professor in all his literary labors, and it seems that even his adversaries will find it both profitable and pleasant reading.

Haeckel is so popular that Watts & Co., the English publishers of his *Riddle of the Universe* and *The Evolution of Life* have engaged Mr. Joseph McCabe to translate this new work under the title, *The Wonders of Life; a Popular Study of Biological Philosophy.* The book forms a stately volume of 500 pages and the translation is well done.

The American edition is published by Harper.

EUCLID'S PARALLEL POSTULATE: Its Nature, Validity, and Place in Geometrical Systems. By *John William Withers.* Chicago: The Open Court Publishing Company. 1905. Pp. vi, 192.

Mr. Withers, Principal of the Yeatman High School of St. Louis, Mo., has taken his Doctor's degree on the thesis "Euclid's Parallel Postulate," and its significance for other systems of hyperspace than is known to us in our tri-dimensional world. The book is scholarly and the arguments are sober. Dr. Withers begins with an historical exposition of his problem, relating the difficulties discovered in the parallel postulate and the several methods of disposing of it, one main result being the discovery and development of non-Euclidean systems. He explains the nature of the problem and its philosophical bearings. He then discusses the psychology of the parallel postulate, comparing it to its kindred conceptions. Finally he treats of its validity which is not *a priori* necessary, but most convenient. He says:

"The world, as our actual experience reveals it, is certainly tri-dimensional; judged by the same standard, it is also Euclidean. If, then, only one variety of tri-dimensional space is possible, if non-Euclidean tri-dimensional geometry really demands a fourth dimension, the so-called non-Euclidean spaces are in reality not spaces at all, for they are not self-dependent totalities. It is not, then, a question as to whether non-Euclidean geometries are possible, but a question as to whether non-Euclidean tri-dimensional spaces are possible. It is, of course, possible to construct such geometries by making use of the idea of a fourth dimension, just as we ordinarily build up our plane geometry by frequently referring to figures which are only possible in a third dimension; but this, of course, is very different from establishing the possibility of non-Euclidean tri-dimensional spaces.

"The question, then, simply reduces to this: Are tri-dimensional space-worlds rationally possible whose internal relations considered as totalities are essentially different from each other? And it is answered by showing that the geometries of such spaces can be constructed without appealing to a fourth dimension. This can be done. As in the case of two-dimensional spaces, we have here also all the conditions necessary to render such geometries possible. Indeed, the most interesting and significant feature of non-Euclidean solid geometries lies in the fact that they are just as independent of a fourth dimension as is Euclid itself. There are, to be sure, certain facts

in all these geometries that make us wish sometimes for a fourth dimension and the power of moving into it, but they do not necessarily imply this dimension. The simple principle of congruence fails, for example, if we attempt to apply it directly in proving the equality of two Euclidean pyramids whose corresponding parts are mutually equal but arranged in reverse order. The analogous theorem in plane geometry is proved by obverting one of the triangles in the third dimension. Were there a fourth dimension and had we the power of moving into it, it is conceivable that this might also be done for the pyramids. What would happen is simply this: By obverting one of the pyramids in the fourth dimension and then returning it to its own tri-dimensional world, its relations to the other objects of this world are changed in a way that is wholly impossible so long as we confine it to three dimensions. But the internal relations of the pyramid itself, as in the observed case of the triangle, remain entirely unaltered. The self-identity of the figure is retained. But as we have said, these facts cannot be regarded as implying the logical dependence of Euclid, or of non-Euclid, upon a fourth dimension."

The author sums up his inferences as to the nature of space by recognising that only pure logic is strictly *a priori*, while geometry with its space-conception contains an element of experience the actuality of which can only be proved empirically. We sum up the situation in his own words:

"The only *a priori* manifold at present definable in Kant's sense of *a priori* seems to be a manifold constituted by a totality of logical classes or distinctions of any similar sort. The constitution of such a complete system of logical entities must be implicitly known to any rational being.....

"The connection between this *a priori* logical manifold and the empirical space of our own experience lies in the fact that the space-aspect of experience is the one which most definitely implies and is implied by our power to co-ordinate our activities so that "*a* leads to *b* leads to *c*," etc. It is that aspect which enables us to introduce illative relations among acts and systems of acts of our own (acts actual and acts possible).

"*That* this aspect of experience exists is an empirical fact. *What* correlations of acts it permits and *how* it permits them are also empirical. All the details are empirical. But if it is to permit such a system at all, it has to conform to the general type of the illative relation and its parts viewed as coexistent must be related to each other in accordance with the general type of an illative relation."

THE FOURTH DIMENSION. By *C. Howard Hinton.* London: Swan Sonnenschein & Co. 1904. Pp. vi, 247.

Mr. Howard Hinton, already well known from the publication of his *Scientific Romances*, ably written rambles into the domains of metageometry

and other spheres of the super-sensible world, presents us now with his theory of the fourth dimension that to him is a well-founded fact, to the explanation and evidence of which he has dedicated the whole of this small volume. His procedure may be briefly characterised as forming a systematic conception of four-dimensional space, and then pointing out how a three-dimensional system ought to act if it were a part of a higher or four-dimensional one. Mr. Hinton shows that in investigating the real universe when descending into the finer subdivisions, we come to forms of matter possessing properties different from those of larger masses; and analogous conditions prevail when we take into consideration cosmic relations such as the parallaxes of stars, where the combined angles of triangles cease to measure exactly 180 degrees. Unfortunately the argument is not conclusive in the opinion of those who are not willing to be carried away by mysticism. But even those antagonistic to a belief in the objective actuality of metageometry will find Mr. Hinton's presentation of the subject refreshing and ingenious. How much room a romance of science can find in the mysterious realm of the fourth dimension!

TUTONISH. A Teutonic International Language. By *Elias Molee,* Ph. B. Published by the author. Tacoma, Wash. 1904. Pp. 96. Price, $0.40.

Among the enthusiasts who propose the creation of a new language, Elias Molee of Tacoma, Wash., takes an intermediate course by offering not a universal language, but a speech that should be acceptable to the Germanic race. Living in a community which is mostly made up of Teutonic people, he tried to establish a tongue that could serve as a means of communication between the English, the Germans, the Swedes, the Norwegians, the Danes, the Dutch, and the Icelanders. He calls this new language "Tutonish" and trusts that it will prove superior to the English. It is constructed after the analogy, of German and English and retains much of the grammar common to all Teutonic languages. As an instance may serve the Lord's Prayer which in Tutonish reads as follows:

"vio fadr hu bi in hevn; holirn (hallowed) bi dauo (thy) nam; dauo reik (kingdom) kom; dauo vil bi dun an erd, as it bi in hevn; giv vi dis dag vio dagli bred, and fergiv vi vio shuld (debt), as vi fergiv vio shulders (debtors), and lied vi not into fersieku (temptation), but befrie vi from ievl, fyr dauo bi du reik, du makt (power) and du herlinu (glory) fyr ever—amen. (from mataeus 6, 9-13.)"

Matthew ii. in Tutonish begins as follows:

"nau ven jesus bin birtn in bethlehem ov judea in di dags ov herod, do king, sie, dar komen veis mans from du ost tu jerusalem. sagend, ver bi hi hu bi birtn king ov di judars? fyr vi hav sien hio star in du ost, and hav komen tu anbied hi."

We doubt very much whether his proposition will ever be introduced anywhere in the United States, let alone in any European country. Those who know both English and German will acquire Tutonish easily, but they will probably prefer the use of English.

M. Couturat who has distinguished himself in behalf of the establishment of an international auxiliary language, discusses, in a recent letter addressed to the inventor of Tutonish, the proposals of M. Elias Molee from his standpoint as a believer in Esperanto.

M. Couturat considers that the project of Mr. Molee does not fall within the scope of his Commission and feels consequently that he cannot take it into account in the final edition of his *History of the Universal Language.* In fact, M. Couturat wishes to see one single language, while Mr. Molee's scheme is intended for Germanic peoples alone. Mr. Molee would doubtless say that the Romance and Slavic nations might in their turn adopt inter-Romance and inter-Slavonic languages. But this would make two or three international languages instead of one, which would very much diminish their utility, to such an extent that no one would wish to adopt them. The objection is already made to the partisans of a single international language that this would be one more language to learn. What then would be said if there were three to be learned?

But Mr. Molee doubtless hopes that the pan-Germanic language would in time supplant the others, or even prevent their ever coming into existence. And Mr. Molee puts forward in support of this hypothesis, arguments of political and patriotic nature which seem calculated to convince his compatriots, but which for this very reason can only arouse invincible opposition in other nations. He forgets that such considerations, if they prevailed in every country, would make any international language impossible. M. Couturat appeals to the agreement and concurrence of all the peoples of civilised Europe, while Mr. Molee, as M. Couturat thinks, appeals, on the contrary, to their feelings of rivalry, if not of hostility, and conceives of a linguistic union only between peoples of the same race. M. Couturat believes that Mr. Molee greatly exaggerates the importance of race-feeling among modern civilised nations, which, he thinks, are quite cosmopolitan in this respect; and that, moreover, unity of race does not necessarily entail unity of language and *vice versa.* Have not the English a language which Max Müller classed among the Romance languages? And furthermore, diversity of race does not prevent community of language: the United States are a good example of this. Neither does it prevent community of civilisation: as instance, the Hungarians and the Finns. On the other hand, community of race does not imply community of interests and consequent sympathy, for the English, the Germans, and the Americans are commercially bitter rivals. And it may be remarked in passing that this rivalry would make the adoption among them

of a single Teutonic language more difficult than that of a neutral tongue such as is advocated by M. Couturat, not to mention the natural and invincible hostility which the former would meet on the part of all non-Germanic nations. All this proves that it is unwise to introduce into the question political and racial considerations which have in fact nothing to do with it and which can only render impossible any solution whatever.

To sum up, Mr. Molee's project tends, in M. Couturat's opinion, to divide nations and make their natural opposition more profound and invincible, while his own tends to unite them and draw them together upon an equal footing, and consequently to develop a feeling of common interest and fraternity. The union which he dreams of is not one of races, whose mutual opposition is, indeed, much less than that of nations; it is a union of all civilised mankind without distinction of race or religion, of weakness or strength.

LECTURES ON NEUROLOGY AND NEURIATRY, PSYCHOLOGY AND PSYCHIATRY. After the Methods of the Class-Room, to the Author's Students, and Designed also for General Practitioners of Medicine and Surgery. By *C. H. Hughes, M. D.* Edited by Prof. *Marc Ray Hughes, M. D.*, Barnes Medical College, St. Louis. St. Louis: Hughes & Co., 1902. Pp. 417. Price, $3.00.

This book on Neurology allows us an insight into the work of Prof. C. H. Hughes, President of the Faculty of Neurology and Psychiatry of Barnes Medical College, former Major and Surgeon-in-Chief of Schofield and of McDowell's College Military Hospitals, also Superintendent of the Missouri State Insane Hospital.

Being overworked in his profession, Dr. Hughes has found no time to edit the book himself, but left the work to his son and assistant, Prof. Marc Ray Hughes of the Barnes Medical College. The contents, beginning with Chapter I on page 12, form a connected course of lectures on neurology and kindred subjects: I, Definitions of Terms; II, Neurones and Nerve Cells, their Composition and Characteristics; III, Neurones and Nerve Centers, Neurone Theories, Association Neurones, etc.; IV, Efferent Prolongations, Histological Composition of Nerve Centers, etc.; V, Polar and Apolar, Bi-Polar and Multi-Polar Neurones; VI, Neurones Grouped into Layers and Brain Cortex; VII, Head Heat in Brain Disease; VIII, Temperature Sense, etc.; IX and X, Extra-Neural and Adneural Nervous Disease; XI, XII, and XIII, Instruments and Procedures of Precision in Diagnosis and Practice; XIV, XV, XVI, and XVII, Ascending and Descending Degeneration, Waller's Law and Its Diagnostic Significance, the Reaction of Degeneration and How to Discover It; XVIII, the Evolution of Neuraxis; XIX, and XX, the Evolution of the Brain and Spinal Cord; XXI, Electricity and Electrical

Appliances; XXIII, the Dura and the Sinuses; XXIV, Cerebral Embolism, Hemorrhages and Thrombosis; XXV and XXVI, the Spinal Cord and its Morbid States; XXVII, Sensory-Motor System; XXVIII, Cerebro-Spinal Axis; XXIX, the Neuraxis Diagnostically Viewed; XXX, Outline of Cerebral and Spinal Nerves and Their Relation to Nervous Diseases; XXXI, Virile Reflex and Its Symptomatic Value in Practice; XXXII, Aphasia Defined and Recorded; XXXIII and XXXIV, the Medico-Legal Aspect Illustrated in the Case of William T. Bevin; XXXV, Neural and Psycho-Neural Aspects of Surgical Practice; XXXVI, Nutrition and Conservation of Neurones.

The book is illustrated with the same diagrams which are used in lecture rooms, and the style is rather that of the speaker in the amphitheater than the author confined in his study. We have obviously to deal with a man who is at home in his specialty but who cares little for literary finish or the external appearance of his book. The typography is imperfect, and the proof-reader did not attend to his work properly. Letters are broken off and Greek words are repeatedly misspelled. We notice for instance "struments" for "instruments" (page 117) and "thenos" for "sthenos" (strength) (pages 13-14). The man who made the makeup began both the Introduction and the first chapter on the left-hand page of the book.

The book will be useful to the students of Professor Hughes and other neurologists who have acquired sufficient knowledge to overlook the shortcomings of the book which are mostly of an external nature. It would be highly desirable that the book should be republished by some medical publishing house which could properly attend to its makeup.

EMPIRICAL ESSAYS. By the Author of *Unthinkables*. Edinburgh: George A. Morton. 1904. Pp. 187.

The anonymous author of this book apparently belongs to theosophical circles that shake off the crudities of its common beliefs and try to work out a higher world-conception in the direction of the New Thought movement. His essays are on four subjects.

The first one is entitled "Rome, Jerusalem and an Ideal," and in it he comes to the conclusion that we need no capital city of our faith; that the only metropolis required for a religion which believes in the fatherhood of God, the words of Jesus, an unworldly life, the service of God, etc., would be the "City of Mansoul."

The second article on "The Ten Commandments" is characterised by the following conclusion:

"It stands to reason that a Code given thousands of years ago to a barbarous nation, a Code which condemns image-worship, but has no word of reprobation for drunkenness, lying, or impurity as such, is inadequade

and unsuitable to the moral requirements of a civilised English community at the present day. And its place should be taken by the Eight Beatitudes, supplemented by the Two Commandments which received the sanction of Christ, and the Golden Rule. All the rest, as Hillel said, is but commentary."

The third article, entitled "Karma and Reincarnation," insists on the fact that early Christianity must have accepted the doctrine of reincarnation, for Christ declares that Elijah had appeared in John the Baptist, and the gnostic book *Pistis Sophia* shows that this was the current belief among the early Christians. The fourth essay on the "Higher Agnosticism" tries to supplant the common negativism among liberal circles by a better, truer, and more thoughtful view.

As to theosophy, to which our author devotes considerable attention in the third essay, he sums up his views in the question, "What, then, shall our attitude be towards theosophy as a whole?" and its answer:

"Beyond all doubt, ninety-nine intelligent persons out of a hundred would be inclined to condemn the entire system offhand, one part of it having been seen to be so palpably at variance with the laws of evidence.....But, let us in fairness ask ourselves, is it necessary to reject every theory of the system called Theosophy because of a few foolish statements made in connection with one particular aspect of it? In all seriousness, I do not think it is. We do not treat other systems with such rigor, be they philosophical or religious. No one thinks it incumbent on him to repudiate Christianity as a tissue of delusion and imposture because many of the doctrines put forward in its name are an outrage upon common sense."

THE PHILOSOPHY OF HOBBES, IN EXTRACTS AND NOTES COLLATED FROM HIS WRITINGS. Selected and arranged by *Frederick J. S. Woodbridge.* Pp. xxxvi, 391. Minneapolis: The H. W. Meson Co., 1903.

This volume of extracts from the writings of Hobbes is to be welcomed as an incentive to the direct study of a master both of thought and of style. It includes Chapters 1-6 of the "Elements of Philosophy Concerning Body" and Chapters 1-18, 31, and 43 of the "Leviathan"; and it adds to these, as supplements or as footnotes, most of chapter 25 ("Of Sense and Animal Motion") of "Concerning Body"; Chapter 2 of "Human Nature," Chapters 1-3 of "Philosophical Rudiments Concerning Government and Society"; and a series of extracts formulating Hobbes's doctrine of causation from Chapters 9, 10, and 26 of "Concerning Body"; besides many shorter extracts mainly from the works already named.

The re-publication of the first part of "Concerning Body" is of real significance, for these chapters constitute a vigorous contribution to the doctrine of scientific and logical method, and they are not otherwise accessible except in the many-volumed Molesworth edition of Hobbes. The re-

maining selections offer an admirable outline of the ethical and political philosophy of Hobbes, as this is based on his psychology. Such an outline well represents the teaching by which Hobbes is best known. Yet the writer of this notice questions the wisdom of precisely these selections from the works of Hobbes. Most of the chapters from "Leviathan," which make up the greater part of the book, are accessible not only in inexpensive editions of the "Leviathan" itself, but also in Sneath's Selections from the ethics of Hobbes. Furthermore, the book hardly makes good the promise of the preface, "to present practically all that Hobbes has contributed to the main questions of philosophy and psychology." So far as psychology is concerned, this introductory statement is indeed justified. But the book does not include, except by incidental statement, the characterisic contribution of Hobbes to metaphysics: his teaching that every reality—God and human spirit no less than physical phenomenon—is through and through material. The materialism of Hobbes was, it is true, so bitterly opposed both by his contemporaries and by his immediate successors, that it was never seriously studied and so failed of exerting due influence on the course of philosophical thought. But this constitutes the greater reason for presenting in systematic form Hobbes's metaphysical teaching about the nature and the manifestations of body. This would be accomplished by a volume including the greater portion of Part II. of the "Elements of Philosophy Concerning Body"; and such a book is unquestionably needed by students of the history of philosophy.

The present volume is heartily to be commended for its lack of the usual critical apparatus. Dr. Woodbridge reprints Aubrey's quaint "Life of Mr. Thomas Hobbes of Malmesburie," but he omits the ordinary "critical introduction" for the sound reason that, if read first it will "make an immediate and uncolored impression by the author impossible." In place of introduction and notes, Dr. Woodbridge offers, as has been indicated, an admirable selection of parallel passages from the different works of Hobbes himself, explaining and amplifying one text by another in a scholarly and illuminating fashion.

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FROM EPICURUS TO CHRIST. A Study in the Principles of Personality. By *William De Witt Hyde,* President of Bowdoin College. New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1904. Pp. viii, 185. Price, $1.50.

The Author, William De Witt Hyde, has given much thought to the philosophical problem, and he treats it from the standpoint of modern Protestant Christianity. To him personality is the secret of human life. Still there are some of the higher elements of personality, represented in philosophical principles which rise above the threshold of consciousness and are

reducible to scientific analysis. Of these principles the author selects five: "The Epicurean pursuit of pleasure, genial but ungenerous; the Stoic law of self-control, strenuous but forbidding; the Platonic plan of subordination, sublime but ascetic; the Aristotelian sense of proportion, practical but uninspiring; and the Christian Spirit of love, broadest and deepest of them all."

The author's main aim is to prove that though all of them possess a grain of truth, the four first are insufficient and find their fulfilment only in the fifth, in the Christian spirit of love.

Our author's plan is to proceed by quotations and then add his own explanations. The best portions of the book are Chapters I and II, in which he does justice to the Epicurean and Stoic principles, analysing them and subjecting them to a fair criticism. Parts III and IV show less mastery of the subject, for there are some passages in Plato's writings which ought to have been quoted, and thus the nobility of the Platonic conception and also its great affinity to Christianity does not become sufficiently apparent. The fifth part is not so much an explanation of the Christian spirit based upon quotations of New Testament sayings, but may be characterised as a sermon in which the crown of perfection is offered to Christianity. The author's Christianity, however, is neither the Christianity of the primitive Church, nor of the Middle Ages, nor even the Protestantism of the Reformers, but the modernised Christianity which is imbued with the spirit of syncretism, a Christianity that would be rejected by the Christians of by-gone ages. The author concludes his work with the following sentences:

"The omission of any truth for which the other ancient systems stood mutilates and impoverishes the Christian view of life. Ascetic Puritanism, for instance, is Christianity minus the truth taught by Epicurus. Sentimental liberalism is Christianity without the Stoic note. Dogmatic orthodoxy is Christianity sadly in need of Plato's search-light of sincerity. Sacerdotal ecclesiasticism is Christianity that has lost the Aristotelian disinterestedness of devotion to intellectual and social ends higher and wider than its own institutional aggrandisement.

"The time is ripe for a Christianity which shall have room for all the innocent joys of sense and flesh, of mind and heart, which Epicurus taught us to prize aright; yet shall have the Stoic strength to make whatever sacrifice of them the universal good requires; which shall purge the heart of pride and pretence by questionings of motive as searching as those of Plato; and at the same time shall hold life to as strict accountability for practical usefulness and social progress as Aristotle's doctrines of the end and the mean require. It is by some such world-wide, historical approach, and the inclusion of whatever elements of truth and worth other systems have separately emphasised, that we shall reach a Christianity that is really catholic."

THE STRUCTURE OF THE TEXT OF THE BOOK OF HOSEA. By *William Rainey Harper.* Chicago: University of Chicago Press. 1905. Pp. 51. Price, $1.00.

We have scarcely finished reviewing Dr. Harper's *Religion and the Higher Life,* when a new publication of his comes to our desk. In the meantime the strenuous President of the University of Chicago has been affected by a serious disease which has brought him to the verge of the grave, and we could not but feel the deepest regret and sorrow, if his useful career should come to a premature end. He is at present taking a much needed rest, while his friends hope for the best.

The publication before us is the revised Hebrew text and a new translation of the book of Hosea. It is in a handy form for any one who wants to see at a glance the meaning of a verse side by side with the original, and especially whether it is part of the prophet's own writing, or a later addition or a gloss. For further explanations as to the reasons of these discriminations the learned author refers us to his essay on "Amos and Hosea," published in the *International Critical Commentary,* 1905. The translation follows closely the Hebrew edition, and so Dr. Harper says that it is "sometimes more Hebraic than English." For the purpose which this version serves, it is certainly most appropriate and will unquestionably be appreciated by Hebrew scholars. P. C.

DESCARTES, DIRECTEUR SPIRITUEL. Correspondence avec la Princesse Palatine et la Reine Christine de Suède. Portraits, dessins et autographes. By *Victor de Swarte.* Préface de *M. Emile Boutroux* de l'Institut. Paris: Félix Alcan, éditeur. 1904.

Two royal ladies of good education played an important part in the life of Descartes. In the year 1862 Count Foucher de Careil published an édition de luxe, under the title *Descartes et la Princesse Palatine, où de l'influence du cartésianisme sur les femmes au dix-septième siècle.* The correspondence of Elisabeth was discovered in 1879 at Arnheim and appeared under the title *Descartes, la Princesse Palatine et la Reine Christine.* The present author has utilised these works and has rummaged the libraries and archives of France and Germany to fill out all their gaps, and with the assistance of Messrs. Boutroux and Darboux, he publishes the present collection of the literary correspondence of these two princesses with the great philosopher. The book affords a real insight into the influence of two noble women upon a great man and is as such a contribution not only to the history of philosophy but as it were of the civilisatory influences which are at work in shaping our great men. Descartes's correspondence acquires an additional interest through the dreadful fate of Elizabeth, the wife of the Prince-Elector of Palatine, who was elected king of Bohemia and lost crown and throne in

the battle of the White Mountain near Prague. It was the first stroke of the Catholic powers in Germany to reassert themselves and set a limit to the expanse of the Reformation which ushered in the Thirty Years War so disastrous to Germany. The fate of Christine was happier. She was certainly the equal of Elizabeth in intellectual accomplishments. The book is well written, contains good portraits of Descartes, Elizabeth, and Christine, and also a facsimile autograph of Elizabeth, and a reproduction of an old engraving of the city of Herford.

NOTES SUR L'HISTOIRE GÉNÉRALE DES SCIENCES. By *Louis Favre,* Directeur de la "Bibliothèque des Méthodes dans les Sciences expérimentales." Paris: Librairie C. Reinwald. Schleicher Frères & Cie., Editeurs. 1904.

This little book which bears the modest title *Notes on the General History of the Sciences* is a useful manual which will familiarise students with the aim, the general plan, and methods of the sciences. The several chapters of it treat the following subjects: What is and what is not, doubt and belief, construction of materials and facts, analysis and synthesis, encyclopædic knowledge, the unity of nature and the unity of science, imagination and science, anthropocentrism and anthropomorphism, method, revolutions of method, the true and the useful, medicine and agriculture, impossibilities, paradoxes, progress, the domain of science, contradictions and reconciliations, conditions of scientific progress, useful errors, classical errors, exaggerations, nothing new under the sun, science is social work. In conclusion, our author discusses how to build up and how to teach, and what ought to be accomplished.

HAUPTPROBLEME DER ETHIK. Sieben Vorträge von *Prof. Paul Hensel.* Leipsic: B. G. Teubner. 1903.

Dr. Paul Hensel, a professor of ethics at Erlangen, had been invited to lecture on the main problems of ethics at Mannheim, and having offered in concise outline to his public the main problems of ethics, he here publishes them, making them accessible to a larger public. He sketches and criticises: (1) utilitarianism; (2) evolutionism; and (3) the ethics of conviction, which represents his own views. He declares that in order to perform a truly moral act one must presuppose an unfailing norm of judgment which can be found only in a dutiful conviction. This, then, is the basis, and the only basis, of true morality, and here our author finds himself in close touch with Kant, but endeavors to go beyond Kant in giving the abstract notion of Kant's categorical imperative a definite content, and thus the purely formal *ought* becomes an *ought* of a definite conscience, based upon a narrower or larger experience, or a more or less correct judgment. He who looks upon man

only as an object of science, he who can judge of him under no other view point than the law of cause and effect, is unable to understand that man is a moral being. We must first come into possession of a system of valuation which will help us to judge of reality and to determine man's mode of action. From the standpoint of moral valuation man appears to himself as the product of the entire past. Thousands of years, to speak with Carlyle, have contributed to his birth, and other thousands of years wait what he will do in his life for their realisation. When thus conceding the enormous importance of our own life, our ethics will lead up to a religious thought, it teaches us that it is no accident that our life falls exactly in the present time, and that we are here to solve its problems. In order to act morally and to make the claim to be judged as a moral man, we need above all the consciousness of duty and the intention to act accordingly. It is not a theological morality which constitutes ethics, but a moral theology will be the necessary completion of our world conception. Any one who has not this faith in a higher power and who does not place his life's work into its service cannot accomplish his labors with the same moral earnestness as he who possesses such a faith.

INTEROGATIVE THOUGHT AND THE MEANS OF ITS EXPRESSION. By *Edward T. Owen, Ph. D.,* Professor of the French Language and Literature in the University of Wisconsin. Reprinted from the *Transactions of the Wisconsin Academy of Sciences, Arts, and Letters,* Vol. XIV.

This book belongs to the class of logical investigations which attempt to classify our methods of thinking, and Professor Owen has devoted his special attention to the element belief or disbelief which is the missing element in the interrogative. The treatise discusses words as idea symbols, sentences as thought symbols, and enters into the different analyses of thought. The second chapter is devoted to judgments,—the ordinary, the imperative, and the interrogative judgment. The writer leads to a determination of the missing element which is analysed in Chapter III, while Chapter IV treats of the elements, peculiarities, and structure of belief, its operation on the hearer's mind, and kindred topics. Professor Owen has given much thought to this important problem, but it is difficult to say even after a careful perusal how specialists in logic will take to his investigations, and how far his colleagues in this special line of thought will deem his lucubrations significant.

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THE MONIST

THE RELATIONAL ELEMENT IN MONISM.

I.

IN the ever-changing panorama which the world offers to the contemplation of sentient beings, two characters have never failed to arouse the interest of the human mind, to provoke it to the activities of philosophic thought—the manner in which objects are related to each other, and the nature of the objects themselves. Being under necessity of adapting himself to it, man looks to the external world for the materials of an organized intellectual awareness to its twofold aspect of extension, or so-called "space," of succession, or so-called "time." Among the most important of the conditions of this awareness, two may be mentioned—on the one hand man's local position in nature and limited power of movement within it, restricting him to a mere fragment of its vast spatial extent; on the other hand, that serial character of the mind process which, yielding direct glimpses in such narrow area of no more than momentary aspects of the nature there accessible to him, confines him largely to the appearances yielded by objects in the present stage of their cycle of change. The conditions of man's existence thus combine with the limitations of sense to favor incomplete and therefore erroneous views of nature—lead man, that is to say, to treat the local environment with which he is familiar as if it were the whole environment; to regard the present stage of the objects with which he is acquainted as if it constituted all the stages of such objects; in a word, to confound each sense-image with the object which it merely represents, and thus to make the temporary and local aspects

of the world around him do duty in his intellectual processes for nature in its totality.

Now the actual mechanism of these limitations—given man's local position in "space"—has always been the sense-image; and as the sense-image restricts us to single objects at a time, as well as to the present aspects of such objects, it makes our power to realize what objects are as wholes in "time" and "space" depend on that supplementary intellectual process by which the mind segregates and unifies all the objective aspects of the environment which sense-images yield. But as this intellectual process, this ordering of the sense-images by the intellect, this totalizing of the fragmentary elements of sense, matures late in the history of the race, the early period of man's acquaintance with nature is one in which he is not only restricted to little more than sense-image knowledge of it, but is compelled to view objects as dynamically isolated from, as out of relation to each other. For as sense-knowledge contains no evidence, apart from the intellectual process, of the way in which objects are intimately and fundamentally related to each other, of how they are connected by action and reaction, it compels the primitive mind to treat each of them as having absolute instead of contingent existence, as possessing in and of itself all the qualities or properties which it manifests, as being self-sourced instead of system-sourced.

There has undoubtedly been advance on this primitive treatment of objects as if they existed independently of each other; considerable progress has even been made towards the realization of their dynamic interrelatedness. For sense-images are merely the materials of nature knowledge; in the earliest stages of its development, the human mind was always at work upon this sense-material, classifying, segregating, unifying it under the stress of an impulsion to self-maintenance that demanded of the organism an increasingly accurate adjustment of itself to environment. Yet it is only in the modern stage that this intellectual process has attained anything like considerable development. Releasing the mind from more or less dependence on the present aspect of an object, it has enabled us to realize the object as constituted of all its aspects—of all the changes through which it passes—and thus to deal with it intel-

lectually as a whole in time; by simultaneously revealing interaction between the individual object and other objects, it has enabled us to recognize that objects are not isolated from each other, but dynamically interrelated and interdetermining.

That the doctrine of "evolution," so called, should have formed the first great step towards the completion of nature knowledge becomes explicable only when regard is had to the fact that the relations earliest revealed to the mind are always those of change. As the "time" aspects of objects are aspects of difference; as it is the procession of an object from one stage of its existence to another and not its continuing existence, which most excites our attention—it was inevitable that when the human mind began to reach out for the deeper and wider acquaintance with objects which is to be gained only from a knowledge of their connection with each other, it should have been overwhelmingly impressed, not with the fact of their relation in "space," but with the phenomena of their relation in "time." And if it be asked why the mind has simultaneously fallen short in the equally necessary process of realizing objects as totalities in their extension aspect, the reply is that the field is here not one of differences that shock the consciousness because they embody change, but of resemblances cognizable by the intellect rather than by the senses—that the deeper extension aspects of existence, being aspects of the fundamental, the universal, the permanent, manifest themselves, not as differences, but as likenesses, and long resisting the solvent of the sense knowledge, yield only to the intellectual process, thus coming late into nature knowledge as one of its most mature and advanced stages. The result of this failure to complete our succession or "evolutionary" knowledge of objects with an equally radical insight into the extension aspect of nature has been, so far as the fundamental method of its thought is concerned, to retain science in a stage which has advanced little beyond that represented by the mind of primitive man. There is undoubted recognition of the fact that objects are interrelated by action, yet the action is viewed independently of the nature of the objects which act. Alike in regard to their motion and nature, objects are regarded, not as contingent, but as absolute existences — not as

system-sourced, but as self-sourced—not as constitutively, but as adventitiously related.

II.

Let us now see what this absolute view of objects must signify for nature knowledge, even when pervaded and permeated here and there by glimpses of the larger relational view. Observe first how it diminishes interest in and retards discovery of the relations which exist between the different phases of objects in both "time" and "space." For if an object as extended possess its properties absolutely, no new knowledge of it can be gained by inquiring into the properties of other objects; if, on the other hand, it possess each "time" phase of its existence absolutely, nothing can be gained by inquiring into the nature of the other phases. Whence it follows that, were we to accept the absolute view of objects—the view that they are self-sourced rather than system-sourced—it could only be a waste of effort to seek for the individual being the explanation yielded by the human society, to consider the cell in the light of the community of cells, to study life in general in order to obtain accurate knowledge of some special class of organisms, to rely on the inorganic for the characters of the organic, to resort to the universe for the illumination of the unit. In the view that each object possesses its powers independently of all other objects, the search for cause, which has done so much for the advance of nature knowledge, dwindles to a mere quest after relation between states of consciousness until the organism comes to be regarded as in no way necessarily dependent for such states upon any real, upon any actual universe which can be conceived of as existing outside. We find this uncertainty even in Kant; the very belief of Hume, still lingering in the philosophical aspect of nature study, to the effect that our supposed knowledge of cause is wholly subjective—that what we call causal relation is merely the habitual succession of states of consciousness—is itself due to the inadequate recognition of the relation which exists between organism and environment—failure to view conscious states as necessarily related to objects outside the organism themselves interrelated—failure also to regard objective relations as constitutive instead of merely adventitious.

We may begin our consideration of the retarding effects of the absolute view, here contrasted with the relational view of nature, by noting the almost complete indifference which science has thus far shown towards the problem of the relation of substance—of the world of ether and matter—to so-called "space"; and it has shown this indifference in the supposition that the problem is one of no importance for the practical interests of nature investigation. Meanwhile, it has tacitly accepted the view that "space," as a containing capacity for objects which would remain even were objects annihilated, is a real entity, an existence *sui generis*. Says Tyndall, in his paper on *The Constitution of Nature*:

"Though compelled to think of space as unbounded, there is no mental necessity appealing to us to think of it either as filled or empty; whether it is so or not must be decided by experiment and observation....If the ether have a boundary, masses of ponderable matter might be conceived to exist beyond it, but they emit no light....As far as our knowledge of space extends, we are to conceive of it as the holder of the luminiferous ether through which are interspersed, at enormous distances apart, the ponderous nuclei of the stars."

The result of specialism thus unfounded in the intellectual conditions of nature knowledge has been to delay our realization of the universe as a unity, since the assumption of an entity called "space," which existence merely "occupies," compels us to compromise in our minds between two ideas—the conception of a universe of objects which "fills" space and is therefore unending, and the conception of a cosmic system which, being limited, is bounded in every direction by "universal space." If we accept the former view, the notion of definite characters—definite amounts of power and of the passing over of power into movement—disappears in the thought of indefinite spatial vastness, or is reduced to an *impasse* of contradiction between characters which, though mentally conceivable, are intellectually irreconcilable; if we accept the view of a limited cosmos locally situated in "universal space," we raise the question of the possibility of other systems, and with it that problem of the relation between them which, unless affirmatively resolved, with the result of irreconcilable contradiction, brings the thought of cosmic unity to an end: as the term "universe," implying "one-

ness," signifies all-inclusive totality, it becomes a misnomer when an attempt is made to utilize it for the pseudo-conception of a plurality of "universes" separated from each other by tracts of unoccupied emptiness. That the thought of an existence vacuum which objects merely "occupy" has otherwise retarded nature knowledge is well seen in the assumption, frequently met with in scientific treatises, that heat may be dissipated from "our universe" into "space," as well as in the historic confusion of "empty space" with the ether system, and in the contradictory assumptions of popular science regarding what are called "the confines of the universe," the "limits of our system," the "material universe," etc.

III.

In now passing from the most general to the more concrete of the nature problems, it will help us if we bear in mind that the absolute view of objects—the view that each exists independently of all the rest, and that the relation between them is adventitious, not constitutive—ignores three principles of the profoundest import for nature study. These principles may be stated as follows:

1. The Principle of Likeness. Objects which, however they may differ in superficial characters, resemble each other in fundamental characters, belong to the same system, and must be interpreted in the same way.

2. The Principle of Derivation. Wherever in local, superficial, transitory aspects of nature we find characters that demand explanation, we are bound to seek that explanation not in other local, superficial, transitory aspects of existence, but in its permanent, fundamental and universal characters.

3. The Principle of Universality. True explanations of nature cannot be isolated explanations, explanations *sui generis,* explanations *ad rem,* but must be explanations which are themselves interrelated. In other words, all great laws which are to formulate or describe nature processes must be laws that are primordially valid for the universal, the fundamental, the permanent characters of the cosmic process, before being derivatively valid for its local, superficial, and transitory characters. The explanatory range of every

true natural law, that is to say, must resemble, to use a homely illustration, the range of a through train which reaches the subsidiary, suburban, outlying stations only because it has begun its trip in the great metropolis.

All three principles assume and demand the thought of the all-inclusive unity of the cosmos. The first, aimed at the failure to realize cosmic unity, preserves us from separating in our thought great classes of phenomena that belong together; the second saves us from the temptation, so strongly held out by sense knowledge and our local position in the universe, to reverse true principles of interpretation by employing the local and immediate for the elucidation of the permanent and the universal; the third emphasizes the orderly filiation of all explanations of nature phenomena by referring such phenomena to their ultimate source in the substance system. Accepting all three, as we are compelled to do, then it follows—from the principle of likeness, that matter and ether, being connected by action and reaction, are of fundamentally the same nature—from the principle of derivation, that we must interpret the mind by the body, and not the body by the mind; the individual by society, and not society by the individual; the cell by the organism, not the organism by the cell; the organic by the inorganic, and not the inorganic by the organic; matter by substance, not substance by matter; the unit by the universe, not the universe by the unit—from the principle of universality, that whatever explanations are reached for vital, for chemical, for electro-magnetic, for gravitative phenomena, must be interrelated explanations, and that the causal determinations which result in organic activity and structure cannot be other than derivative forms of the causal determinations out of which inorganic activities and structures arise.

Now all these principles are more or less negatived or ignored in the absolute attitude towards nature—in the tacit acceptance by our so-called "scientific method" of the view that objects, possessing their characters absolutely, are related to each other not constitutively, but only adventitiously—in views, that is to say, which really go together, for if an object be self-sourced, then any relation between it and other objects must be adventitious, while if the object

be system-sourced, then any relation between it and other objects must be constitutive. Taking our first example from the most important of the concrete nature problems, we may easily recognize that, by ignoring the principle of likeness, the physicist need not assume that there is any relation other than an adventitious one between matter and ether; while, by denying the principle of derivation, he may even seek to explain ether from matter—the universal from the merely local element, with the result of one or other of the familiar comparisons in which physicists liken ether to jelly, wax, or steel. Well-nigh all the difficulties thus far met with by the human mind in trying to realize the nature of ether have been difficulties resulting from the effort to approximate it to the nature of matter. Le Sage used material corpuscles to elucidate gravitative action; Newton's theory of light had an analogous basis in matter; heat was long traced to material elements which could be mingled with and obtained from the molecules of objects; the early "fluid" hypothesis of electricity anticipated, in its material character, certain modern methods of accounting for the luminous manifestations of electro-magnetic phenomena; it is still, in our own time found possible to formulate hypotheses for ether which contradict those held for matter, as in the case of the so-called "vortex-atom" theory, which asserts the possibility of "frictionless" or unresisted motion.

The absolute view of objects as existing independently of the system of objects carries with it the belief that the motion of an object is similarly independent. Even in modern times it has seemed unnecessary to set up any indispensable relation between motion and resistance to motion, whence physicists are able to propound hypotheses regarding matter which accept or reject at will the notion that movement is possible in an existence vacuum. Nor does the ability of the mind to do this depend altogether on the survival of the old thought of the ether system as a vast emptiness whose only function is to allow itself to be occupied by objects. If the object be itself absolute—related only adventitiously and not constitutively to other objects—then its motion must in like manner be absolute, and we may conceive of it as being utterly indifferent to the presence or absence of resistance—may conceive of it, that

is to say, as motion against resistance, or as motion without resistance, according to the assumed circumstances. The important question whether the resistance is constitutively bound up with the motion as an essential and therefore indispensable element thereof, thus turns on the question whether the object which moves exists absolutely, or only by virtue of some relation which connects it with the system of objects. If, moreover, each unit object be regarded as possessing its nature as such absolutely, instead of contingently upon the system; and if motion be also viewed absolutely, as a character not constitutively related either to the nature of the object or to the nature of the system; then physicists are compelled to resort to one of two hypotheses—either to regard motion as an original, underived property of matter, possessed by each unit object, or to treat it as divinely originated at some period in the early history of the cosmos. The latter view is now widely rejected as anthropomorphic; as to the former, it will suffice to say that, besides being a negation of inertia, it is an effort to set up for unit objects in the "celestial spaces," characters which are denied by our experience of such objects on the surface of the earth. The law of likeness requires us to recognize the fundamental oneness of all the forms of power, yet physicists have thus far failed to unify the power which an object puts forth as moving with the power which the same object possesses and exerts by virtue of its nature as related to all other objects. Meanwhile the principle of derivation has been ignored in the effort to make all power kinetic by deducing it from motion instead of from substance.

IV.

This question of the relation of motion to the resistance which it encounters is always met with whenever we come to discuss such problems as the origin of motion, the direction of motion, the conservation of energy, inertia, and cause. As it is of the utmost importance for us to reach relational rather than absolute solutions of such problems, we shall lose nothing by re-emphasizing, in a special form for each, the constitutive relation whereby motion and resistance inter-condition and inter-involve each other. Note first

the difference between the absolute and the relative view of the origin of motion; in the absolute view motion is adventitiously acquired from the system, and is under no necessity of returning its energy to the system, whereas in the relational view the energy of motion, being from the system, must be returned to it. Our modern account, again, of motion as taking place along, or as following, the line of least resistance, cannot be regarded as other than overwhelmingly absolute. By distinguishing with such definiteness between the initial stress which results in motion and the resistance which the moving object encounters, it makes the so-called "resistance" adventitious merely—something which, so to speak, motion finds it has to deal with after it has once been set up. To say that motion follows the line of least resistance is to assume that the "least resistance" is something superadded to a process which already exists *de toutes pièces,* is therefore complete independently of whether there is resistance or none—in advance, that is to say, of any experience of resistance by the moving object. The absolute view regards motion as a character *sui generis*—as something which must happen whether it be "resisted" or not—as a change which, while it frequently takes place through a resisting medium, may also take place through an existence-vacuum—as something which is resisted not because "resistance" is any necessary, indispensable part of the motion process, but only because, under certain conditions, "resistance" happens to be present. The absolute view thus relates the "line of least resistance" adventitiously to the stress producing motion; the relational view relates it constitutively to that stress, and does this by showing that resistance, re-stress, or re-action is an essential condition of the stress which produces motion, and therefore an indispensable element of the motion process. The intellectual conditions of the problem, moreover, do not permit of an absolute view of motion, since were it possible for bodies to move through "empty space," the motion of such objects, being unresisted, would require no stress to initiate it, and we should be compelled to conceive of them as indifferently at rest or in motion—as lacking definiteness of condition.

An inevitable result of the view which regards the unit object

as possessing its properties absolutely, which disconnects the power of motion from the power of substance, and finds no constitutive necessity for a relation between matter and ether, is the absolute attitude of modern physics towards the method of the so-called "conservation of energy." The term "conservation" is itself objectionable, since it makes half the process do duty for the whole process. Not only must energy be expended in order to be conserved—there is no energy in any form save to the extent that "expenditure" and "conservation" take place simultaneously. Power, in a word, whether it be the power of objects or of the motion of objects, can exist only in the degree of a conserving process which involves expenditure, and of an expending process which involves conservation. To speak of a "conservation" of energy, moreover, is to suggest that, were the conditions unfavorable, energy might fail to be "conserved," might pass out of existence—in which supposition there is at once the error of implying that energy is complete before it is conserved, and the error of denying that presence of a conserving process which is the indispensable condition of expenditure. Note also that the absolute view provides two methods of conservation instead of one—methods wholly irreconcilable with each other —the distribution of the stress into the resistance, when there is resistance; and the continuance of the motion when there is "no resistance." It thus treats "expenditure" and "conservation" as separate processes either of which might theoretically exist without the other; it therefore regards the relation between them as adventitious. In the relational view they are constitutively related, since they reciprocally interinvolve each other as aspects of the two-sided unity which we call Power.

Observe now some of the results which the absolute attitude towards "conservation" makes inevitable. If "conservation of energy" is a character possessed absolutely, not contingently, by matter, then it is useless to seek the explanation of it in any process outside the realm of matter. If, again, the power with which an object moves is something *sui generis*—not related either to the nature of the object or to the power of substance—it is equally useless to seek for any relation between the "conservation" of the energy of

motion and the "conservation" of mass (the so-called indestructibility of matter). And if, finally, the conservation of the organism is in like manner something absolute, instead of contingent, there need be no inquiry as to its origin in earlier and more universal forms of conservation. It is, in fact, by failing to relate to each other the various forms of conservation—conservation of ether, conservation of motion, conservation of the organism—that science ignores the principles of likeness, derivation, and universality, and therefore abandons all hope of the solutions to which the application of these principles inevitably lead.

Here we reach the conception of inertia, which is similarly open to an absolute and a relational interpretation. Bodies are said to "persist" in their condition of rest or motion until that condition is changed by power other than their own—to go on moving in a straight line until they meet with resistance or are made to change their condition by force. All such propositions are characteristically absolute: they warn us of the possibility of resistance (reaction), but say nothing of its necessity. They assume that the moving object, with a convenient existence-vacuum for its "medium," may go on moving for ever; yet they fail to show how motion is possible to an object which the proposition has disconnected from the universe. In the absolute view, lingering everywhere in modern physics, the object is held to possess its condition of rest or of movement independently of its relation to the system, or at any rate, as a result of adventitious, rather than constitutive relation to the system; the continuous motion of an object is therefore attributed to absence of resistance, instead of to continuity of differential stress, while the continuous rest of an object is held to be due to absence of differential stress, instead of to continuity of equalized stress. All of which is opposed to the relational view, which holds that when an object remains at rest, it is held at rest by the system —that when it remains or continues in motion, it is kept in motion by the system. For inertia, instead of being a condition adventitiously acquired from the system, is a condition constitutively imposed by the system.

V.

The neglect to recognize constitutive relation is also seen in our modern attitude towards the organism, which has long been viewed absolutely—viewed rather as imposed upon nature, with powers possessed independently of nature, than as arising out of nature with such powers contingently originated. Hence the effort to explain the organism from the cell rather than the cell from the organism — an effort obviously founded on the belief, however tacitly held, that the cells are not constitutively, but only adventitiously related. This attitude is manifest in the perpetual striving of biological experts to find in some detail of cell structure the "secret of life"; in the belief, which confounds the concomitants of phenomena with their causes, that life is to be traced to some electrical, fermentive or other local process in the organism. We are here reminded of the slow advance which has been made towards relational views since the time when the organs of body and mind were treated by physicians as if each existed and possessed its powers more or less independently of the rest—when specialists expert in one field of human pathology were not expected to know anything of the other fields—when sociology, essentially a science of human relations, was not yet born, and it was the custom to regard the characters of the human being as individually intelligible, instead of as being explicable only in the light of the society of individuals. As early hypotheses regarding man left out of consideration the world of the lower organic life, in the supposition that man was self-sourced, instead of system-sourced, so theorists in the realm of human society took that absolute view of the individual human being out of which the exaggerated individualism of the eighteenth and nineteenth centuries had its birth. Even to-day our science of sociology still treats the human individual as related more or less adventitiously instead of constitutively to the sum of individuals, the biological idea, itself absolute, of a system of co-operating units, each complete in itself, having been incorporated almost bodily into the scientific conception of the social system.

Note also how the absolute view has retarded our knowledge of the process of organic development. In the theory of "natural selection" we have an explanation contrived for organisms which has no application to anorgana—a law which, being *ad rem*, describes no part of that higher, that more universal process in which organic development must have originated. And it is because of this isolation of the special theory from any more general theory that we have been compelled to ignore the problem of the manner in which variations arise in the attention which we give to the manner in which they are accumulated—to believe, in a word, that we can solve the problem of the "origin of species" without having first solved the problem of the origin of life. Instead of seeking in the world of the inorganic for some fundamental process of which the superficial organic process is merely a highly special and derivative form, we have been trying to explain the organism by dealing with it alone—by treating it as an object *sui generis*, as an object totally unrelated, or related only adventitiously, to the general system of objects which we call nature.

It is also in the very temper of the absolute view that we have dealt with the problem of intelligence. The principle of derivation requires us to explain the conscious from the unconscious forms of intelligence, yet we have never succeeded in ridding ourselves of the notion that some form of conscious intelligence, if not our own, is at work in the countless adaptations of structure and process which we find within the bodies of plants and animals. In like manner, the principle of derivation requires us to refer the general intelligence of the organism, conscious as well as unconscious, to that larger world in which it must have had its origin; yet instead of tracing organic intelligence to the inorganic cosmos, where the fundamental characters of that intelligence are plainly manifest, we try to read into the universe the most local, the most special, the most transitory forms of intelligent activity—those associated with the consciousness of the human organism. For scientific purposes, that is to say, we seek to explain the intelligence of the organism by making the atoms of matter intelligent; for general purposes, we try to understand nature by referring its intelligent

adaptations to a divine intelligence patterned after the intelligence of man.

VI.

The contrast thus shown between absolute and relational views may be traced, with simultaneous disclosure of the source of inaccuracy in the former, through every department of human knowledge. Everywhere the absolute method is the method of ignoring the dependence of the individual object, the single process, on the sum of processes, the system of objects; the relational view is everywhere the method of viewing objects and processes in the light of the totality of processes and objects. Advance in nature knowledge, however darkened and disguised by imperfect method, has ever been advance from absolute to relational ways of viewing nature; it has always meant progress from the thought of the object as self-sourced to the thought of it as system-sourced; it has never been anything other than the progressive mastery, by recognition of fundamental likeness, of those relations of stress and re-stress, of action and re-action, which make up the total system of power which we call universe. Nor is the contrast between absolute and relational merely a character of mental processes: it has its foundation and source in the world of objects. The whole of so-called development, alike in inorganic and organic, is nothing other than a gradual setting up of relation between units and groups—a growing dependence of each unit on the sum of units,—a gradual increase of the contribution made by unit to group, by group to unit—a progressive subordination of unit to system—an advancing domination of unit by system. The formation of matter groups by the gravitational and chemical processes is simply the earlier form of the process which manifests itself on a larger scale in the phenomena of crystallization, and on its most complex scale in the organism and in human society. In all the movements with which sociology deals—movements industrial, political, philanthropic, religious—life shows itself as a moving away from conditions that are absolute towards conditions that are relational. As all failures of nature knowledge have been failures of the absolute view, so all

failures in conduct, individual and national, have resulted from an inadequate sense of relation — from the effort to substitute for system-sourced conduct the conduct which is sourced in self. Movement away from the view of the individual and the group as self-dependent towards the view of both as contingent upon and dominated by the system—this is the process which has been at the heart of all moral advance.

It is now proposed to rationalize, and therefore to universalize the procedure which has thus far been followed in the investigation of nature—to make application to the cosmos as a whole the method which has hitherto been applied only locally and fragmentarily, and has thus been applied with inadequate realization of its universal meaning and scope. In the relational view, the solution of nature problems yet unsolved is nothing other than a process of reaching out from the individual object, the individual process, to the system which is to elucidate both—a passing from the local and superficial characters which most easily affect the senses to those fundamental and universal characters which appeal to the intellect—a process of universalization which, demanding fundamental likeness as the condition of its possibility, implies a universe of one kind throughout whose units, everywhere system-contributing and system-determined, exist only as they are constitutively interdependent.

Reasserting, therefore, the supremacy of the total mind process over the deliverances of the senses, as well as over every imperfect application of the intellect to those deliverances, the relational view demands that our knowledge of nature, instead of being made up of unrelated or imperfectly related views, shall have its foundation in an outlook over the whole field. Holding that the warrant for any view of nature must always be the reasonableness of that view—its consistency with all other attainable truths, with all other propositions believed to be true—it casts the light of the relational method over the path hitherto traversed by the mind. It indicates the way yet to be followed; it points also the goal to be reached. Its task is that of completing the monistic account of nature, and of doing this by revealing that cosmic unity which the accumulated facts of science, when relationally interpreted, already disclose.

The aim of the relational philosophy, so far as concrete nature problems are concerned, is to relate motion to the forms as well as to the substance of the cosmos; to correlate gravitation with light, electro-magnetism, heat; to connect chemical with electro-magnetic action; to unify the self-maintaining organism with the self-maintaining universe; to revise the theory of natural selection with such an account of the internal factors of organic development as shall separate the process by which intelligent adaptations are accumulated from the process by which they are originated; to universalize so-called "intelligence" by showing it to be primarily neither a conscious nor even an organic process, but a process rooted in the very nature of power; and finally, without danger of "pantheistic absorption" or injury to moral interests, to derive all organic and inorganic characters — characters of form, characters of motion, characters of mind—from their fountain and source, the substance system, the Creative Universe.

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ON THE FOUNDATIONS OF LOGIC AND ARITHMETIC.[1]

WHILE to-day in researches on the foundations of geometry we are essentially agreed as to the procedures to be adopted and the ends to be sought, it is quite otherwise with the inquiry concerning the foundations of arithmetic: here even yet the most diverse notions of the investigators stand bluntly opposed to each other.

The difficulties in the founding of arithmetic are partly indeed of a different character from those which were to be overcome in the founding of geometry.

In the examination of the foundations of geometry it was possible to leave aside certain difficulties of a purely arithmetical nature; in the founding of arithmetic, however, the appeal to another basal science seems unallowable.

I shall show the essential difficulties in the founding of arithmetic most clearly by subjecting to a brief critical discussion the views of individual investigators.

L. Kronecker, you know, saw in the concept of the whole number the true foundation of arithmetic; he formed the conception, that the integer, and that too as a general notion (parameter value), is directly and immediately given; thereby he was prevented from recognizing, that the idea of the whole number needs and is susceptible of a foundation. In so far I would designate him as a *dogmatist*: he takes the integer with its essential properties as dogma and makes no attempt to get behind it.

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[1] Translated by George Bruce Halsted.

H. Helmholtz represents the standpoint of the *empiricist;* the standpoint of pure experience, however, seems to me to be refuted by the objection, that from experience, that is, through experiment, can never be gotten the possibility or the existence of an indefinitely great number. For the number of the things which are object of our experience, even though it is great, lies nevertheless below a finite limit.

E. B. Christoffel and all those opponents of Kronecker's, who, led by the correct feeling, that without the concept of the irrational number the whole of analysis would remain doomed to unfruitfulness, seek, by finding out "positive" properties of this concept or through like means to save the existence of the irrational number, I would designate as *opportunists.*

In my opinion, however, they have not succeeded in reaching a real refutation of the Kronecker standpoint.

Among the scientists who have penetrated more deeply into the essence of the whole number, I may mention the following:

G. Frege sets himself the problem of founding the laws of arithmetic by means of *logic*, this taken in the usual sense. He has the merit of having rightly apprehended the essential properties of the concept of the whole number as well as the significance of the inference by complete induction. Inasmuch as he, however, true to his plan, takes this also among others as axiom, that a concept (an aggregate) is defined and immediately available, provided only it be determined for every object, whether it falls under the concept or not, and also in doing this subjects the concept "every" to no restriction, he exposes himself to just those paradoxes of the theory of aggregates, which lie, for instance, in the concept of the aggregate of all aggregates and which, it seems to me, show that the conceptions and means of investigation of logic, taken in the usual sense, are not adequate to the rigorous requirements set up by the theory of aggregates.

The avoidance of such contradictions and the clearing up of those paradoxes is rather from the very outset to be fixed upon as a chief aim in researches on the number concept.

R. Dedekind has clearly perceived the mathematical difficulties

in the founding of the number concept and in most ingenious fashion first supplied a construction of the theory of whole numbers.

I would, however, designate his as a *transcendental* method in so far as he conducts his proof for the existence of the infinite in a way, whose fundamental idea is indeed used in like manner by philosophers, but which because of the unavoidable contradiction of the concept therein employed of the totality of all things, I cannot acknowledge as allowable and sure.

G. Cantor has perceived the above-mentioned contradiction and has given expression to this perception by distinguishing between "consistent" and "inconsistent" aggregates. Inasmuch as he, however, in my opinion sets up no sharp criterion for this distinction, I must designate his conception on this point as one which still leaves room for the *subjective* judgment and therefore affords no objective certainty.

I am of the opinion all the difficulties touched upon can be overcome and we can attain to a rigorous and entirely satisfactory founding of the number concept, and that by a method, which I would call *axiomatic,* whose fundamental idea I wish briefly to develop in what follows.

Arithmetic is indeed designated as a part of logic and it is customary to presuppose in founding artithmetic the traditional fundamental principles of logic.

But on attentive consideration we become aware, that in the usual exposition of the laws of logic certain fundamental concepts of arithmetic are already employed, for example the concept of the aggregate, in part also the concept of number.

We fall thus into a vicious circle and therefore to avoid paradoxes a partly simultaneous development of the laws of logic and arithmetic is requisite.

In the brief space of a lecture I can merely indicate how I conceive of this common construction. Therefore I ask indulgence if I succeed only in giving you a rough notion of what direction my researches are taking. Moreover, for the sake of being more easily understood, I shall employ the ordinary speech "in words"

and the laws of logic therein indirectly expressed, more than would be desirable in an exact construction.

Let an object of our thinking be called a *thought-thing* or briefly a *thing* and designated by a symbol.

Let us take as the basis of our consideration first of all a thought-thing 1 (one).

The taking of this thing together with itself respectively two, three or more times, as:

$$11, 111, 1111,$$

we designate as *combinations* of the thing 1 with itself; in like manner any combinations of these combinations, as:

$$(1)(11),\ (11)(11)(11),\ ((11)(11))(11),\ ((111)(1))(1)$$

are in turn called combinations of this thing 1 with itself.

The combinations likewise are designated merely as things and then in distinction to this the fundamental thought-thing 1 as *simple* thing.

We adjoin now a second simple thought-thing and denote it by the symbol = (equal). We consider now in turn the combinations of these two thought-things, as:

$$1=,\ 11=,\ \ldots(1)(=1)(===),\ ((11)(1)(=))(==),\ 1=1,$$
$$(11)=(1)(1).$$

We say, the combination a of the simple things 1, = *differs* from the combination b of those things, if they, as regards the mode and sequence of the combination, or the choice and participation of the things 1, = themselves, deviate in any way from one another, that is if a and b are not *identical* with each other.

Now let us think the things 1, = and their combinations as somehow divided into two classes, *the class of the existent* and *the class of the non-existent*: everything which belongs to the class of the existent, differs from everything which belongs to the class of the non-existent. Every combination of the two simple things 1, = belongs to one of these two classes.

If a is a combination of the two fundamental things 1, =, then we designate also by a the *statement*, that a belongs to the class

of the existent, and by $\bar{a}$ the *statement,* that a belongs to the class of the non-existent. We designate a as a *true* statement, if a belongs to the class of the existent; on the other hand let $\bar{a}$ be called a *true* statement, if a belongs to the class of the non-existent.

The statements a and $\bar{a}$ constitute a *contradiction.*

The composite from two statements, A, B, represented in symbols by

$$A|B,$$

in words: "from A follows B" or "if A is true, B also is true" is likewise called a statement and then A is called the *hypothesis,* B the *conclusion.*

Hypothesis and conclusion may themselves in turn consist of several statements A_1, A_2, respectively B_1, B_2, B_3 and so forth, in symbols:

$$A_1 \,\&\, A_2 \mid B_1 \text{ o. } B_2 \text{ o. } B_3,$$

in words: "from A_1 and A_2 follows B_1, or B_2, or B_3" and so forth.

In consequence of the symbol o. (or) it would be possible, since negation is already introduced, to avoid the symbol |; I use it in this lecture merely to follow as much as possible the customary word-speech.

We will understand by A_1, A_2,... respectively those statements which—to be brief—result from a statement $A(x)$ when in place of the "arbitrary" x we take the thought-things 1, $=$ and their combinations; then we write the statements

$$A_1 \text{ o. } A_2 \text{ o. } A_3,\ldots \text{ respectively } A_1 \,\&\, A_2 \,\&\, A_3,\ldots$$

also, as follows:

$A(x^{(o)})$, in words "at least for one x"
respectively $A(x^{(\&)})$, in words "for every single x,"

in this we see merely an abbreviated way of writing.

We make now from the fundamental two things 1, $=$ the following statements:

1. $x = x$
2. $[x = y \,\&\, w\,(x)] \mid w(y).$

Therein x (in the sense of $x^{(\&)}$) means each of the two funda-

mental thought-things and every combination of them; in 2. y (in the sense of $y^{(\&)}$) is likewise each of those things and each combination, furthermore $w(x)$ an "arbitrary" combination, which contains the "arbitrary" x, (in the sense of $x^{(\&)}$); the statement 2. reads in words:

From $x = y$ and $w(x)$ follows $w(y)$.

The statements 1., 2. form the *definition of the concept* $=$ (equal) and are in so far also called *axioms.*

If one puts in place of the arbitraries x, y in the axioms 1., 2. the simple things 1, $=$ or particular combinations of them, there result particular statements, which may be called *inferences* from those axioms.

We consider a series of certain inferences of such a sort, that the hypotheses of the last inference of the series are identical with the conclusions of the preceding inferences.

Then if we take the hypotheses of the preceding inferences as hypothesis and the conclusion of the last inference as conclusion, there results a new statement, which in turn may be designated as an inference from the axioms.

By continuation of this deduction-process we may obtain further inferences.

We select now from these inferences those which have the simple form of the statement a (affirmation without hypothesis), and comprehend the things a so resulting in the class of the existent, while the things differing from these may belong to the class of the non-existent.

We recognize, that from 1., 2. only inferences of the form $a = a$ ever arise, where a is a combination of the things 1, $=$.

The axioms 1., 2. in their turn as regards the partition in question of the things into the two classes are also fulfilled, that is true statements, and because of this property of the axioms 1., 2. we designate the concept $=$ (equal) defined by them as a concept *free from contradiction.*

I would call attention to the fact, that the axioms 1., 2. do not at all contain a statement of the form $\bar{a}$, that is a statement, accord-

ing to which a combination is to be found in the class of the non-existent.

We therefore could also satisfy the axioms by comprehending the combinations of the two simple things all in the class of the existent and leaving the class of the non-existent empty.

The partition above chosen into the two classes, however, shows better how to proceed in the subsequent more difficult cases.

We now carry the construction of the logical foundations of mathematical thinking further, by adjoining to the two thought-things u (infinite aggregate, infinite), f (following), f′ (accompanying operation) and laying down for them the following axioms:

$$3.\quad \mathrm{f}(\mathrm{u}x) = \mathrm{u}(\mathrm{f}'x)$$

$$4.\quad \mathrm{f}(\mathrm{u}x) = \mathrm{f}(\mathrm{u}y) \mid \mathrm{u}x = \mathrm{u}y$$

$$5.\quad \overline{\mathrm{f}(\mathrm{u}x) = \mathrm{u}1}$$

Therein the arbitrary x (in the sense of $x^{(\&)}$) means each of the five now fundamental thought-things and every combination of them.

The thought-thing u may be called briefly *infinite aggregate* and the combination ux (for example u1, u(11), uf) an *element* of this infinite aggregate u.

The axiom 3. then expresses, that after each element ux follows a definite thought-thing f(ux), which is equal to an element of the aggregate u, namely to the element u(f′x), that is belongs likewise to the aggregate u.

The axiom 4. expresses the fact, that, if the same element follows two elements of the aggregate u, those elements also are equal.

According to axiom 5. there is no element in u, after which the element u1 follows; this element u1 may therefore be called the first element in u.

We have now to subject the axioms 1.—5. to the investigation corresponding to that before made of the axioms 1., 2.; therein it is to be noticed, that those axioms 1., 2. at the same time experience an extension of their validity, inasmuch as now the arbitraries x, y mean any combinations you please of the five fundamental simple things.

We ask again, whether certain inferences from the axioms 1.—5. make a contradiction or whether on the contrary the fundamental five thought-things 1, =, u, f, f′ and their combinations can be so distributed into the class of the existent and the class of the non-existent, that the axioms 1.—5. in regard to this partition into classes are fulfilled, that is, as regards that partition into classes, each inference from those axioms comes to be a true statement.

To answer this question, we take into account that axiom 5. is the only one which gives rise to statements of the form $\bar{a}$, that is that a combination a of the five fundamental thought-things is to belong to the class of the non-existent. Statements, which with 5. make a contradiction, must therefore in any case be of the form:

$$6.\quad f(ux^{(0)})=u1:$$

such an inference, however, can in no wise result from the axioms 1.—4.

In order to perceive this, we designate the equation, that is the thought-thing $a=b$ as a homogeneous equation when a and b are both combinations of two simple things, and also if a and b are both any combinations of three or both any combinations of four or more simple things; for example

$$(11)=(fu),\ (ff)=(uf'),\ (f11)=(u1=),\ (f1)(f1)=(1111),$$
$$[f(ff'u)]=(1uu1),\ [(ff)(111)]=[(1)(11)(11)],\ (fu111=)$$
$$=(uu111u)$$

are called homogeneous equations.

From the axioms 1. and 2. alone follow, as we have already seen, nothing but homogeneous equations, namely the equations of the form $a=a$. Just so axiom 3. gives only homogeneous equations if in it we take for x any one thought-thing.

Likewise axiom 4. is certain to exhibit in the conclusion always a homogeneous equation, if only the hypothesis is a homogeneous equation, and consequently only homogeneous equations can appear at all as inferences from the axioms 1.—4.

Now, however, the equation 6., which is the one to be proven, is certainly no homogeneous equation, since therein in place of $x^{(0)}$ one has to take a combination and thus the left side comes to be a

combination of three or more simple things, while the right side remains a combination of the two simple things u and 1.

Herewith is explained, as I think, the thought fundamental for the recognition of the correctness of my assertion; for the complete carrying through of the proof there is need of the idea of the finite ordinal number and certain theorems about the concept of equality as to number, which in fact at this point can without difficulty be set up and deduced: for the complete carrying through of the stated fundamental thought we have still to consider those points of view, to which I will briefly refer at the close of my lecture. (Compare V.)

The desired partition into classes results therefore, if one reckons as in the class of the existent all things a, where a is an inference from the axioms 1.—4., and considers as in the class of the non-existent all those things which differ from these, especially the things $f(ux) = u1$.

Because of the property of the assumed axioms so found, we recognize, that these never lead at all to a contradiction, and therefore we designate the thought-things u, f, f′ defined by them as concepts or operations *free from contradiction* or as *existing free from contradiction* (compatible).

As to the concept of the infinite u in particular, the affirmation of the *existence of the infinite* u thus appears justified through the above indicated exposition; for it gets now a definite meaning and a content continually to be applied later on.

The investigation just sketched makes the first case in which the direct proof of the freedom-from-contradiction of axioms has been successfully given, whereas the method heretofore usual—especially in geometry—for such proofs, that of suitable specialization or construction of examples, here necessarily fails.

That this direct proof here succeeds, is, as one sees, essentially owing to the circumstance, that a statement of the form $\bar{a}$, that is a statement, according to which a certain combination is to belong to the class of the non-existent, only appears as a conclusion in one place, namely in axiom 5.

When we translate the known axioms for complete induction into the speech chosen by me, we attain in like manner to the com-

patibility of the so increased axioms, that is to the proof of the contradiction-free *existence of the so-called smallest infinite** (that is, *of the ordinal type* 1, 2, 3, ...).

There is no difficulty in founding the concept of the finite ordinal number in accordance with the principles above set up; this is done on the basis of the axiom, that every aggregate which contains the first element of ordinal number and, in case any element belongs to it, also contains the one following this, surely must always contain the last element.

The proof of the compatibility of the axioms follows here very easily by the bringing in of an example, for instance of the number two. It is then the main point, to show, that an arrangement of the elements of the finite ordinal number is possible, such that each part-aggregate of it possesses a first and a last element—a fact, which we prove by defining a thought-thing $<$ by the axiom

$$(x < y \ \& \ y < z) \mid x < z$$

and then recognizing the compatibility of the axioms set up with the addition of this new axiom, when x, y, z mean arbitrary elements of the finite ordinal number.

By using the fact of the existence of the smallest infinite, the theorem then follows also, that for each finite ordinal number a still greater ordinal number can be found.

The principles which must be normative for the construction and further elaboration of the laws of mathematical thinking in the contemplated way, are briefly the following:

I. Arrived at a definite standpoint in the development of the theory, I may designate a further statement as true, as soon as is recognized, that it superadded as axiom to the statements already found true, gives no contradiction, that is leads to inferences, which in regard to a certain partition of things into the class of the existent and that of the non-existent are all true statements.

II. In the axioms the arbitraries—as equivalent for the concept "every" or "all" in the customary logic—represent only those

* Compare my lecture delivered before the International Congress of Mathematicians at Paris in 1900: *Mathematical Problems*, 2. The Compatibility of the Arithmetical Axioms.

thought-things and their combinations with one another, which at that stage are laid down as fundamental or are to be newly defined. Therefore in the deduction of inferences from the axioms, the arbitraries, which occur in the axioms, can be replaced only by such thought-things and their combinations.

Also we must duly remember, that through the superaddition and making fundamental of a new thought-thing the preceding axioms undergo an enlargement of their validity, and where necessary, are to be subjected to a change in conformity with the sense.

III. The aggregate is generally defined as a thought-thing m, and the combinations mx are called elements of the aggregate m, so that therefore—in opposition to the usual conception—the concept of the element of an aggregate appears only as later product of the idea of aggregate.

Exactly as the concept "aggregate" are also "correlation," "transformation," "reference," "function" thought-things for which, precisely as was done a moment ago with the concept "infinite," the suitable axioms are to be stated, and these then in the case of the possibility of the partition of the respective combinations into the class of the existent and that of the non-existent can be recognized as compatibly existing.

In I. the creative principle receives expression which in the freest application warrants us in ever new concept-building with the sole restriction of the avoidance of a contradiction. The paradoxes mentioned at the beginning of this lecture become because of II. and III. impossible; especially does this hold of the paradox of the aggregate of all aggregates not containing themselves as element.

In order to permit the perception of the far-going agreement in content of the concept of aggregate defined in III. with the usual aggregate-concept, I prove the following theorem:

At a definite stage in the development let

$$\mathrm{I}, \ldots, a, \ldots, \mathrm{k}$$

be the fundamental thought-things and $a(\xi)$ a combination of these, which contains the arbitrary ξ; further let $a(a)$ be a true statement

(that is $a(a)$ in the class of the existent): then there is sure to exist a thought-thing m of such a sort, that $a(mx)$ for the arbitrary x represents true statements only (that is $a(mx)$ always occurs in the class of the existent) and also inversely each thing ξ, for which $a(\xi)$ represents a true statement, is equal to a combination $mx^{(o)}$, so that the statement

$$\xi = mx^{(o)}$$

is true, that is the things ξ, for which $a(\xi)$ is a true statement, make the elements of an aggregate m in the sense of the above definition.

In proof we set up the following axiom: m is a thought-thing, for which the statements

$$7.\quad a(\xi)\,|\,m\xi = \xi$$
$$8.\quad \bar{a}(\xi)\,|\,m\xi = a$$

are true, that is if ξ is a thing such that $a(\xi)$ belongs to the class of the existent, then must $m\xi = \xi$ hold good, otherwise $m\xi = a$; adjoin this axiom to the axioms which are valid for the things

$$1, \ldots, a, \ldots, k,$$

and then assume, that thereby a contradiction is produced, that is, that for the things

$$1, \ldots, a, \ldots, k, m$$

perchance the statements

$$p(m) \text{ and } \overline{p(m)}$$

are at one and the same time inferences, where $p(m)$ is a certain combination of the things

$$1, \ldots, k, m.$$

Therewith 8. means in words the stipulation $m\xi = a$, if $a(\xi)$ belongs to the class of the non-existent.

Whenever in $p(m)$ the thing m appears in the combination $m\xi$, replace in accordance with the axioms 7. and 8. and taking 2. into consideration the combination $m\xi$ by ξ, respectively a; if from $p(m)$ is formed in this way $q(m)$ (where now $q(m)$ no longer contains the thing m in a combination mx), then must $q(m)$ be an inference from the original fundamental axioms for

$$1, \ldots, a, \ldots, k$$

and therewith also remain true if we for m take any one of these things, as for instance the thing 1.

Since the same consideration holds also for the statement $\overline{p(m)}$, there would therefore exist also at the original stage, when we take as a basis the things

$$1, \ldots, a, \ldots, k,$$

the contradiction

$$q(1) \text{ and } \overline{q(1)},$$

which cannot be—it being presupposed that the things

$$1, \ldots . k$$

exist free from contradiction. We must therefore reject our assumption, that a contradiction is produced; in other words, m exists free from contradiction which was to be proved.

IV. If we wish to investigate a definitely given system of axioms in accordance with the above principles, then we must partition the combinations of the fundamental things into the two classes, that of the existent and that of the non-existent, and in this process the axioms play the rôle of prescriptions which the partition must satisfy.

The chief difficulty will consist in making out the possibility of the partition of all things into the two classes, that of the existent and that of the non-existent.

The question of the possibility of this partition is essentially equivalent to the question, whether the inferences, which can be obtained from the axioms through specialization and combination in the previously exemplified sense, lead to a contradiction or not, *if besides are adjoined the familiar logical deduction-modes such as*

$$[(a|b) \ \& \ (\bar{a}|b)]|b$$
$$[(a \text{ o. } b) \ \& \ (a \text{ o. } c)]|[a \text{ o. } (b \ \& \ c)].$$

The compatibility of the axioms can then either be made out by showing how a peradventure contradiction must show itself as early as a preceding stage in the development of the theory, or by making the assumption, that there is a proof, which leads from the axioms to a definite contradiction, and then demonstrating, that

such a proof is not possible, that is to say contains in itself a contradiction. Thus indeed the proof just now sketched for the contradiction-free existence of the infinite amounts also to making out, that a proof for the equation 6. from the axioms 1.—4. is not possible.

V. Whenever in what precedes *several* thought-things, combinations, combinations of *manifold* sort or *several* arbitraries were spoken of, a limited number of such things ought always to be understood.

After the setting up of the definition of the finite number we are in position to take that mode of expression in its general meaning.

Also the meaning of the "any you please" inference and of the "differing" of one statement from all statements of a certain kind is now, on the basis of the definition of the finite number—corresponding to the idea of complete induction—through a recurrent procedure, capable of an exact description.

Thus also is to be conceived the complete carrying through of the proof just now indicated, that the statement

$$f(ux^{(0)}) = u1$$

differs from each statement which results through a finite number of steps as inference from the axioms 1.—4.: one has, that is, to consider the proof itself as a mathematical structure, namely a finite aggregate, whose elements are connected through statements expressing that the proof leads from 1.—4. to 6., and one has then to show that such a proof contains a contradiction and therefore does not in our defined sense exist free from contradiction.

In a way like that in which the existence of the smallest infinite can be proven, follows the existence of the assemblage of real numbers: in fact the axioms as I have set them up* for real numbers are expressible precisely through such formulas as the axioms hitherto laid down. As for that axiom which I have called the axiom of completeness, it expresses that the assemblage of real

* *Grundlagen der Geometrie,* second edition, Leipsic, 1903, pp. 24-26.

numbers in the sense of the reversible unique referability by elements contains every other aggregate whose elements likewise fulfill the preceding axioms; thus conceived the axiom of completeness also becomes a requirement expressible through formulas of the foregoing structure and the axioms for the assemblage of real numbers are qualitatively distinguished in no respect from the axioms necessary for the definition of the whole numbers.

In the perception of this fact lies, as I think, the real refutation of the conception of the foundations of arithmetic advocated by L. Kronecker and at the beginning of my lecture designated as dogmatic.

In like manner is shown, that contradiction-free existence belongs to the fundamental concepts of the Cantor theory of aggregates, in particular to the Cantor alefs.

D. HILBERT.

GÖTTINGEN.

SHYLOCK IN THE OLD TESTAMENT.

THE STORY OF LABAN VIEWED IN THE LIGHT OF THE CODE HAMMURABI.

A VERY interesting question concerning the relations of the famous Hammurabi Code to the Hebrew record has hitherto been passed over by critical students. The intrinsic interest of the narrative, when read in the light of the law of the time in that region, as well as its value as material for critical purposes, suggest that it should be given careful consideration. For the present paper, a bare presentation of parallels must answer: critical conclusions being left to the reader.

The Hebrew traditions declare that their ancestors were Arameans. "An Aramean ready to perish was my father," was the confession of the devout Hebrew. "Laban the Aramean" is of Abraham's own kindred. The point of departure, geographically speaking, is Ur-Casdim. The various theories about the location of Ur need not be discussed here. The preponderance of opinion is toward a location in southern Babylonia. We are therefore justified in examining the early Aramean stage of the Hebrew people for traces of Babylonian influences. Conversely, should comparison of the Code of Hammurabi with the patriarchal narratives disclose in the latter evidences of Babylonian culture, we would be strengthened in the view that the site of Ur-Casdim must be sought in Babylonia.

The theory that a primitive common clan law sufficiently accounts for all resemblances between the Babylonian and the patriarchal law can also be tested. If they are but sister developments

from a common nomad code, we should not anticipate wide differences in patriarchal practice in the same generation. But if kinsmen dwelling in different lands are shown to speak and act as though the laws of their respective homes were widely different, we may be sure that we have to deal with considerably developed local laws, instead of mere primitive clan customs.

Hammurabi's own records also warrant our making the proposed examination. "Martu," as Palestine was called, is mentioned repeatedly in his inscriptions. The precise extent of Babylonian authority there we do not know. But Harran and Aleppo are mentioned by Hammurabi as objects of his special care and attention. We find that Babylonian supremacy seems complete throughout the Euphrates valley: and we may expect all important transactions in that region to be influenced by the Hammurabi Code, while a stranger from Southern Palestine would probably not be familiar with the law of the land. Only one of the patriarchal narratives, that of Jacob and Laban, has its scene laid in the land of Harran. The sharp practice narrated should then be examined in the light of Harran law.

In the Code of Hammurabi, much attention is given to the property rights of women. We are concerned with but one of the elements of a woman's property in the present case, the *tirhatu,* or betrothal present. The groom is expected to bring such at the time of the formal arrangement of the marriage contracts. The father of the bride must not appropriate this gift, and must endow his daughter's marriage, else he puts her in the position of having been sold as a slave, instead of honorably married.

The bride's possession of the *tirhatu* is clearly indicated by the general principle of the code, which compels a wrong-doer to forfeit to the injured party a sum at least equal to the amount originally involved in any given business transaction. In the cases where a wife is wronged by her husband, the equivalent of the original *tirhatu* is paid over to the wife herself, not to her father. If the latter holds the *tirhatu,* it seems that he does so merely in trust; to divert it to his own uses would be equivalent to embezzlement. If the wife be divorced without just cause, the *tirhatu* is doubled

by the husband and paid over to the wife as penalty for infringement of the marriage contract.

One naturally asks, with regard to the *tirhatu,* what were the poor man's chances for marrying into a wealthy family, or what he would do if unable to purchase a maid-servant. The code makes it apparent that some equivalent might be offered by a penniless suitor. In section 139 we are told, in case of unjust divorce, that if no *tirhatu* had been presented by the husband in the beginning, one mina of silver must be paid to the divorced wife. That is to say, one mina of silver is named as the equivalent of the least *tirhatu* which should have been brought by the penniless suitor.

Now from the wage-scale in the code we learn that the standard daily wage for a first-class herdsman or agriculturist is 5 ŠE of silver per day; skilled artisans being rated slightly lower. As 180 ŠE make one shekel, and 60 shekels a mina, and, as Prof. Morris Jastrow has shown (A. J. T., 1898), that the Babylonians observed a seventh day in some fashion, we readily recognize that one shekel means six weeks wages and one mina 360 weeks; or exactly seven years, at the ordinary Semitic standard of 360 days to the year. Seven years service, for a day-laborer who is a competent workman, stands then as the possible alternative for a *tirhatu* in cash or goods, if his aspirations are to alliance with one in more fortunate circumstances. But what has been pointed out with regard to the bride's ownership of the *tirhatu* would indicate that the net proceeds of such service the bride would consider as constituting her *tirhatu;* and appropriation of it by her father she would be prepared to resent.

In the story of Jacob and Laban, the former, after a month's residence, proffered seven years service for the hand of Rachel. Perhaps Laban felt that the minimum amount proffered was derogatory to the dignity of his family. Whatever the motives of his conduct, it appears that Jacob did not know the laws of the land, and Laban was prepared to take advantage of the fact. He had the law constructively in favor of his specious excuse. While not specifically enjoined, it is clearly expected (C. H. 66) that the marriages of the older children shall be arranged first.

Laban has the further advantage in the fact that no bonds appear to have been drawn up, specifying which daughter Jacob desired as his bride. C. H. 128 declares that if a man has betrothed or married a wife, but has not drawn up the required bonds, that woman is no wife. In the absence of such documents Jacob could not have a legal claim to Rachel.

Jacob's reliance upon a mere verbal agreement between kinsmen in a land whose laws made witnesses or bonds essential to the validity of all important business transactions (C. H., *passim*) had brought him a bitter experience. By the end of the second seven years, however, it is apparent that he knew something of the technicalities of the law himself, and was prepared to better the instruction by putting Laban in the position of breaking the law repeatedly. Two important sections of the code may be quoted here (C. H. 264, 265):

"If a herdsman, to whom oxen and sheep have been given to pasture, receives his hire according to agreement, is satisfied (in that particular), and allows the cattle or sheep to become enfeebled, or lessens the birth-rate, according to his contracts he shall make good the birth-rate and the increase."

"If a herdsman, to whom oxen or sheep have been given to pasture, has been dishonest, or has altered the terms (of his contract) or has sold them, they shall call him to account, and he shall restore to the owner oxen or sheep tenfold what he had stolen."

These provisions are not intended for the ordinary day laborer, but for the master-herdsman or contractor. Laban's experience with Jacob had convinced him that he had a valuable master-herdsman whom it might be well to keep at his own terms. The sections quoted indicate the customary character of such agreements. It is expected that contracts shall stipulate a certain reasonable proportion or percentage of increase. With such a contract, Jacob would have no opportunity for his revenge. Hence the peculiar proposition he makes to Laban.

Now if Jacob proposes to alter the terms of his contract, he is liable for heavy damages; but he so manipulates matters that Laban changes the terms himself, ten times over; and Jacob has Laban's

daughters as witnesses to the fact (Gen. xxxi. 6, 7). Again, if Jacob, under an ordinary contract, diminishes or enfeebles the cattle, Laban can collect damages from him; but the character of the agreement leaves Laban no such recourse, and he repeatedly alters the terms to recover his previous losses.

Meanwhile Laban's daughters have a deep sense of wrong. No dowry had been given them: the results of Jacob's service had been appropriated by Laban; and they were in consequence in the status of maid-servants, who had been sold to a foreigner, contrary to the provisions of the code (C. H., 280). Or they might consider themselves as legally in the status of unportioned concubines whose marriage their father refused to endow, and who must expect their brothers, after their father's death, to give them their rights (C. H., 184). But the black looks of their brothers, who are asserting that Jacob has robbed Laban, warn them that they need not look for redress in that quarter. At the family council the wives of Jacob apparently approve his methods, declaring that their father has treated them as strangers or foreigners, that he has devoured or wholly alienated all that they rightfully considered their own, and that he has simply sold his daughters as if they were slaves. Jacob, in their view, is only helping himself in a case where the law could not help him, when he plans to get possession of the vast increase in Laban's cattle, which his service had produced, as their *tirhatu*.

But there is another contingency, which they apparently consider: Laban's original fraud, with the absence of legal documents, makes it possible for Laban to take radical action in the case. He might choose, in the last resort, to take away his daughters by force, upon the ground that they were not legally married, and so send Jacob away stripped of everything. As the strained relations make it clear that the end is nigh, Rachel, the ancient Jessica, cunning and daring as well as beautiful, plans the final *coup*.

This may be understood from C. H. 6. We learn that whoever steals the property or household furnishings of a god, shall be put to death, and whoever receives the stolen goods shall be put to death. Such property of the god would include not merely symbols and statuettes, but all kinds of votive or dedicated objects.

Babylonian Judaism in a later period shows how wide a range of interpretation could be given the law. It could be made to accord to property as well as to person the privilege of sanctuary. Unprincipled Jews gave it great abuse. Christ alludes to it in his reference to "Corban," "dedicated," being made an excuse by unnatural children for not using their property to help a needy parent. Perhaps this originated the other device of a "gift to Cæsar" to forestall confiscation by some greedy official. Such protection of valuables may have been the end sought by Micah's wealthy mother, in the story in Judges. Learning the fact, and of the terrible curses launched against the thief, the frightened Micah hastened to surrender his plunder.

The reader may imagine the frame of mind of Laban when he learned that Jacob and Rachel had outwitted him, and had a week the start in the race for the frontier. One may apply, if he will, the outcry of Shylock as described by Salanio. But in the present case —perhaps because Jacob has the stronger troop, and because efforts to recover any property without violence would lead to recriminations that would not be helpful to his cause,—Laban discovers that he has religious scruples upon certain points, and will speak neither good nor bad. His insincerity is shown by his boasting of power to do hurt to the fugitives, and by his immediate preferment of a capital charge.

Jacob replies, stating that he had feared forcible action upon the part of Laban, and later tells him openly that Laban would, if he dared, strip him of everything. Of the final offense charged by Laban he knows nothing, but admits its capital character: "With-whomsoever thou findest thy gods, let him not live." Legal action concerning all earlier proceedings Jacob does not fear, as the absence of documents in the original fraud destroys Laban's opportunities for appeal to the law. Laban cannot deny the bringing of a *tirhatu* in the form of seven years' service. If he choose to assert that the marriage is not legally complete, and that he prefers to bestow his daughter upon some one else, the law would compel him to refund the *tirhatu* or proceeds of Jacob's service, and to add to

it an equal sum (C. H., 160, 161). Such course would be out of the question for such as Laban.

To grasp at once the sudden change of the *rôles* of prosecutor and prosecuted in the dramatic *dénouement,* it must be remembered that the *lex talionis* is the fundamental principle of the code, and every formally preferred charge, if unproven, recoils with the corresponding penalty upon the head of the accuser. C. H. 1 declares that if a man charge a capital crime upon any one and fail to prove it he shall be put to death.

At the end of the search, Jacob suddenly turns upon his accuser, and in his lofty rage he assumes the *rôle* of the magnanimous, as he demands instant trial, before witnesses. Laban has charged a capital crime, and boasted of his power to hurt before the whole company. His charge is not proven and his life is legally forfeit. The herdsman's contracts between them have been altered repeatedly, despite the most faithful service upon Jacob's part; each alteration is liable to a fine of tenfold the amount involved. Laban's sons have been charging fraud (Gen. xxxi. 1); they should prove their allegations, or the family may be fined a sum equal to that which they assert lost. The aggregate fines for the charges made would bankrupt the family. Jacob goes further. The law does not hold the shepherd responsible if wild beasts slay his employer's cattle (C. H., 266). Yet Jacob declares that he voluntarily assumed such losses at first, and that Laban later required it, contrary to the law. He then reverts to the original fraud and closes by asserting that Laban would, if he dared, rob him of everything. Thus the avaricious Aramean, very punctilious about small technicalities of the law when he would get the advantage of his foreign kinsman who did not know the law of the land, has, without his suspecting it, been put in the position of breaking the law repeatedly. He is legally bankrupt, his life is forfeit; his jewelry and sacred equipment have been stolen by his fleeing daughter; and, despoiled of all opportunity for legal redress, he is compelled to sue for peace, and to ask for an agreement that there shall be no effort at prosecution.

In this request for a treaty we may observe another point of contact with the code. Under its provisions a man could not marry

two wives unless the first were a chronic invalid. But for Leah's weak eyes, (perhaps serious abscesses, a common malady of the eye in the Orient and especially considered in the code, 215-220) the first fraud of Laban could have permanently closed the way to Rachel. Neither as wife, maid or concubine could she have come to Jacob, under the law. Perhaps Laban had never intended that she should. But the advisability of retaining a skilful master herdsman would be enough to impel a man like Laban to avail himself of the very convenient section 148 of the code, using Leah's bad eyes as a pretext. But at the witness cairn of Gilead the frontier is near. Beyond the border the code does not apply, and other social standards prevail. That his daughters may not be mistreated, and that Jacob shall take no other wives, Laban has recourse to adjuration.

We may have here one version—perhaps the original—of that much varied, far traveled popular tale, which the genius of Shakespeare has immortalized for the English-speaking world in the "Merchant of Venice." The main elements—the contest of wits over legal technicalities between an avaricious old man and a young man of another land, who finally bests the elder man and runs away with the daughter and the family jewelry, with the dramatic *bouleversement* at the trial scene—are all in the patriarchal tale. It should prove a very interesting problem for the student of comparative folklore.

A. H. GODBEY.

CHICAGO.

QUALITY AND QUANTITY.[1]

THE problem of quality and quantity implies two distinct studies, which we shall combine here for greater convenience in exposition. The first is of an historical nature and must answer the question: What is, in the history of philosophy, the exact meaning of the opposition of the concepts of quality and quantity? or, in other words, what is the original attitude of modern physics toward the old conception? The second study, of a purely rational character, must solve the question, What is the psychological meaning of the words quality and quantity, and from a scientific point of view what is the import of the contrast of two categories so long admitted to be mutually irreducible? in other words, what must be thought of the transition from the unextended to the extended? or, in any case how is it brought about, and what is really the value of the distinction between intensive and extensive magnitude—the latter being clear and serving as an adequate symbol to the former which is as confused as the very depths of being?

I.

Quality and quantity characterize very exactly the two points of view, from which the human mind has successively regarded physics during the long history of the progress of that science taken in its most general sense. In turn each term becomes the crucial test as to the nature of matter: quality is the pivot around which the old science of physics gravitates; quantity, the new. Between these two conceptions has evolved the theory of living beings as well as that of inorganic bodies. It is enough to say that the

[1] Translated by Amélie Séraphon.

problem of the relation of quantity to quality is not lacking in interest. We will consider here only very general ideas.

These then are the terms of the psychological problem:

1. From the subjective point of view, trying to find quantity in quality will be looking for the application of the law of number or measure in the realm of mere intensity; it will be reducing to well-known proportions the mobile and intangible depths of sensation; it will be finding out the connection between the object exciting sensation, and the sensation itself. From this point of view, however, one particular will always escape us, and that is the purely emotional and affective in sensation.

2. From the objective point of view, searching for quantity in quality, will be passing from the subject to the object, by reducing to distinct and clear formulas the sensations that we interpret as signs of some object outside of ourselves; it will be affirming that we know objects only in relation to the clear ideas we have of them, and that the reality of the external world is connected with the evidence of the mathematical formulas to which we reduce them. This is again transferring the unextended into the extended, and making general mathematics the condition of all certitude. But from this point of view also, one thing will always escape us, namely: to know the very fundamental facts set in equation, and the necessity of this interdependence postulated *a priori* of reason and reality. Therein lies the great problem of thought.

Sound, color, odor, taste, cold and heat, resistance, weight, hardness, shape, situation, and movement: in these consists all our external world, or at least as much of it as can be perceived by a consciousness in which reflection has had no part. The distinction between the qualitative and the quantitative point of view that we establish in things, is not so clear on the whole as it would seem at first. Common sense, far from seeing a great difference between the extensive and intensive, makes of them two forms of one and the same thing, as it were. It immediately looks upon quantity and quality as notions fusing into the unity of an object of which they express different modes of existence on a common basis. Thus quality and quantity imply each other, since all ideas relating to

magnitude indicate as many ways of existing, and everything that serves to determine the nature of a thing is rightly called quality. Such is the common opinion. We shall see later, on what preconceived idea it rests. Now we shall limit ourselves to stating that this radical difference which is primarily established between quality and quantity is not founded on reason. What we first know are the sensations which we distinguish from what we suppose to be their causes; that is to say, we first perceive ourselves and afterwards that which is not ourselves.

II.

Before going further, let us examine what may fitly be called the distinction between primary and secondary qualities. Does such a distinction impress itself upon the popular mind? or is it but the sublimated result of reflecting thought?

It seems to me that common sense clearly makes this distinction. As we have said it intreprets all sensations, in so far as they relate to an external object, as qualities of that object and places them nearly on the same level. Moreover, the contradiction of primary and secondary qualities is no longer of any consequence whatever, since science has shown most emphatically that both were in the first place, but states of consciousness identical by nature; and in the second place, that they were only the different expressions of the action upon us of a certain cause under given conditions, and following a ratio of which one's own self is one of the terms, and the cause in question which remains to be determined, the other.

People say, "We know the primary qualities quite clearly; the secondary but confusedly." This argument in favor of a distinction had its value when science had not yet shown what could be expected of it. But now we know how to regard all those sensations formerly thought to be confused from the fact that they could not be measured, and qualities such as sound, color, odor, taste; or such others as weight, resistance, impenetrability, and in general all sensations which with the exception of extent, shape, and size were considered secondary (that is to say, confused) are at present

quite susceptible of being submitted to measurement and therefore to quantity. This progress in analysis makes sufficiently clear how slight is the foundation for a distinction uncritically established, and also how necessary it is to continually verify the content of certain notions, the frequent use of which blinds us to their significance.

III.

But how to escape from sensation? How can we pass from quality to quantity? Here indeed arises the psychological problem which interests us.

At this moment I experience a sensation of heat. What is the meaning of this fact? It means that just now my consciousness subsumes its present state under a class of past conditions called heat. Strictly speaking, I have not a sensation of heat in me. My being is simply in a certain state different from the preceding and it has the consciousness of this state and of this difference. I try to find the reason of this sensation. Now as I am near the fire I conclude that the fire is the cause of my actual condition; and then passing from my self to what is not myself, I affirm that the fire has a property, a quality, that of causing warmth.

It is important to establish the terms of the ratio: on one side, my own self; on the other, that which is certainly not my self. Two terms being present I have the right to establish the relation, and it is expressed here for me by the sensation of warmth. Have I perceived by this sensation a quality of the fire? I cannot state positively that I have; for a relation is never an expression of the existence of one of the two terms on which it rests. It is only the new result derived from a comparison of the two terms, but is neither the one, nor the other. In the above instance my sensation of warmth is but the *tertium quid,* resulting from the fact that my body is near another body which I call "fire." That is all I can say about it.

Let us continue the analysis. According to the judgment of common sense, actual sensation is what puts me into direct and immediate communication with the external world. Practically this

belief in the comprehension of external reality is sufficient. I say that I am actually warm and that this sensation is not the result of my own will. Now by repeated experiments I have come to know that fire has the property of causing the feeling which I now experience. Hence I conclude that fire has one quality (among others, doubtless) that experience has already revealed to me or will in the future, namely, that of warming; and that is enough for every-day use.

But the reasoning of the scholar is quite different. He will not draw his conclusion simply from self and non-self. He will not say: "I am warm now because the fire is warm" or "because there is heat in the fire." How could he really know it since he perceives but the actual sensation which can only give him what it implies, namely a state of consciousness for himself who experiences it, and not a certain quality of the fire, the existence of which he could only affirm positively by transporting himself momentarily into the consciousness of the fire, supposing it to have one. So the philosopher instead of concluding from a psychological state a reality outside of himself—an entity which would explain nothing—would try instead to lift the veil from the illusion of common sense. Applying the process of analysis to the actually experienced sensation, he will there establish a very nice distinction. He will first of all try to find out what this sensation within himself may be, and will say, "It is only a state of my own self; it is still my own self, but different from what it was an instant before." But here he is only at the philosophical explanation of the popular point of view; and if he did not go further with his reasoning, this consciousness of a certain psychological state which has been preceded by another, and will be followed by an infinite number of others, in other words, the consciousness of a possible series of psychical states, would be practically sufficient for him.

But this knowledge pertains only to his own being, and does not inform him of what is commonly called the external world. He is led to ask himself what it is he really knows of this state of consciousness. I say that it is a state of my being; but if I cannot reduce it to anything simpler, in what way will this knowledge help me

on with the idea I have of it? And I shall never be able to escape from the narrow circle in which the actuality of this condition encloses me, unless we suppose that spontaneously and without our being able to explain this psychological mystery, thought lays down the postulate of otherness, that is to say, something different from my present state.

Note that there is nothing excessive in the claim of this postulate. In fact we treat here the question of the psychological origin of belief in an external reality, which is found closely combined with our affirmation of the existence of qualities outside of ourselves. Now to make this task easier, we have the right to take into account all that philosophical reflection has created in the external world whether under the name of illusion or of reality. In short, we cannot neglect all the facts which actually constitute for us that kind of moral certainty which Descartes mentions. We have recourse to that well-known process of demonstration which consists in taking for granted what we are about to demonstrate. In a word, to give a solid foundation to our thesis on quality and quantity we take our footing on the notions which we consider provisionally in the light of purely moral or practical certainties and of which we shall bring out the rational character afterwards.

So, admitting the postulate of an existence foreign to mine, and which I suppose to be the cause of certain sensations for me, am I entitled to say that these sensations are qualities of an object? No, I simply affirm a relation and still have to deal only with the question of states of consciousness. In order to have a clear idea about quality and quantity, our thought must have become conscious of the objective laws which govern it. "Mere consciousness of my own existence, if empirically determined," says Kant, "proves the existence of external objects." It is necessary to understand well the sense of this theorem. I do not conceive external objects independently from my thought, but only inasmuch as they are matter necessary to its activity. My thought cannot become isolated from its external condition. In order to regard itself as a series of states of consciousness, it must take hold of something upon which to record these states. Thus we manage to affirm the existence of

an external object which up to the present time was entirely unknown, and to which we attribute as its own by a sort of illusion, qualities that are in reality nothing but our own sensations. Herewith ends the first stage of psychical processes that lead the philosopher to establish the terms of the relation between quality and quantity.

IV.

But reflection is not contented with this still confused point of view. In ancient times science found these explanations sufficient; in all things it searched only for the essence, which it identified with a certain quality. Aristotle, for instance, isolated qualities, classified them and thus settled the whole of creation in functions of one qualitative hierarchy. In the Middle Ages too, men were contented with such considerations; scholars spoke only of substantial forms, natural finalities and hæcceity.[2]

Even the Renaissance, which with its double current of scholars and mathematicians prepared the way for modern philosophy, clung to the determination of qualities belonging to things, of the forms in which they express themselves, and of the forces which they symbolize. There is nothing in that to surprise us. It is difficult for us, even now, not to interpret our internal states as real qualities of things. Why then should we wonder at the grosser illusions on which was wrecked a science which had never engaged in the study of psychical existence. Descartes's *cogito* was the signal of a reaction. While to the popular mind the growing number of experimental discoveries seemed to render more and more legitimate its belief in an external reality, to the philosopher they proved that this reality depends on ourselves since it is really known to us only when we have reduced it to a simple idea, especially that of magnitude or quantity.

The human mind knows only number adequately. By reducing perceptible things to the quantitative relations pursued by science, the horizon of thought has widened. Until then, an abyss divided self from non-self. The mind, having a conception of itself only as

[2] From the Latin term, *haecceitas,* meaning "thisness."

a mirror on which external objects are reflected, and accepting sensations as real qualities apart from itself, established on a classification of these qualities the dualism of reality, self and non-self. Since Descartes the external world is closely bound to ourselves. The illusion about quality is denounced; it is no longer of importance, but quantity (that is, numerical relation) takes its place.

With the author of *Principles of Philosophy,* mathematics is declared to be the symbol of all intelligibility and to reduce the knowledge of bodies to the laws of quantity is to bring them back to reason. The mind only grasps fully and clearly that which is reducible to the terms of ratio. Such is the nature of our thought that it can see distinctly at a glance only what it creates, so that the external world is known to it only in so much as it is the reflection of its own laws, and above all the work of the initial category of quantity from which the principles of mathematics are derived. And if since the mind has not become conscious of its conditions of existence, or in other words, since it has not understood that it can only think through analytic ideas, quality in itself is not susceptible to perfect apprehension, it is therefore reducible to something simpler than itself, and is a confused notion requiring analysis.

V.

We have seen how it is possible to understand the distinction between quality and quantity, and how the mind can pass from one to the other. It remains to show how the total reduction from the first to the second is brought about. It is the last stage in the ascent of the mind towards purely rational knowledge. This last investigation will throw a new light upon the two preceding stages of the processes we are trying to follow.

We shall see that just as in mathematics the progress of reflections consists in exhausting as far as possible the objective, concrete matter of ideas, "unceasingly diminishing the part of intuition, and seeing as little as possible in order to demonstrate better,"[3] so

[3] Milhaud, *Essai sur les conditions et les limites de la certitude logique,* p. 47.

here the progress of knowledge will be proportional to the abandoning of the perceptible element, to the predominance of representation over affection, in short, to the substitution of mathematical formulas for the purely intensive fact.

Herein lies precisely the object of physics taken in its broadest sense: to reduce the most diverse phenomena to motion, all science to mechanics. It is only a question of establishing a unit of measure for the elements of which the latter disposes, space, time, speed, form and mass of bodies in order that mathematics may adapt itself to it and furnish us with an explanation of facts. "I find," says Descartes, "that in the ideas about corporeal things one meets with very little that he can conceive clearly and distinctly, and that is to know size, or rather extension in length, breadth, and thickness, the figure that results from limiting that extension, the position that bodies of different forms hold in relation to each other, and motion or the change of that relation....As to other things such as light, color, odor, taste, heat and cold, and other qualities which come under the sense of touch, they meet in my thought with so much obscurity and confusion that I do not know whether they are real or false."[4]

The ideal of physics has not changed since that time. The question for it is still only to submit to analysis our ideas about qualities and to show that if in ourselves they are sensations, outside of ourselves they are nothing but different modifications of motion that may take place within particles of matter. Thus we must conceive the material universe as a "machine in which there is nothing at all to consider except the figures and movements of its parts,"[5] and physics in its highest abstraction is only a web of algebraic formulas, expressing forms and motions.

Then if, like M. Evellin,[6] we consider the world as a system of forces (according to the views of L'Abbé Moigno) or if like so many scholars, we study it only from a mechanical point of view, gravity, weight, mass, density, resistance, impenetrability, and many

[4] 3rd *Med.* I, 277; *Principes* IV, 203; III, 518.

[5] *Principes,* IV, 188.

[6] *Infini et quantité,* pp. 60-65.

other material properties which we transform into entities will be brought back either to the mutual attraction of dynamic monads, or to a collection of partial attractions, or to combinations of movements; but whatever the explanation may be, in the last analysis it will resolve itself into a system of equations. The mechanical nature of physical phenomena, that is the reduction of quality to quantity; this is indeed the last word of science.

It would be useless to insist any further on this point; let us rather investigate the meaning of our knowledge of things, after we have submitted them to the category of quantity.

VI.

What is a numerical relation if not a product of our thought? and why is it a product of our thought if not because laws of our thoughts are such as they are? Affirming the agreement of an external reality with a certain equation, is establishing a postulate of which nothing can warrant the foundation unless we connect it with a metaphysical idea, that of the perfect God admitted by Descartes, for instance. There may be a connection between our thought and reality; but probable as it may seem to us it is still but uncertain since in fact we only perceive through our senses, such as they are, although they might be different and since we reason by the means of what we call laws of thought such as they are but they also might be different. This starting-point admitted, the relativity of all knowledge will follow. We reduce our impressions to particular mathematical formulas, and simply by means of this reduction of a confused state to a clear idea, let us say, we manage adequately to grasp the real.

Adequately indeed, but in relation to our way of knowing. So that when we think that we are reducing external reality to a mathematical formula, it is nothing but ourselves that we are so reducing —ourselves rendering objective the product of our thought; ourselves inasmuch as the organic laws of our thought symbolize themselves, express themselves in a form we call equation for instance, and which is only a result of the laws of these thoughts beginning

to act on the occasion of any kind of a sensation the cause of which is outside of ourselves.

And what may that other thing be? Subjectively (and we are coming back to our first point of view) a sensation; objectively, the same sensation entirely transformed through thought, and this is due to the fact that the category of quantity comes into play. Objectively and scientifically, the external object is only our sensation measured in what we suppose to be its cause; it is the intensive expressed by the extensive. This expression is found moreover in the question of time and space. Space is the extended, time the unextended. We can grasp fully only the former and that helps us to know the latter; and still we get to the knowledge of space only through time, which to be measured needs a conception of space.

One of these two terms is certainly primary and doubtless it is time, since it is in time that we live, while undergoing a state of consciousness of any kind; but we are forced to admit that we get an exact conception of time only when the notion of space is given us, and also the result of the application of the category of quantity to particular sensations.

The outcome of all this is that quality is scientifically the expression of a relation between two terms of which our own self is one; objectively, an illusion derived from the habits of our mind but founded on reason, inasmuch as it is an expression of the relation established between objects and ourselves; and subjectively, a sensation whose certainty lies in our own psychical existence.

VII.

We see therefore how unreasonable it is to turn quality into a category of thought, since it is reducible to that of quantity which is in reality founded on a necessity of the human mind. Now herein consists the principal characteristic of the theory of categories.[7] They are not things-in-themselves distinct in some way from thought, after the manner of the faculties admitted by the Eclectic school. To admit them as real qualities, would be going back to the system

[7] Couturat, *L'Infini mathématique*, p. 208.

of explanation by occult powers. They are laws and still this term seems only accurate in part, for we know to how many interpretations it is liable. Whichever term we use to designate the fact that thought has states of existence, it will be impossible to determine what after all cannot be determined. Indeed we do not seize categories in the act. We infer them from all this activity of which we have only been quite conscious from the time when the results of science began to reveal themselves so considerably. Is not that the salient point of Kant's philosophy, to place science on a solid foundation? Having an immediate knowledge only of the succession of our states of consciousness, we cannot imagine in what way that wonderful structure science and society to which we all agree to grant, at least, moral certainty, has been able to build itself on the fragile basis of our ephemeral sensations. Kant attributes this to the categories of thought. This world is only my own representation, but a well-founded representation in the sense that the reality of the harmony of the external world, with the knowledge that we have of it, is all in the cognizant subject, that is in the forms of thought. Hence we see that only through induction we can become conscious of the categories; that is why we must be careful not to interpret them as realities, distinct from the sensations to which they apply, and to limit them to the simple affirmation that our thought (as well as every other thing) has its conditions of activity, which we designate by the word category.

To explain mathematically, that is, to reduce to extensive magnitude what we call the qualities of bodies, remains therefore the essential condition of sure knowledge. But if we may indeed pretend that we comprehend objects only in so far as we reduce them to the clear and distinct notion of quantity, it is not less exact to maintain that something will always remain out of the reach of exact science, we mean quality, considered as one of our inner states. Those qualities which we think belong to objects, are in ourselves; they are relations. Now being such, it is difficult for us to pretend that we can reduce them to a formula absolutely exact, for of the two terms of each relation the most important, the psychological inner self, escapes any fixed determination. The proof of it is that

those qualities which we know only from the intensity of one of our passing states experience variations according to the temperament of each individual. Quality subjectively taken always oscillates in the obscure vagueness of a more or less vivid state of consciousness.

The difficulty presented by the absorption of the intensive by number entitles us to wonder if there is no danger in wishing to submit by force the originality of our psychical life to the rigor of an equation. The same process of reduction of the external world to numerical relations raises the same objection. Do we not mutilate things by setting them in algebraic formulas?

We shall be content with saying that science does not in any way pretend to reduce the reality of things to a formula; but it simply affirms that the mathematical expressions in which it sets reality are to us the only condition of any perfect intelligibility. Thought has no knowledge besides the working of its laws. Now these laws are the principles of mathematics. When the mind subsumes its internal conditions to them it grasps in the operation all that is thinkable in the external object. That is what M. Couturat brought out clearly when he wrote:[8]

"While all perceptible qualities that we draw through abstraction from the objects of experience lose all distinctness when generalized....and give place only to vague and confused concepts, the dimensions of concrete objects thus brought out through abstraction of their perceptible qualities, keep their primitive determination. That is why natural science becomes exact only when it treats of physical dimensions and when it turns perceptible qualities into measurable and calculable qualities. Scientific knowledge could not be founded on concepts because qualities are essentially heterogeneous and hence impossible to compare with one another. To take away their original intensity and their own fine distinctions to bring them under one and the same concept, heaviness or lightness, heat or cold, is indeed destroying them, and substituting for the concrete object an undecided and colorless image, without objective or scientific worth. On the other hand science took possession of nature when it resolved to determine dimensions and their relation towards each other, because dimensions being essentially homogeneous may be compared, combined, and measured, and without losing their individual precision they may be classified under a single and universal type of magnitude. After

[8] Couturat, *L'Infini mathématique,* p. 558.

all, the concept is fatally and irremediably inadequate to the real object. Magnitude, on the contrary, is certainly not the whole object, but it is all that may be scientifically known about an object."

VIII.

Thus the problem of quality and quantity concerns at the same time: psychology, by the fact that it is in ourselves with reference to our states of consciousness that the question about the value of the two concepts arises; the criticism of the mind, inasmuch as it is important to establish the rational foundation of the transition from the intensive to the extensive by applying the notions acquired by experience to the initial category of thought; the logic of sciences, since we are compelled to found on reason the exact meaning of a term which plays so important a part in general mathematics; metaphysics, for it is impossible to do without investigating whether the two concepts have any relation whatever with fundamental existence; finally the history of philosophy, which traces for us the different points of view from which the problem of quality and magnitude has been successively faced.

To sum it up, quality and quantity are not radically opposed, except in the dominion of science; for common sense the contradiction does not exist at all. It appears only when the mind, trying to unravel the general conditions of every existence, makes the distinction between what is in itself only a *tertium quid,* resulting from the relation of things to our own selves, and what we justly call existence, which means subject to measurement or in other words that which can be subsumed under the necessary forms of thought.

Quality, scientifically speaking, is a point of view relating to the exigencies of our body in its relation to external objects; it is in us the more or less confused feeling of something good or evil for our organism. Quantity is the irreducible point of view of thought in its effort to reflect and classify the world.

JOHANNES GROS.

THE SIGNIFICANCE OF QUALITY.

THE question as to the nature of quality is one of the most important problems of philosophy. It is, first of all, of practical importance, for the difference of quality is the most significant feature of experience and in practical life it is quality not quantity we want.

The existence of quality is a fact. The question is not whether or not quality exists, but what it is and how it has to be explained. Quantity may be very important, but quality is more important, and all of us have to learn how we have to deal with it in actual life.

Quality may be (and we believe it actually is) different from quantity by being unstable and contingent upon conditions, while quantity (in so far as it is equivalent for mass) is constant and indestructible, but for that reason no one can deny either its actuality or its paramount significance. Every trader knows that good quality commands a higher price than bad quality, and quantity is only appreciated if the commodities are of equal quality.

Qualities withdraw themselves from our direct observation. They seem to be occult entities that reside within things. Moreover, qualities change. Some goods deteriorate in course of time, and on the other hand better qualities can be produced from poorer materials by human labor, be it through chemical combinations, mechanical mixture, or other manufacturing processes.

There was a time in the development of mankind in which different qualities were attributed to different agencies that had mysteriously taken possession of things; spirits were supposed to enter or to leave bodies; diseases were explained by obsession and so exorcism was the natural method of the medical art. With the

progress of science and the deeper insight into the mechanical nature of things the animistic conception changed into the metaphysical and the metaphysical into that of positivism. Scientists learned to appreciate the methods of weighing and measuring and they noticed that many differences in qualities could be explained by a difference of proportion. Thus they fondly imagined that they could discard quality altogether and have it subsumed under the category of quantity. No doubt this was possible (at least in a certain sense) in some cases where differences of mixture produce different effects, and, since quality is discredited as mystical, the assertion is made that quality is an illusion and that the old philosophers, among them Aristotle and Kant, had simply blundered by admitting the idea of quality among the categories.

In this sense M. Gros has written his essay on quality and quantity, and he proposes to explain the transition of our philosophical conceptions from quality to quantity. Modern science, he thinks, has disposed of the idea of quality and supplanted it, at least in theory, by methods of counting; but such is not the case, for in spite of the proclamation of the demise of Quality, quality will forever remain the most significant fact of experience, which, if it were merely for practical purposes, can not be dismissed and will have to be retained. A closer inspection will show that the existence of quality is not limited to practical life; it is not a mere illusion of merchants and grocers which disappears in the light of science. For theoretical purposes also the categories of quality will have to be retained as being essentially different from quantity, and this distinction will remain forever indispensable not only to the men of practical life but also to the scientist and to the logician.

Incidentally the statement should be made here that there are some scientists and philosophers who characterize modern science as mechanical and purely materialistic. It is frequently assumed that we should dispose of all former philosophies as antiquated and belonging to the animistic era of savage life. This kind of modern science has proved to be a fond illusion of the rationalist movement which was started in the eighteenth century, for it had to be abandoned on a closer acquaintance with the most important problems

of life. The rationalists of the eighteenth century overlooked entirely the existence of soul. They thought they could explain all processes by mechanical laws, but they forgot that feeling is not a motion and so could not be subsumed under the category of mechanical action. As a result Weber and Fechner introduced the theory of parallelism which showed that feeling is one side of a process which accompanies the physical actions of the nervous system. Thus they fell back on Spinoza who had been the first to teach the duality of existence which in a monistic sense he conceived as one whole, the two sides being sentiency and extension, or idea and matter, or spirit and body. In this contrast quality had been subsumed under the category of the subjective element, sentiency, and quantity under its contrast, the objectivity of extended bodies. Quality began to be suspected on account of its mysterious character. It was denounced as an illusion together with the notions of idea, soul, spirit, etc., and its non-existence was maintained. The absurdity of these theories was obvious, for the theory amounts to a negation of our own spiritual existence, of our thinking, which constitutes the very nature of our most essential being. Thus a reaction has set in and we may say that the modern tendency is no longer to discard the notions of soul, spirit, quality, etc., but to comprehend their nature and significance; to understand what they mean and how they can be explained without resorting to mysticism or a belief in occult phenomena, and this we shall attempt to do now.

Before we give our brief explanation as to the nature of quality we must remind our readers of the monistic principles of science and the philosophy of science. We must be clear as to the nature of the scientific ideas which we use as instruments of thought and we must bear in mind that all general notions are abstractions. The real world is one great totality and the observing thinker describes certain features of it which he symbolizes by a name that applies generally. Abstractions denote real and actual qualities of things but not things-in-themselves. Gravity is not an essence, not an object, but a certain feature which is observed in all things heavy. There is no whiteness in itself, but whiteness is a quality which is

observable in all things which we call "white," which possess such chemical qualities that they reflect the light that shines upon them so as to produce in our eye a chemical reaction which causes the sensation called "white." Sentiency or feeling is a quality which appears in all things sentient. All these general notions and other abstractions are methodically arranged so as to produce different hierarchies in which specific ideas are subsumed under general ideas so as to represent all things, according to rules of logic as genera and species. It is this method of arrangement which makes it possible for us to pigeonhole as it were our knowledge of things systematically and make each notion easily and quickly accessible. It enables us to know the nature of things and to do the right thing at the proper time. In fact, comprehension is nothing but an adequate description of things and a pigeonholing of each correctly under its proper category. Knowledge is a sufficient stock of such descriptions and their orderly arrangement in our minds.

As to the categories quality and quantity, we must observe that there have been things which could be counted and others the nature of which could not be established by counting, but was possessed of features that were describable only in terms referring to special experiences. For instance, we can see how many head of cattle there are in an enclosure, we can tell how many pounds a bag of salt weighs, we can measure how high a tree or house may be, but we cannot by measuring or weighing set forth the taste of salt; we cannot by measuring or weighing explain the nature of a circle. Of course we can measure the size of it, but in order to describe the figure of it we must draw a circle and show it. No amount of counting or weighing will explain its curvature or the relation of the circumference to the center. Thus quality is a thing that stands in contrast to quantity. It cannot be determined by measuring or weighing, but is in need of special experiences, and those who use the same language know exactly what is meant when we speak of the taste of salt, or the taste of sugar, or the color sensations of red, green, blue, etc.

Some sensations have been reduced to a difference in quantity, for instance: rough or smooth may under circumstances be due to

more or less high elevations on the surface. The smoothness of velvet is due to a fine fibre of its fabric which may be of a definitely measurable thickness and height. The rougher plush may be similar in its manufacture, only showing the thread thicker and longer. Thus we may in certain cases reduce quality to quantitative measurements and say that the feeling of roughness or smoothness depends upon certain arrangements that are quantitatively determinable; but this is not true of quality itself, only of some features of quality, and assuredly it is not true of all qualities. Some qualities are due to a difference of configuration. Opaqueness of a piece of coal and the transparency of a diamond are due to an arrangement of their atoms, and we have here a difference of quality which cannot be reduced to a quantitative analysis. It is a difference of quality. The material of which both bodies consist is the same, but the arrangement is different and is due to form.

Difference of form is describable but it cannot be determined by the use of either the yard-stick or the scales. Its nature cannot be defined by either measuring or weighing.

What is true of the qualities of the diamond and the coal is true of all other qualities, spiritual as well as corporeal. Nor is it true that quality is restricted merely to the subjective sphere of existence. Quality plays also a most significant part in the objective world of bodily extension, and indeed the difference of psychological qualities will find its explanation according to the theory of parallelism in the physiological formation of its bodily counterpart. The difference of red sensation and white sensation can be explained by a difference of the nervous state of the retina, and thus an insight into the physical laws of our nervous structure will throw light upon the psychical process of our soul-life.

Intimately connected with the several problems of quality is the idea of unity. In fact the two notions, "quality" and "unity," appear to be inseparable. Every unity is possessed of a quality of its own, and whenever by combination a new unity is created, we are confronted with a quality which originates not as the product of a quantitative summation of its elements, but through a characteristic interaction of parts.

A clock, a steam-engine, a dynamo, etc. are not quantitative amounts of metal, but definite configurations of wheels and other contrivances of machinery which perform a certain kind of work. In addition to the sum total of the weight of all particles a new value is established which is of a qualitative nature; so that in case the machinery breaks down, although there is no loss in quantity, that imponderable something which constitutes the nature and usefulness of the machine, its quality, is gone.

Every chemical combination is a new thing that acts otherwise than did its several constituents.

The qualities of salt (NaCl) cannot be explained as the sum of the qualities of Natrium (Na) and Chlorin (Cl). The taste of salt is contained in neither of its constituents; and so all other qualities of chemicals originate through combination according to the way in which they are grouped.

When we draw three different straight lines in three divergent directions and prolong them until they meet, we produce a triangle; and a triangle is a new geometrical figure with definite angles, possessed of a constitution of its own. The nature of a triangle cannot be deduced from the nature of the several lines; the triangle is a configuration representing a new unity, possessing qualities not contained in its constituent parts.

The combination of parts into a higher unity produces effects which are not a sum of equivalent elements, but introduces a new factor which is of a qualitative nature.

Quantitatively, the universe remains the same, and in every process of nature we can trace the same amount of matter before and after each change. Qualitatively, the universe changes. New qualities originate and old qualities disappear. There is no increase in either matter or energy, but there may very well be an increase of value in quality, or, *vice versa*, a loss. The effort of life is everywhere directed toward a favorable change of quality so as to transform the materials on hand into goods that will give more sustenance of life, greater comfort and better facilities.

And what is the part played by unity in this transformation?

If a number of grains of sand are heaped up in a pile, we have

a mere summation of their several qualities; nothing but an addition of their weight, mass, etc. But if a number of constituent parts enter into a compound which forms a higher unit we produce something new that did not previously exist. A unitary complex is not merely a summation of its constituent parts; it contains a new factor which is not of a quantitative but a qualitative nature, originating through the co-operation of its parts; and this new factor would not have been produced by any of its parts alone, but is the result of their mutual interaction.

The characteristic features thus originated are sometimes most marvelous in their effects and thoughtful observers of natural phenomena, accordingly, have been overwhelmed with awe and wonder. The origin of higher unities with their production of new qualities of most astounding and unheard-of effects, has become the main source of all mysticism; and, assuredly, the inexhaustible possibilities of new formations are the most fascinating events of life, sometimes as surprising as the tricks of sleight of hand.

Supposing the world to exist of homogeneous material of some kind whirling about in cosmic space, we find it consolidated in the alembic of nebulæ into hydrogen, oxygen, nitrogen and other chemical elements, which condense into planetary systems. Every chemical element is not merely the sum total of a certain amount of world-stuff, but a new combination in which, through peculiar groupings of its particles, new units of interaction are created that possess an individuality of their own with qualities that did not exist in the homogeneous ether. Higher complexes are formed in more complicated chemical combinations, and inventors are busy to increase their number by artificial formations. Some chemicals crystallize. According to their angle of juncture they combine with substances of the same kind in different geometrical forms of crystallization. Every crystal forms a new unit, and though its elements are homogeneous in their chemical makeup, yet the crystal as a whole is something new which as such did not exist before.

The most important new departure is attained by organization which produces the phenomena of life. Some of the most unstable chemicals enter into such a co-operation that they form a constant

circuit of materials which by constant renewal of its waste products preserves the original form of the same round of function, and this process is called metabolism. It is a combination of adaptibility and permanence; the old form is preserved but constantly modified by new experiences. We call the new product of this wonderful interaction of parts vitality, and there are two forms of it; one, endowed with sentiency, and the other void of it; the former develops into animals, the latter into plants. There is a qualitative difference between the two, and each is differentiated into higher and more complicated forms in the course of evolution.

We see that we can not appreciatively study nature or understand the evolution of life without comprehending the significance of quality. In quality the creativeness of the universe reveals itself, and in contemplating the increasing efficiency of quality, we are confronted with the divinity of nature.

Every unitary complex is an individual, and the tendency is that unitary complexes in their turn will combine into higher unities. The higher unitary complexes in the domain of life are called organisms; their parts which in themselves are smaller units depending on the co-operation of the whole, are called organs. Organs are such intermediary units as could no longer lead a separate individual existence. Thus they are, in a certain sense, true unitary complexes, but are never found separate or isolated.

The highest kind of a unitary complex is man, who as such is called a person. Several persons enter into higher combinations such as states, churches, societies, corporations, etc., and even their interrelations coalesce into organized institutions such as language, habits, laws, forms of government, etc.

Properly speaking, all persons are organs of the social whole; for it will be seen that the combinations of personal interrelations are the most important features of human life. If we could cut out from a person all he owes to society and his social intercourse with his fellow-men, nothing would be left of his personality but the mere physiological organism. Our exchange of ideas, our school institutions, trade, commerce, and even our charities, also the struggle in our social life, competition, trust formations, labor unions, the

antagonism between capital and labor, etc., are due to new combinations in the field of human hopes and ideals. The interrelations of human society are being constantly readjusted, and the result is a difference which is not purely quantitative but qualitative.

The problem of unity found a peculiar construction in India where the unity of the soul was hypostatized into a thing-in-itself called *atman* (or "self") that was assumed to be independent of its parts. The Vedanta affirms, and Buddhism denies, the existence of an atman. Buddha proclaimed as an essential truth of his doctrine that (1) all compounds are transient, (2) that all compounds are subject to suffering and (3) all compounds are lacking an atman, i. e., a self that is independent of its parts. The Vedantic view leads to mysticism while the Buddhist doctrine takes a bold stand upon a sober and purely scientific conception.*

There is no need of entering into further details or pointing out all the applications of the non-existence of the atman, but we must insist on the paramount importance of the part which unity plays. Though a unitary compound, be it in the shape of chemical molecules, or organisms, or inventions of machinery, or mathematical concepts, or ideals, is not a thing-in-itself, though it is not a metaphysical entity which owns its parts as if they were its properties, though there is no atman; yet the effects of a unification are real, and so we say in a certain sense, that things act as if they were ensouled with atmans.

Atmans are conceived in the Vedanta as eternal and immutable, not subject to time and space, and the same can be predicated of the unity of compounds without ascribing to them any mysterious selfhood of atman-existence. Though unifications must be accomplished in time and space, they are possessed of a pre-existence as potentialities in the womb of eternity. They are the Platonic ideas which constitute the formative factor of existence. They are not things-in-themselves but forms-of-themselves. Like pure mathe-

*How difficult the question of unity proves to be can be seen in Plato's attempt at solving the contradictions of "the one and the many." Concerning Kant's theory of things-in-themselves see the author's book *The Surd of Metaphysics*, pp. 6 ff., and 29 ff.

matics, they exist in the domain of potentiality, and their realization, unlike the invention of a fairy tale, has not been woven out of the pure fancy of the inventor. Their realization is, properly speaking, an incarnation or actualization of eternal possibilities. In the same way the invention of machinery, of the wheel, the sewing-machine, the steam-engine, the dynamo, the motor, electric light, etc., are (as indicated by the word) in-ventions, i. e., findings; they are discoveries; in fact they are revelations of hidden truths; they existed as much before their invention as did the continent of America before its discovery either by the Norsemen or by Columbus. They lay concealed in the unfathomable abyss of the laws of being and no one knows what wondrous surprises the future still has in store for us.

Thus we find that the old contrast of quality and quantity is justified. The old philosophers who distinguished these two categories cannot be branded as dupes of an illusion, and we would make a great mistake if we discarded these notions or tried to obliterate the idea of quality. In fact far from rendering our insight into nature clearer it would obscure matters and would involve us in untold contradictions. On the other hand the suspicion which we rightly entertain against notions that lead to mysticism has been disposed of. Quality is by no means an idea which necessarily leads to occultism. A right conception of the nature of quality, which is always due to a definite configuration or structure, constituting a higher unity endowed with new and characteristic features of its own, not contained in any one of its several parts, shows us that there is as little mystery in the differences of qualities as there is in counting, in weighing, and in measuring.

The significance of our solution can hardly be underrated. It throws light upon all problems of philosophy, including the domains of psychology and ethics. It is a solution which commends itself by soberness and justice,—soberness because it disposes of the mysterious aspect of quality without denying the remarkable facts that naturally give rise to mysticism, and justice because we recognize the truth in the statements of both opponents; on the one hand those who insist on the significance of quality as a fact of experience

which is true though it might smack of occultism, and on the other hand those who endeavor to reduce all phenomena of experience to a quantitative analysis in the hope of rendering the universe as intelligible as any system of mechanics.

There is no use denying the wondrousness of thte facts of experience after the fashion of the old rationalists, nor is there any need of seeking refuge in agnosticism. The appearance of new qualities necessarily seems a miracle to the uninitiate, and even when we explain these occurrences as the inevitable results of definite combinations of parts into new unities, the fact remains as strange as before. On account of it the universe we live in is replete with illimitable potentialities, a condition which constitutes the main charm of life.

The nature of our own being—the human soul—stands out foremost among all the qualities that challenge the curiosity of the investigator; it is the noblest phenomenon of the universe, and the deepest problem of science. The qualities that appear in the domain of psychology and ethics, constituting the background of religious life and the history of mankind are the most wonderful facts —more wonderful than could be invented by any poet or romancer. We have good reason to assert that all of them are explicable by science, and yet they remain what they are—wonderful, curiously wonderful; apparently miraculous, and certainly divinely grand.

Clearness of comprehension does not destroy the worth of things, and an explanation does not dispose of the facts explained.

EDITOR.

THE SEARCH FOR THE PROPHETS.

THERE is no part of the Old Testament that has for us greater interest than the prophetic literature. In its impassioned poetic passages, in its lofty ethical thought and in its profound interest in life, it is far superior to any other type of literature which we find in the Hebrew canon. This is but saying that the greatest minds in Israel expressed themselves as spokesmen or interpreters of Yahveh in oracular literature, the highest thought was molded into prophetic forms of expression. For this reason the question, who wrote this literature? who were the men who cast their thought into oracular molds? is an important critical question to the student of Hebrew life. The question has the greater significance, it is worthy of note, because the prophetic literature is so extensive. One fourth of the Old Testament canon consists of prophetic books and pieces. Three of these books are individually equivalent to a duodecimo of one hundred and fifty pages. This prophetic literature is indeed, for an ancient literature, of vast dimensions.

It has commonly been supposed that the writing prophets are known to us through the titles which the various books and prophetic pieces bear and through occasional personal allusions in these writings. There has been little disposition to question these titles and allusions; especially as they have been thought to be supported, measurably at least, by references to these prophets in the historical books; but such references are so few and so suspicious as to their character that the search for the men themselves becomes to him who prosecutes it very perplexing. Apparently too much has been taken for granted. It has been assumed that just as we

know certain Greek tragedies as the work of an Æschylus, and certain as the work of a Sophocles, and certain others as the work of an Euripides, all prominent in Greek life; so we know the various prophetic books and pieces of the Old Testament as the work of the men whose names they bear, which men indubitably appear in the historical annals of Israel. Such, as a careful critical study reveals, is not the case.

The Greek tragic poets find a large place in the life and historical annals of the Greeks of the fifth century before Christ. Æschylus is known to have borne an honorable part in keeping the Persians in the Marshes of Marathon and to have aided later in the overthrow of Xerxes at Salamis. It has been said of him that he was honored by his countrymen as a patriot rather than as a poet, though as such for a generation he was awarded the prize for superiority in the drama. Sophocles is known to have led as a youth the chorus which danced and sang around the trophy in celebration of the battle of Salamis and to have served as a colleague of Pericles in the Samnian war. The statement of his biographer that he bore his full share of the civic burdens of his people and that he served frequently in foreign embassies, has been regarded an exaggeration. There can, however, be no question but that as a poet for three decades he was prominently before his people and kept in close touch with the great movements of his time. Euripides had less fondness for public life; but his work as a dramatist kept him before the people for half a century while his unhappy family life became notorious. Though he in his old age expatriated himself, it is said that when the news of his death reached Athens the whole city was thrown into mourning. The same is not true, so far as we can discover, of the writers of the Hebrew prophetic literature. They do not appear in the historical annals of their supposed time.

To him who is interested in the life and thought of Israel there is no more fascinating diversion than the search for the literary prophets. It is upon this still-hunt that I purpose to take my readers. My reasons for so doing will appear later. It is enough at this point to remark that our interest in the ethical thought of the

past—and nowhere is there to be found prior to Jesus's time loftier ethical thought—leads us to desire to place this thought where it belongs, that we may appreciate it and grasp its significance to Israel and to the world. If we date some of these prophets two or three centuries too early, we must think of them as belaboring their people with messages which they could not understand, and which, because they were untimely, accomplished nothing. If, on the other hand, we date these writings where they belong, we may be able to determine what their authors accomplished as the great ethical teachers of their time. This will remain true though we may find that these books and pieces were written by men who belonged to a literary school and did not exercise orally the functions of prophets.

In our search for prophets who are thought to have given utterance to oracles which were afterwards written out fully, or in part, we confine our attention to the books of the so-called major and minor prophets. The supposed authors of these only are known as literary prophets; and it is for traces of the literary prophets we are looking. We cannot forbear noticing at the outset that there are credible reasons for believing that there were prophets, men who professed to speak for Yahveh in ancient times among the early Hebrews, just as among other peoples there were men who stood forth as prophets and professed to speak for the gods of their people. Scholars have been wont to regard suspiciously the words put in the mouth of Nathan in 2 Samuel (see vii. 2 ff.; xii. 1 ff.); but we may take the allusions to him in 1 Kings (i. 8 ff.) as revealing the existence of an actual prophet who was a member of David's household. His functions may have been few and simple; and he may have been wholly subservient to his royal master, still it is reasonable to suppose that David had some such man who professed to be able to ascertain the will of Yahveh and to speak for him.

There are numerous allusions in the history of the kings of Judah and Israel to such a class of men. Ahijah the Shilonite who is said to have encouraged Jeroboam appears to have been such a one (1 Kings xi. 29 ff.); though the Deuteronomists spoil the

simple story told of him by their expansion (see vss. 32 ff.). It is not unreasonable to suppose that Elijah and Elisha, despite all the legends which gathered about their names, were men who figured prominently in certain directions in the life of Israel, though the latter seems to have been more inclined than the former to play the part of a courtier. We are told that Jonah, son of Amittai, served at the court of Jeroboam II, and that he encouraged him in his imperialistic policy (2 Kings xiv. 25). Such, not to mention others, were the prophets of Israel and Judah. They were men of action, rather than men of letters. There is nothing to lead us to suppose that they ever committed such petty oracles as they uttered to writing, if, indeed, they were possessed of the art. Our search is not for such men; but for traces of the men who are named as the great actors of the prophetic literature, who are said to have uttered the great oracles which were grouped about their names. Can we discover in the actual history of those times such men as Amos, Hosea, Isaiah, and Jeremiah? For these men we are to search. If they were actual personages, and, especially, were the great voices and actors of their time, then we should expect to find many traces of them in the annals of those old days.

We have to confess at the outset that we do find, as, indeed, we have seen, mention of a certain Jonah ben Amittai; but we hasten to remark that this man who figures in the book of Jonah, as scholars have long since noted, was imaginatively taken by the late writer of the book as his supposed prophetic actor. Some four or five hundred years must have separated the age of the prophet who frequented the court of Jeroboam II from the time when this delightful little evangel was written. Here, then, we have, admittedly, a late piece of literature, dated back and fictitiously assigned to a prophet of the eighth century. A study of the phenomena which this book presents raises in our minds the question whether this is the only pseudepigraphic prophetic piece in the Old Testament. It would be strange if this were the only one, so strange that we note with interest the fact that other prophetic books have been found perplexing, that scholars have been wont, for example, to question whether Malachi was an actual prophet, or whether

the name was that of the supposititious prophet of the writer who had given Israel this little book that is universally recognized as late. It is not matter for wonder that they should have done so, for the name means "my messenger." It is just such a name as we may conceive a writer who wished to put his thought in prophetic form might have taken. Of this Malachi there is no trace in the history. "Obadiah" (servant of Yah, or Yahveh), was a common name among the Hebrews, but of a prophet of this name the history gives us no hint. The oracle against Edom which forms the burden of the little prophetic piece, which is ascribed to him, might have been published near the Maccabean age; for we know it was not until the time of Judas that the Edomites, who had been crowded by the Nabateans up into southern Judea in early exilic days, were subjugated (1 Maccabees v. 3 ff., 65). The oracle is really an expansion of one which occurs in Jeremiah (xlix. 7 ff.). As for the name, here again we have just such a name as a late writer might have taken if he wished to conceive of an oracular prophet as uttering what he had written.

Nowhere in the historical books do we come upon prophets known as Nahum and Habakkuk. Nahum (consolation) is a fit title for the supposed prophet of the impassioned oracle which, Otto von Happel in his recent handbook thereon concludes, must have been late, thus agreeing substantially with my unpublished notes of two or three years ago. There can be no question but that the allusions to the Assyrians are veiled allusions to the Greeks or the Syrians, while Nineveh stands for some city of the third or second century B. C. As surely are the references to the Chaldeans in Habakkuk veiled allusions to later peoples.

Of a prophet known as "Zephaniah," who appears as the preacher in the little prophetic book which is said to be his, there is no mention in the history. The manifest attempt to give this supposed prophet a royal pedigree in the title renders the existence of an actual prophet of this name all the more doubtful. Of Hosea, Amos, and Joel there is not the shadow of a trace in the history of Israel. This is, as scholars have confessed, remarkable. Amos, as the herdsman of Tekoah, who is thought to have gone north

as a Judean prophet and roared, though ineffectually, at the old sanctuary of Bethel, has been declared to be "one of the most marvelous and incomprehensible figures in the history of the human mind." So incomprehensible has he seemed that we can understand why one scholar has been moved to remark that Amos could not have gone north to the Bethel of which we read in North Israel, but must have gone rather to some house of God or local shrine of that name in Judea. Hosea is thought, as the title of the book named as his intimates, to have labored as a prophet in the north for half a century, though no trace of him is to be found. The book of Joel comes before us as a problem quite as perplexing. It is significant that the book of Amos which is a burden, a message of doom to Israel and Judah and neighboring peoples, with but a word of bright promise and assurance at the end thereof which has been supposed to be an appendix by another hand, has for its title "Amos" (a burden), a name which occurs nowhere else in the Old Testament. While "Hosea" and "Joel" are common Israelitish names, it is easy to see why they may have been taken by late writers as names of the authors of their prophetic pieces.

More astounding still is the fact that Ezekiel, who is supposed to have been the great prophet of the early exilian days, is mentioned nowhere in the Old Testament outside the book which bears this name. Even in the book the name appears but twice. On the very reasonable supposition that the book is a late pseudepigraphic work whose author purposely dated it back several centuries, we may explain the failure to speak of such a one as Ezekiel in the historical annals, not otherwise. We are likely to find that Zunc and Seinecke, as they labored long ago in this field, were the pioneers of a more intelligent conception than were their opponents.

Micah the Moreshite is named as the prophet of one of the short prophetic books. Though unmentioned in the history, this supposed prophet is quoted by name in Jeremiah (xxvi. 18). This has little evidential value without Jeremiah as a prophet actually played an important part in the life of Judah in the days of Josiah and later.

Haggai and Zechariah who are named as the prophets who gave

utterance to the oracles of two of the minor prophetic books are mentioned in Ezra (v. 1; vi. 14); but if we are to conclude with one of our modern scholars that Ezra was, as he appears in Hebrew literature, a creation of the late priestly school and that the book which bears his name was largely, if not wholly, imaginative, we must admit that the mention of such prophets in the late literature counts for little. In some curious ways the book of Ezra and these two prophetic books are interlinked. It is possible that both Haggai and proto-Zechariah were written to bolster the fictitious priestly story of the return and restoration which we find in Ezra. We can safely assert that in the actual history of Israel no such prophet appears.

Two prophetic books remain to be considered, two of the longest and most important to the student of this part of the Old Testament literature, Jeremiah and Isaiah. There is probably no one of the literary prophets who has puzzled scholars more than has Jeremiah. According to the book which bears his name he must have been the most important personage in the last half century of Judean life prior to the exile. In the days of Josiah and for several decades thereafter he is said to have figured prominently as the spokesman of Yahveh. He is pictured as throwing himself into the civil affairs of his time with a zeal which knew no abatement and with a heroism which was unquestioned. Opposed, yet never disheartened, thwarted and made to suffer terribly, yet never crushed by adversity, he made his influence powerfully felt in a lost cause. Recognizing the inevitableness of the spread of Chaldean power he unweariedly endeavored to save from utter ruin the Judean state and to turn the thoughts of his people to the loftier ethical ideals for which they might live as dreams of material advancement and splendor faded. Such he appears to have been, according to the writings and the oracles incorporated therewith, attributed to him; yet when we come to search for him in the history of his time we discover not the slightest trace. This, as Dr. MacCurdy and others have noted, is marvelous and manifestly inexplicable.

It must of course be admitted that the references to Jeremiah in the late priestly literature (2 Chron. xxxv. 25; xxxvi. 12, 21, 22;

Ezra i. 1) are without critical value, as is the mention of the name in Daniel (ix. 2), a Maccabean book. Such allusions were made long after, though perhaps not more than a century after, the writer of Jeremiah had published his work and it had been accepted as an ancient prophetic book. When we call to mind the fact that some three or four centuries intervened between the date usually assigned this supposed prophet and the date of the first priestly mention of him we can easily see how little warrant we have for assuming that there was an actual personage of that name in Josiah's day. We have also to take into account the fact that the writings promulgated as Jeremiah's are thoroughly saturated with Deuteronomy and must in consequence have been written some considerable time subsequent thereto. If the Deuteronomists were post-exilic, as we shall have to conclude they were, then the book of Jeremiah must be placed somewhere between 400 and 250 B. C., or even later.

In turning to Isaiah, we are interested to notice that much of the book has long been thought to be the work of an unknown exilic writer who for convenience is called Deutero-Isaiah; even much of what was once thought to belong to the original, or proto-Isaiah, is now, for reasons which appear to be conclusive, assigned to the second Isaiah, or some later prophet. To some, as to Canon Cheyne (see *Isaiah, S. B. O. T.*), but little is left of the work of the first Isaiah, the equivalent of about fourteen chapters in all. The mention of Isaiah in the titles of chapters i and ii has no evidential value, for either we must consider the titles late, or must, and more reasonably, with certain advanced scholars, regard these chapters as a part of the work of Deutero-Isaiah, and therefore late. Similarly the mention of Isaiah in xiii. 1, the title of an admittedly late oracle against Babylon is equally valueless. Let no one remind us of the Assyrian chapters (xxxvi-xxxix) in which the name of this supposed prophet occurs several times, for these are undeniably late, as Dr. Cheyne has conclusively shown. To discredit these chapters as the work of an original Isaiah is to throw out 2 Kings xix, xx as evidence that there was such a person in the days of King Hezekiah. The mention of Isaiah in the Berodach-

baladan episode (2 Kings xx. 12-19; Isa. xxxix) may form a possible exception, though it is not wholly free from suspicion. It certainly is somewhat after the character of the accredited stories of the old prophets of action, unlikely as it is that such a prophet bore such a suggestive name as "Isaiah."

There remain only the references to the supposed prophet in chapters vii and xx. The passages in which these allusions to Isaiah occur are quite different from anything else which is found in this book, absurd and apparently incredible as they are. In the first passage we are told that Isaiah at the command of Yahveh went forth to meet King Ahaz with his son whom he had strangely named "a remnant shall return," and encouraged him with fitting words. We are expected to believe that Isaiah, about a century and a half before Jerusalem fell and two or three centuries before the pious Zionists began to straggle back from foreign ports, by this wondrously suggestive symbolic name thus designated his son. The story is palpably absurd: it puts too great a strain upon our credulity. And a symbolic name may have been given by a late writer to a son of his supposed prophet very naturally, for then did he and others cherish the hope of a return and of a resurrection of the old Hebrew state, then and not until then.

Quite as incredible is the allusion to Isaiah in chapter xx. According to this passage Isaiah is said to have gone naked and barefoot about Jerusalem for three years as a sign and warning against Egypt, lower and upper (Mizraim and Ethiopia), thus insinuating to his friends and neighbors who were said to be looking to Egypt for help, that the people of that land were to be led abroad as captives, and that dependence on them was therefore vain. Something akin to this, the old prophets were ever doing; but it is hardly conceivable that the writer is here describing an actual occurrence.

We are thus forced to conclude that neither in the historical books nor in this great prophetic book do we come upon convincing evidence of the existence of such a one as Isaiah. It is significant that the very name "Isaiah" is symbolic, and is strongly characteristic of the oracles throughout. It is the salvation or deliverance of Yahveh which is the theme of the book; and "Isaiah" means

"salvation or deliverance of Yah, or Yahveh." Here, moreover, as in the case of other supposed literary prophets the name of the supposed father of the prophet is of one who appears nowhere in the history. Besides "Amos" means "strength," or "strong one." Even if our search in this instance be thought to bring to light an actual prophet of the olden time we are not to think of him as having anything to do with the oracles here brought together. We may regard them as late writings thrust back imaginatively into the earlier time by their author or authors in a way thoroughly characteristic of the Hebrews.

We shall have to admit that our search for the literary prophets of Israel has not brought such men to light. Nowhere do we find traces of such men. Though they are pictured in their supposed writings as figuring prominently in the life of Israel from the close or middle of the eighth century on for five hundred years; we cannot in the chronicles of the people put our hands on them: always and everywhere they elude us. Need we wonder that scholars who have spent much of their time in this quest in their study of the prophetic literature should have drawn back amazed and perplexed?

I ask no one to accept my conclusions; but I cannot forbear saying that I see but one reasonable explanation of this most perplexing problem, it is that in common with most of the other Old Testament literature the prophetic is pseudepigraphic and as such is late. Such writings must be accounted for. There is in the Old Testament nothing finer, nothing more uplifting from both the poetic and ethical point of view than large sections of the prophets. For good reasons the great men of the post-exilic time chose to publish anonymously or pseudonymously their prophetic thought. Taking up the work and following on after the Deuteronomic school, the school which for convenience we call the prophetic, chose to work out of sight, giving an air of mystery to their pieces as they were sent forth; as the publication of Deuteronomy itself had been compassed about with mystery, as a work attributed to Moses, the reputed discovery of which in the time of Josiah was said to have occasioned a great and drastic reformation.

If my findings as to the Deuteronomists are accepted there need

be no question as to the prophetic writers that cannot be reasonably explained. If we can conceive of pious Zionists as they straggled back from foreign ports with their nobler conception of Yahveh and their purer ethics in their endeavor to build up a new Israel on the ruins of the old, labored as Deuteronomic monotheists, redacting after their peculiar manner the old chronicles of their people and promulgating Deuteronomy as a recapitulation and enlargement of the Book of the Covenant, as passing over into the prophetic school which was further reinforced by other returning Zionists, we have a conception of the prophetic literature which is most inspiring as it is withal most reasonable. Already the discovery of the fact that Deutero-Isaiah is post-exilic and late, that the burden of its matchless oracles has to do with the *golah,* the Jews who returned from Babylonia and other distant parts, has rendered it a most fascinating book. A more careful examination of the prophets reveals the fact that large portions of them are of the same general character as Deutero-Isaiah, that whenever the *golah* is mentioned in the prophets it is with radiant optimism. To think of the prophetic literature as late and to discover how the writers of this literature turned to the Zionists to whom they undoubtedly themselves belonged is to find how needless it is to mutilate the prophetic writings and assign to late writers all portions and fragments which are hopeful and optimistic.

We cannot of course be sure of the integrity of any one prophetic book; though we may seriously doubt if it be any such patchwork as some find such books as Amos and Isaiah to have been. Still there is nothing inherently incredible in the thought, if these different books are late, that they are for the most part the work of men who gave their books an individuality and unity that may be apparent to us; while certain of the books may be the work of two or more writers. In a few instances a prophetic writer may have produced more than one prophetic piece or may have had a hand in the composition of two or more of the larger books. There are chapters of Jeremiah and Ezekiel that may have come from the hand of the writers of the more optimistic portions of Isaiah. It is thus that a prophetic school sends forth its work. Once grant

that the prophetic literature of Israel is the pseudepigraphic and late work of such a school and we have to admit that the question of the authorship of any individual book or piece is of no particular moment as it certainly is as much beyond our power to determine as the authorship of a psalm. It is significant that the titles of so many of these prophetic books have been regarded by certain of our great critical scholars as spurious. Taken as they stand they are supposed to be inexplicable. By looking upon the prophetic writings, as I have here suggested we must, we may let the titles stand as the efforts of their late writers to give an imaginative setting for their work in earlier centuries.

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CONFLICT OF RELIGION AND SCIENCE.

FROM A JAPANESE POINT OF VIEW.

THE century which closed a few years ago must be regarded as an eminently successful period for science, whose influence is everywhere felt at this beginning of the twentieth century. Japan, too, which has been following in the wake of European scientific progress only during the last few decades, could not but feel its consequences. Men of science have shown their brilliant achievements in almost every phase of life, and naturally they stand now before us much elated over their triumphant march. Japanese education, which had hitherto placed too much importance upon ethics to the exclusion of scientific study, could no longer hold its ground against this general assault so successfully carried on, and a reaction soon set in. People ran wildly after things scientific, applauded the scientific frame of mind, and showed everywhere a disposition to disregard the old traditions. Recently, however, symptoms are becoming more and more recognizable, that point to a revival of the old spirit. Young men of Japan are beginning to feel that science does not necessarily satisfy all their moral needs, and that it is a mistake to attach too much significance to it. But I am seriously in doubt as to whether this revival really is to be welcomed at this juncture in the development of our national culture. By no means do I wish to make light of the ethical culture which was strenuously pursued by our fathers. The point I wish to make, is that this is not yet the time to revive ancient tradition at the sacrifice of the general scientific culture which has but lately

[1] Translated by T. Suzuki.

started. A universal propagation of the scientific spirit among our people is still needed, and even more urgently than it was a few decades ago.

In this connection, I have one or two questions to ask: "Do science and ethical culture antagonize each other or not? And further, not only do they perhaps not antagonize, but do they not actually coöperate with and complement each other?" Broadly speaking, science aims at discovering and elucidating laws that govern natural phenomena, while by culture we mean the improvement of our subjective attitude toward the laws thus formulated, or in short, character building.

When viewed from this standpoint, science and culture must be said to complement and not to contradict each other. Why, then, are some people inclined to think otherwise? The explanation of this lies in the fact that such thinkers are generally specialists who, in the heat of enthusiasm over successes achieved in the particular department of science to which they have devoted their lives, forget the necessary limitations of their subjects and arrogantly attack hypotheses and even ignore facts, when both facts and hypotheses are beyond the scope of their own study, and, therefore, can not be included within the bounds of their favorite theories.

The proper object of science is to investigate various laws controlling natural phenomena. For instance, it is a proper subject of scientific study to find out the laws that govern the phenomena of mutual attraction between the sun and the earth, or those which make one element combine with another in various degrees of affinity, or to discover those psychological principles which prompt men and women to unite themselves in matrimony. Sciences, to use logical terms, are made to determine some particular propositions, explaining each natural phenomenon by a certain definite law. They have no right whatever to overstep this limitation and absolutely deny or affirm things which do not properly belong to those specific spheres.

Suppose here is a man whose special study is psychology. He can investigate the relations that exist between the soul and the body, between the nervous system and consciousness, and he can

assert that particular states of consciousness are accompanied by or follow from corresponding organic or nervous conditions; or, that whenever the brain is affected in a certain way, a certain state of consciousness may be expected. But he will go beyond his sphere of study, if he tries to positively decide the problem whether our consciousness could continue to be active after a dissolution of the material body. The psychologist, who studies the relation between the mind and the body, feels naturally disposed to think that without a nervous system mentation would be impossible. But he, as a scientist, has no right to make, or rather has no positive facts to support, the unqualified denial of mentation without cerebration.

Let me make a wider application of this scientific attitude and method. Our wonderful solar system is, as is well known, mathematically governed by the laws of attraction. But we cannot say by reason of these laws that there is no God in the universe controlling its multitudinous phenomena. We are not scientifically justified in making such a universal negation. In this respect Newton was quite right. He has scientifically—mathematically—established in his *Principia* the laws of gravitation, by which all celestial bodies attract or repel one another. But the fact did not warrant him in advancing his logic further, and denying the existence of God. On the contrary, he said that there probably is a supreme being above all these natural laws.

Unfortunately, however, a number of scientists both in Europe and America, dazzled by successes brought about by some special scientific investigations in their chosen spheres, have sometimes yielded to the temptation of unscientifically extending their conclusions beyond the limits which they have set for themselves. Thus, even the principles of ethics and religion have been discussed and attacked and condemned by the scientists, whose business, strictly speaking, had nothing to do with those subjects. Rising against these encroachments, philosophers and men of letters declare that there are some facts and principles which defy treatment by regular scientific methods, so called. The sudden revival of mystic romanticism whose waves have also begun rolling over the Japanese sea

of thought, may be considered as a reactionary movement against the belief in scientific omnipotence.

Whatever its claim, mystic romanticism has at least one lesson to teach us. This is its peculiarly inspiring stimulus to our inner life. According to its doctrine, the human soul is considered to perform three distinct functions, thinking, feeling, and willing. Each of them has peculiar needs of its own. Science and philosophy may satisfy our intellectual demands, but utterly fail to administer to our emotional needs; and what mystic romanticism strives after is to fill this deficiency. As far as it stands above simple mechanical intellectualism it has a unique fascination, which strangely appeals to man's innate spiritual aspirations. It cannot be regarded as an abnormal pathological phenomenon of the soul, for a mystic element is surely to be found in our normal mental activities. Its only danger is that some weak-minded people are apt to take refuge in mysticism, thereby excusing themselves for want of thought and giving a free rein to their unjustifiable subjectivism.

I cannot here enter into any detailed discussion concerning the recent revival of mysticism in Europe. But we can remark that the further the progress of various sciences, the more complicated, detailed and specialized they become, and this fact finally tends to isolate the scientists of one branch from those of every other, confining each within his own narrow department. Therefore, the social soul, if there really be such a thing, at this beginning of the twentieth century, must be said to be losing unification and gradually disintegrating. In this sense we can say that the present social soul is pathological. Such men as Helmholtz, Virchow, Huxley, and Tyndall, are getting rarer every day. They were scientists of a high order, and at the same time had a great interest in general social education, and did everything to propagate scientific knowledge among the masses. Mystic romanticism, it seems to me, is trying to fill the vacancy. Standing against the isolation of over-specialized sciences, romanticism aims at concretely inspiring the social soul. It is a sort of humanistic movement. But I doubt whether this romanticist activity is able to do what was done by Helmholtz, Huxley, and other scientists.

One more point I wish to notice; and that is, why mysticism came to be so widely welcomed by the public. The progress of science towards the end of the nineteenth century has been so amazingly great that people have been induced to put too much confidence in its possibilities. But as a matter of fact there are a great many problems still left unsolved by science. This opened the eyes of some scholars to the limitations of scientific knowledge, while others have failed to unravel such "miraculous" phenomena as spiritism, telepathy, etc. Tired of fruitless researches and disappointed at unfulfilled expectations, scholars as well as the general public began to look for something else to satisfy their inner yearnings. And they happened to think of the long-forgotten mysticism.

After all, what is necessary at the present juncture, is to start *a humanistic movement founded upon scientific ideas,* to effect a coördination among isolated departmental sciences, and to establish an organic relation between actual life and science.

From the psychological point of view, science belongs to the domain of intellect, and character means individual subjective life. Now this being the distinction between character and intellect, in what relation does one stand to the other? What are the fundamental constituents of character? Can character be moulded independently of the development of intellect?

Among the many constituents of which character is made up, the intellect takes a very prominent place. The widening of a man's intellectual horizon is certainly greatly conducive to the refinement and consolidation of his character. If, on the other hand, he acts hastily, from the lack of sufficient knowledge, as dictated by an impulse of the moment, his character must be said to be standing on a very unsteady basis. Knowledge, especially well-systematized scientific knowledge, is surely needed for the building up of character.

Generally speaking, we can distinguish two forms of knowledge: scientific knowledge and religio-philosophical knowledge. By the former we mean the knowledge that relates to a specified group of facts. Its practical result is the quickening of will-activity rather than the refining influence; it promotes the practicality and definite-

ness of conduct rather than its ennoblement. Religio-philosophical activity, on the other hand, is a synthetic factor. It watches over the totality of things, it grasps the individual's relation to his entire environment. It has, therefore, to be distinguished from the faculty that deals with special laws or a particular mode of activity. Religio-philosophical knowledge, therefore, elevates character to a higher plane of activity rather than making it exact and definite, and secures will-activity on a steady foundation.

These two forms of knowledge, one of which can properly be called scientific and the other religio-philosophical, thus perform two different functions in the formation of character. At this stage of the national development of Japan, which of these kinds of knowledge is more needed, which is more to be developed, than the other? It is of course difficult to form a definite opinion about these things; but to my mind, one is needed just as much as the other, and both of them are still in an adolescent stage of development. While we have to do all we can to further the dissemination of scientific knowledge, we must not neglect to encourage the cultivation of religio-philosophical knowledge.

The fact that scientific knowledge can be acquired from without, but religio-philosophical knowledge must be evolved from within, is readily explained. The former can be obtained without great difficulty by any fairly-endowed mind either through instruction or through self-application. To develop the latter, however, it is necessary to have a strong, comprehensive will, fine sentiment, steady aspirations, keen insight into life, and various inner experiences. Moral discipline, therefore, is indispensable here. As was once discussed by Socrates and Plato in ancient times, morality is not a thing which can be grafted into one's being from without. Unlike scientific knowledge, it must be created by each individual from within. It is truly said that every man is his own philosopher. However wide or however narrow a man's sphere of interest in life, he must have his own philosophy that comprehends and is in harmony with his entire environment. It is the same with a petty tradesman whose store front does not exceed more than a few yards, as with a great statesman on whose shoulders rests the fate of em-

pires. Every man must have a philosophical knowledge comprehensive enough to grasp the whole situation to which he has to adjust himself. With a successful business man every dollar and cent must be accounted for, for otherwise he will sooner or later fail. Therefore, philosophical knowledge has to do with the entirety of things, whatever their importance and consequence. Its characteristic is completeness and universality. To the development of character, this form of knowledge is highly essential, and it would be truer to say that every man should be a philosopher than to say that every man is a philosopher.

Some people imagine that philosophy is a dry, tasteless, and uniteresting affair, having no direct important bearing on practical life. To illustrate that this popular notion is not justified, let me say a few words about love. This sentiment is no doubt at first awakened by some organic impulses, but gradually losing its original significance, it becomes spiritualized. For this spiritualization two things are necessary. One is esthetical association and the other generalization. Sexual love may start with an individual admiration of beauty in the other sex, but as the soul expands and elevates itself, the sentiment of love grows beyond the pale of individualism and begins to cover a wider field, finally embracing entire humanity under its wings. This love, now purely spiritualized, is Platonic. It is then evident that the two things, association and generalization, are necessary to enoble and spiritualize a sentiment which was primarily confined to some particular object.

Some philosophers, especially those of the Middle Ages in Europe, were wont to take into consideration only the element of generalization in philosophical knowledge. This naturally led the common people to understand by philosophy anything but what is interesting and inspiring, while in point of fact philosophy does not exist independent of human sentiment. But the sentiment becomes widened through the generalizing process of philosophical speculation, while it retains its original character of concreteness throughout. Here we have the conception of a universal concrete. While still maintaining its realistic effect, the sentiment moves in unison with general concepts. To illustrate this, take a dramatic work

or a novel. It is an artistic delineation of concrete facts such as we observe in our daily life and is not the presentation of an abstract theory such as we have in Lao-Tze's Tao Teh King or Chwang-Tze's philosophy. Yet we have in the concrete statement of a novel or a dramatic production some general truth reflected or suggested. Every particular incident as it is depicted awakens our associations with things general and conceptual.

This universal concreteness of a sentiment is essential in the development of character. People who act only according to impulses of the moment may be innocent enough, but cannot be said to have any character. The worth of a man's character is betrayed, however, when his apparently meaningless acts, such as laughing, smiling, or chatting, reflect some general concepts deeply ingrained in his being. Sometimes, students disciplining themselves in the Dhyana practice of Buddhism or in the Taoistic doctrine of Lao-Tze and Chwang-Tze, may wrongfully interpret the significance of their master's teachings. They begin to think that the most essential qualification of a philosopher is absolute transcendentalism or utter indifference to worldly interests. The truth is, we cannot escape this earthly entanglement, we must laugh or weep as every other fellow-being, but we can make our every particular act meaningful and reflect in it some grand universal truths. This philosophical discipline is essential to culture.

Next comes practical discipline, which means the adjustment of thought to action. It frequently happens in our daily life that we are unable to execute what we know we ought to do. It is not that we are too lazy, but simply that we are not sufficiently disciplined. The channel between central motives and motor nerves has not been cleared sufficiently for an idea when awakened to find its unobstructed course in action.

As the last essential factor of ethical culture, we have to refer to the strength of will, of which so much is spoken lately in this country. What is meant by a strong will? Can the will be strengthened by discipline? Is a strong character born and not made? These are the questions I wish to discuss here. But before doing

so it is necessary to see what constitutes the will from a psychological point of view.

There are among modern psychologists so many conflicting theories about the nature of the will, that they have not yet come to any definite settlement, but this is not the place to enter into a discussion and criticism of those various will-conceptions. Let me state my own view here and apply it to the practical subject under consideration.

Several conditions necessary to make up will-activity are: (1) End-concept; (2) Motive; (3) Adaptation of the peripheral organs; (4) Persistency of the motive, which comes from the conjunction of end-concept and motive; etc. The first is a simple concept; the second is a feeling of uneasiness; the third is the physical action such as talking, gesturing, or any other mode of adjusting the muscles to the central motive; the fourth is a continued state of uneasiness. When the conjunction of the end-concept and the motive is effected, the latter will persist in the satisfactory adjustment of the peripheral organs, so long as the feeling of uneasiness is not eliminated. A thirsty person will not be quieted until he secures a copious drink of water. If, however, the adjustment of the peripheral organs is not up to the expectation and fails to satisfy the inner needs, there are only two ways between which the individual must choose. The first is the unyielding persistence of a dissatisfied motive which insists upon repeatedly trying the adjustment of the organs, until the result is entirely gratifying to it. The second way is the disappearance of the dissatisfied motive itself. Not being able to overcome the difficulties besetting the final adjustment, the motive yields to them in consequence of its weakness.

For instance, I sometimes take a fancy to play at chess and try to learn the game. But after a few vain attempts I soon come to the conclusion that it is not worth my while, and then abandon it altogether. For in this case my motive is not backed by any strong desire arising from higher aspirations. But it is not so with those experts who, spurred by some irresistible impulses, never relax their efforts to master the art.

Speaking of matters of more serious importance, might there

be any artificial method by which the lack of a strong inner impulse can be remedied? In my opinion, this is done by the cultivation of the foundation of will which consists in a harmonious blending of natural inclination and religio-philosophical knowledge. Ethics, which is still in its primary stage, has not yet given any definite name to what I call here the foundation of will. Some call it will-motive and others end-concept. But neither term is quite accurate, for in our active life it cannot be so analyzed. It may appear to be one or the other according to our viewpoint, but its real significance lies not in the analysis, but in the synthesis in which end-concept and motive-feeling work as one. This synthesis cannot properly be called the will, for it is the source from which the will derives its vitality. Scholars have not named this definitely. I sometimes term it the "foundation of the will," but may it more properly be called the "nucleus of personality"? It is well known in biology that the vitality of a cell depends upon its nucleus. When a protozoic cell is cut in two, the nucleus being left entire in one half, this half continues to grow and heals its wound completely; but the other half in which there is no nucleus, dies. In a similar fashion, the nucleus of personality is, on the one hand, an end-concept of spiritual activities of a man, and, on the other hand, their ground-motive constituting the vital principle of his personality.

Now, that which is most essential in building up a strong, noble chaarcter is to nourish this nucleus of personality. When a man loses his hold on it, he must be said to be spiritually dead. Nobody is perfect, and we are all liable to err frequently, but these errors are not to be censured very severely as long as a man is in possession of a strong, healthy, growing nucleus of personality, for he is sure to recover from the wounds temporarily inflicted and will grow perhaps with more energy. As was seen before, the nucleus must have as its constituent element a comprehensive concept such as Mencius's Vast Energy (*Hao jan chih ch'i*), Christian God, Buddhist Amitabha, or ethicist's humanity. And at the same time it must have this universal concept organically coupled with a healthy, pure sentiment, such as Confucian fellow-feeling (*jên*), Christian love, Buddhist mercy (*karuna*), or ethicist's philanthropy.

The man who has these two essentials coöperating in the make-up of his nucleus of personality, is truly to be called great.

The final issue of our spiritual culture turns on the development of this moral nucleus. To a certain degree, it is a matter of predisposition or heredity. But by accelerating religio-philosophical activities in our soul-life, and by having this soul-life coupled with the noblest sentment, and finally by disciplining oneself in its actualization, much can be achieved by a fairly-endowed soul.

To conclude, it is science that furnishes us with the necessary knowledge of dealing with life and things, and makes our conduct accurate and definite and practical; and in this respect science does much toward moral culture. We cannot do very well without it; science and culture must supplement each other. But as to the establishment of the central nucleus of personality on a solid foundation, we must look for religio-philosophical activities which are vigorous and unbiased, while the scientific knowledge which concerns itself with our natural wants and activities may be compared to the protoplasmic matter that surrounds and feeds the nucleus.

YUJIRO MOTORA.

TOKIO, JAPAN.

THE CONCEPTION OF THE SOUL AND THE BELIEF IN RESURRECTION AMONG THE EGYPTIANS.

WHEN students of comparative religion began to collect their data of the several faiths of primitive peoples, they were astonished to find that a belief in the immortality of the soul was all but universal; and there are many scholars who look upon this unanimity as a proof that the idea is inborn in man and that this *consensus gentium,* so called, is a strong argument in favor of its truth.

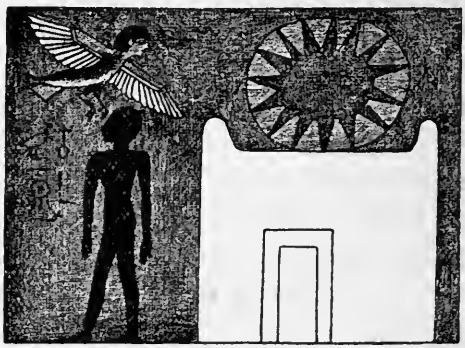
There is a good reason for the prevalence of the belief in immortality, and it is based upon the fact that primitive peoples do not discriminate between dreams and reality. Dreams are real to them, and so if their dead appear to them in dreams, they believe them to be living still.

We must, however, modify our statement, lest we be misunderstood. To say "Savages *believe* in immortality," is, closely considered, wrong. It is not a "belief" with them, not a religious doctrine, nor even a conviction of any moral tenor. To them it is simply a fact of immediate experience.

Savage psychology has been studied in several parts of the globe, and the similarity of its essential features among the different tribes of all continents is remarkable. Indeed, if we consider the logic of primitive man in face of the facts which confront him, we have to understand that to his unsophisticated mind the dead are actually present when they appear in dreams. Savages do not philosophize on the subject, nor do they formulate a *credo.* They see the dead in dreams and visions; they hear their voices; they

converse with them; they consult with them. To question their existence would be as ridiculous to them as to doubt their own being or the actuality of material bodies. What to later generations changes to belief is to them knowledge. Doubt is a creation of incipient civilization, when ideas begin to be "sicklied o'er with the pale cast of thought."

We know of no time when the Egyptians did not believe in immortality, and we may assume that the aborigines as well as the Punt invaders had both some notions of the fate of the soul after death. Their ideas must have been hazy, for in different districts different notions seem to have prevailed, many of which survive in later historical documents. The result is that while all the Egyptians may fairly well be said to have believed in an immortality of



THE KHAIBIT AND THE BA.*

some kind, there are different views, and it is obvious that they have never been systematized into one consistent formula of the Egyptian faith.

We may enumerate many different conceptions of souls, all of which play an important part in the Egyptian religion, and yet we are not informed whether the Egyptians believed in all of them at once, or whether some of them are different names for the same or approximately the same thing, or finally whether we have sometimes to deal with heretical opinions.

The probability is that in some districts the soul was regarded

* From Naville, *Das Thebanische Todtenbuch,* I, plate CIV. — Maspero. *Dawn of Civilization,* p. 108.

as a shadow image, an unsubstantial and idealized shape of the body; in others it was thought to be a bird, a hawk or a phoenix. Later on, it became a human-headed hawk, a mysterious being with wings. Again, it was regarded as a spiritual essence, man's energy and will-power, obviously the product of philosophical reflection. Those who had a vague idea of the significance of the heart-beat looked upon the heart as the seat of the soul, and hence, as the organ of consciousness. All in all, we have no less than nine con-

THE DEAD MAN AND HIS SOUL, THE BA, ON THE GOOD COW HATHOR.*

ceptions of the soul, which occur side by side in the same papyri of the great books of Egypt, among which the Book of the Dead is the most important one.

This mysterious work, the Book of the Dead, is a collection of prayers or incantations, which the soul must recite on its journey to the other world. The name has been given it by modern Egyptologists, because the several chapters of it have been discovered

*From Leemans, *Monuments Egyptiens,* I, III, pl. XII; Maspero, *Dawn of Civilization,* p. 187.

in sarcophagi wrapt up with the dead, but the title is, to say the least, highly inappropriate. The best Egyptian name for it would be, as Budge proposes to translate it, "The Coming Forth by Day," meaning thereby that the soul, in its passage through the underworld, will rise again with renewed life, as the sun, after having set in the West, comes forth again in all his glory in the East. In brief, these prayers are intended for the protection of the soul, and if we had to modernize the name, we ought to call it the "Book of Resurrection."

* * *

The prehistoric inhabitants of Egypt buried their dead in crouched positions with knees drawn up to their faces, on mats

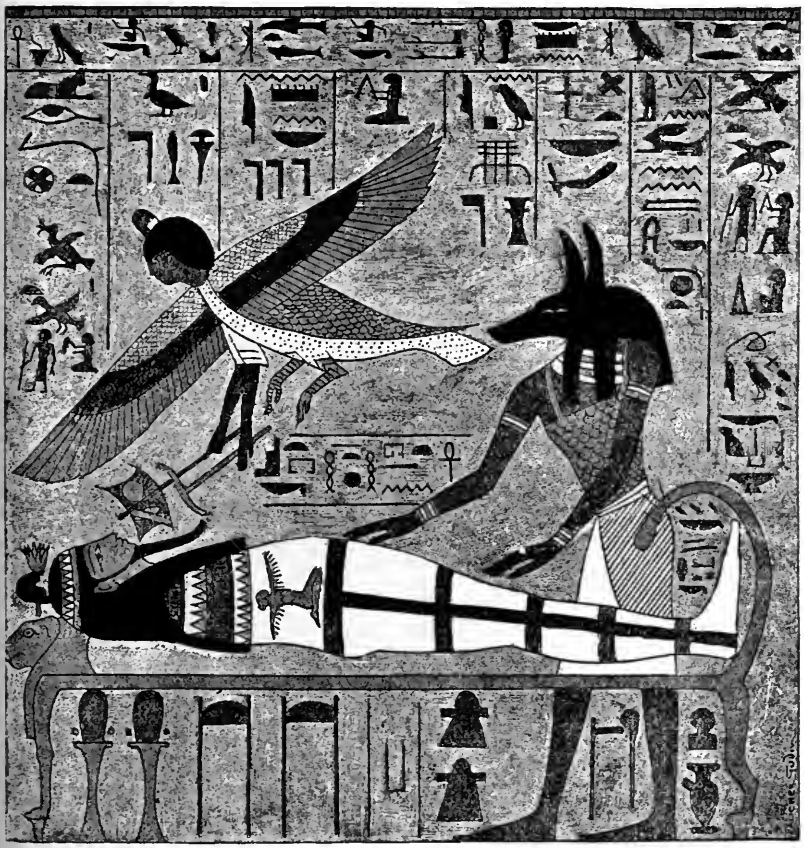
THE SARCOPHAGUS OF THE SCRIBE RA.*
The soul (*ba*) is visiting the body and lays its hands upon the heart of the mummy.

or gazelle skins. There are instances in which the bodies were mutilated, with heads severed from the trunks, and in some cases there are indications of a religious cannibalism. This means that parts of the flesh had been removed for the purpose of being eaten, presumably by the heirs in order to symbolize the transference of the soul of the deceased upon his descendants.

The historical Egyptians, who may have been an entirely new

* From a photograph by Emil Brugsch-Bey. Maspero, *Dawn of Civilization*, p. 199.

race (probably a mixture of the descendants of the Punt invaders with the aborigines), developed a definite system of preserving the bodies by embalming. The reason for this practice must have lain in the belief that the fate of the soul after death depended mainly



OSIRIS ON THE FUNERAL COUCH.*

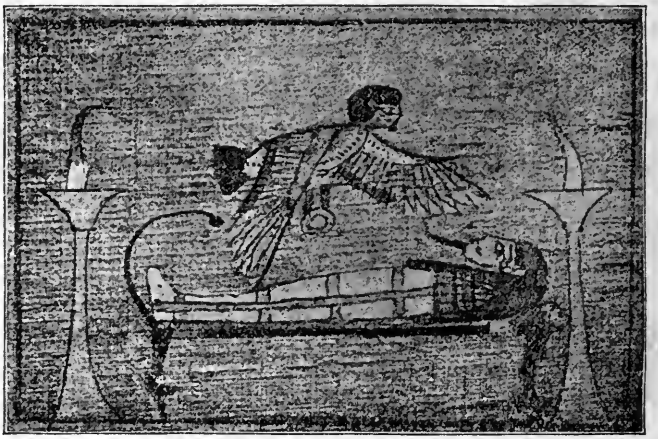
While Anubis prepares the mummy, the soul holds to its nostrils the scepter and the wind-filled sail, the former symbolizing the power of renewal, the latter the breath of life.

on the preservation of the body, and the idea of the significance of the body in connection with the belief in a resurrection has been pre-

* From Rossellini, *Monumenti Civili,* pl. CXXIV, 2; Maspero, *Dawn of Civilization,* p. 179.

served through the history of Egypt. Indeed it has survived in the Christian doctrine of the resurrection of the flesh and is still incorporated in the confession of faith which is recited each Sunday from every orthodox altar, Protestant as well as Greek and Roman Catholic, although actual belief in it is rapidly fading from progressive Christendom.

The ideals that underly the Christian conception of Christ the Saviour, are not foreign to the ancient Egyptians, but the part which Christ plays in Christianity is there ascribed to several deities. First of all he is typified in the god Osiris who, too, had to die after



THE SOUL VISITING THE MUMMY.
(From the Papyrus of Ani.)

he had lived on earth as a man and like unto any other man. Having died, he was embalmed and guided through the under-world by his brother-god Anubis. Anubis accordingly played in this respect the part of Christ not only for Osiris, but for all the dead of Egypt, and we know that among the early Christian Copts, Christ was frequently identified with Anubis. He was the Greek Hermes, who is called by Homer *psychopompos,* leader of souls.

The idea of the soul visiting the body was dear to the Egyptian, for it is represented again and again in papyri, on wall frescoes, and illuminated sarcophagi. The soul's visit to the mummy must

have meant a temporary resuscitation of the dead person, and it was for his benefit that libations and sacrificial meals were offered at the tombs.

* * *

No doubt the Egyptian soul-conception is typically Egyptian. We do not find it in the same shape anywhere else on the surface of the globe. Nevertheless, it is also typically human, and sums up in a matured and cultured form the soul-conception of savage life as it is known to us in Africa, Oceania, North America, and in stray historical records of the primitive people of Europe and Asia.

In spite of the typical peculiarities which confront us in the Egyptian monuments, Egyptian life and Egyptian religion form a

THE MUMMY AT THE TOMB PROTECTED BY ANUBIS.
(From Wiedemann's *Religion of the Ancient Egyptians.*)

definite phase characteristic of a certain stage in the development of mankind. The ingredients which do not go back to the aboriginal inhabitants are partly Lybian, partly Abyssinian, partly Punt Arabic, partly Canaanitish, and a mixture of all these elements with a few incidental ingredients from other countries: Assyria, Phœnicia, and Greece; but the general result is decidedly human, and that is the reason why it still attracts and fascinates us. Moreover, Egyptian views have entered into the life of our present civilization, and in this sense the Egyptians are as much our spiritual ancestors as are the Greeks and the Israelites.

Professor Budge in his recent work on *The Gods of the Egyp-*

tians, characterizes the situation in the Preface (pp. xiv-xvi) as follows:

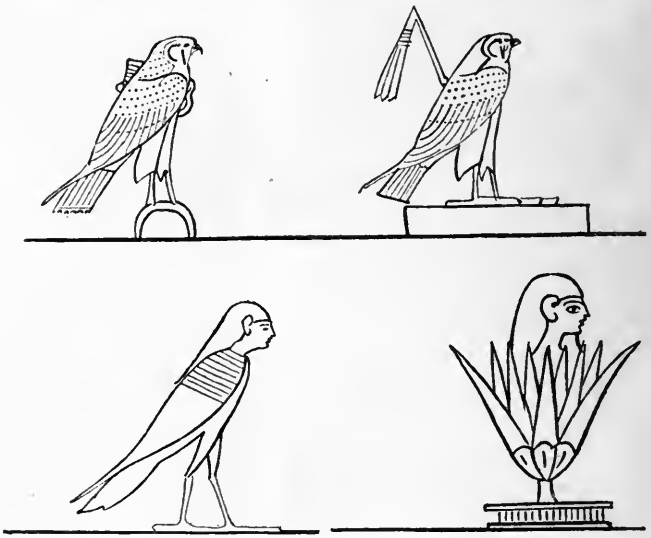
"The cult of Osiris, the dead man deified, and the earliest forms of his worship, were, no doubt, wholly of African origin; these are certainly the oldest elements in the religion of the Dynastic Period, and the most persistent, for Osiris maintained his position as the god and judge of the dead from the Predynastic to the Ptolomaic Period. The Followers of Horus, who brought a solar religion with them into Egypt from the East, never succeeded in dislodging Osiris from his exalted position, and his cult survived undiminished notwithstanding the powerful influence which the priests of Rā, and the worshipers of Amen, and the votaries of Aten respectively exercised throughout the country. The heaven of Osiris was believed to exist in a place where the fields were fertile and well stocked with cattle, and where meat and drink were abundant; the abodes of the blessed were thought to be constructed after the model of the comfortable Egyptian homesteads in which they had lived during life, and the ordinary Egyptian hoped to live in one of these with his wives and parents. On the other hand, the followers of Rā, the sun-god, believed in a heaven of a more spiritual character, and their great hope was to occupy a seat in the boat of the god, and, arrayed in light, to travel whithersoever he went. They wished to become bright and shining spirits, and to live upon the celestial meat and drink upon which he lived; as he was so they hoped to be in every respect. The materialistic heaven of Osiris appealed to the masses of Egypt, and the heaven where Rā lived to the priests of Rā and other solar gods, and to royal and aristocratic families, and to the members of the foreign section of the community who were of Eastern origin.

The various waves of religious thought and feeling, which swept over Egypt during the five thousand years of her history which are known to us, did not seriously disturb the cult of Osiris, for it held out to the people hopes of resurrection and immortality of a character which no other form of religion could give. Secure in these hopes the people regarded the various changes and developments of religious ideas in their country with equanimity and modifications in the public worship of the gods, provided that the religious fasts and processions were not interrupted, moved them but little. Kings and priests from time to time made attempts to absorb the cult of Osiris into religious systems of a solar character, but they failed, and Osiris, the man-god, always triumphed, and at the last, when his cult disappeared before the religion of the Man Christ, the Egyptians who embraced Christianity found that the moral system of the old cult and that of the new religion were so similar, and the promises of resurrection and immortality in each so much alike, that they transferred their allegiance from Osiris to Jesus of Nazareth without

ANUBIS USHERING THE DEAD INTO THE PRESENCE OF OSIRIS.
(After a colored facsimile of a picture in the *Book of the Dead*, by Pleyte.)

difficulty. Moreover, Isis and the child Horus were straightway identified with Mary the Virgin and her Son, and in the apocryphal literature of the first centuries which followed the evangelization of Egypt, several of the legends about Isis and her sorrowful wanderings were made to center round the Mother of Christ. Certain of the attributes of the sister goddesses of Isis were also ascribed to her, and, like the Goddess Neith of Saïs, she was declared to possess perpetual virginity. Certain of the Egyptian Christian Fathers gave to the Virgin the title "Theotokos," or "Mother of God," forgetting, apparently, that it was an exact translation of *neter mut*, a very old and common title of Isis."

The body of man was called *khat*[1], and was represented in hieroglyphics by a dead fish and a perfume bottle, indicating in



FOUR REPRESENTATIONS OF THE SOUL.
(From Lenormant's *Histoire de l'Orient*, III, 269.)

their combination putrid odor. It was also written in a fuller form,[2] which means something subject to decay that can be preserved by mummification. The hope of the Egyptians for immortality being closely affiliated to the idea of the restitution of the body, they were bent on preserving its form, which gradually led to the practice of mummification.

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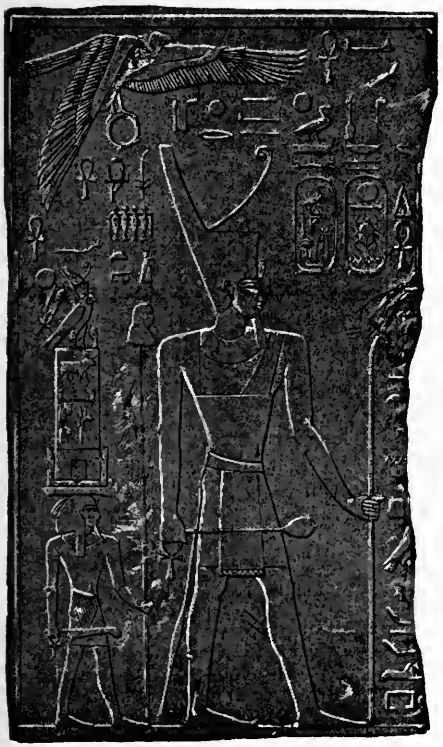
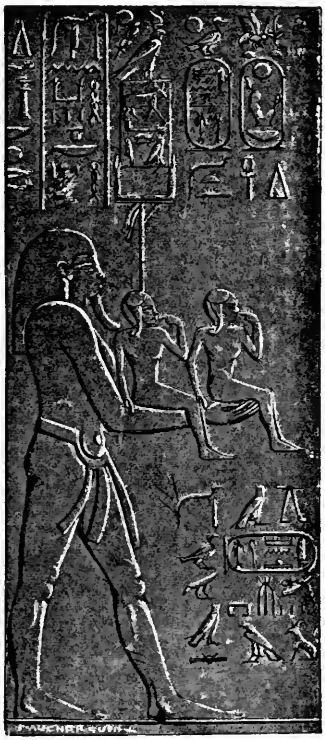
[1] 

[2] 

The tomb was built to be the residence of the mummy for all time to come, and was hence called "the eternal house," *pa t'etta;* and we must assume that there, at appointed seasons, comparable to our All Souls' Day, memorial services were held with libations, food-offering, and incense-burning.[3]



KING THUTMOSIS II ACCOMPANIED BY HIS DOUBLE.*



A ROYAL INFANT AND HIS DOUBLE.†

[3] The priest is called *ker heb*  which signifies one who conducts the festivals at the tomb *pa t'etta,* the everlasting house.

* The king belongs to the XVIIIth dynasty; his double carries on his head the king's *ka*-name. (From Arundale-Bonomi-Birch, *Gallery of Antiquities from the Br. M.*, pl. 31. Maspero, *Dawn of Civilization,* p. 261.)

† This bas-relief in the temple of Luxor represents the birth of Amenothes III. From a photograph by Gayet; Maspero, *Dawn of Civilization,* 259.

The soul is represented in many ways, either as a bird,[4] or as a hawk,[5] or, most commonly, as a human-headed hawk,[6] called *ba*.

The *ba* represents mainly the functions of consciousness and is supposed to visit the tomb from time to time, and enter into the *khat,* the perishable body. In fact, the purpose of the *khat's* mummification is simply to make it possible for the soul to enter again into its body.

Another conception of the soul is the idealized shadow of a man, called "the shade," which in hieroglyphics is called *khaibit.*[7]

A typical Egyptian view of the soul is a description of the sentiment that throbs in our breast—that part of the body that lies between the arms and finds a vivid expression in the use of our hands. It is called *ka* and is pictured in hieroglyphics by two outstretched arms,[8] which is commonly translated "double," for it is supposed to be the ethereal shape of the man and represents the personality as a kind of astral body, which is supposed to be in possession of all attributes of the man to whom it belongs. The translation "double" is in so far justified as the monuments actually represent the *ka* as a second and an additional figure, which, at certain times and certain places, is deemed necessary to add to the representation of a man. We see, for instance, the picture of a new-born prince in which his double, his idealized self, is represented right behind him, bearing a special name, the so-called *ka*-name of the future king.[9]

The conscience of the man, the organ of his moral life, is supposed to have its seat in the heart, hence *ab,* the heart, is the name of the soul in a similar sense as even to-day we would use the word heart. It is written in hieroglyphics in two ways.[10]

The spirit of a man is called *khu,* represented as an ibis,[11] the emblem of Thoth, the scribe of the gods, the mediator between

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4  5  6  7 8  Coptic ka

[9] The *ka*-name is indicated by resting on the hieroglyph *ka* and having on top the hawk of Hor.

10  or  11 

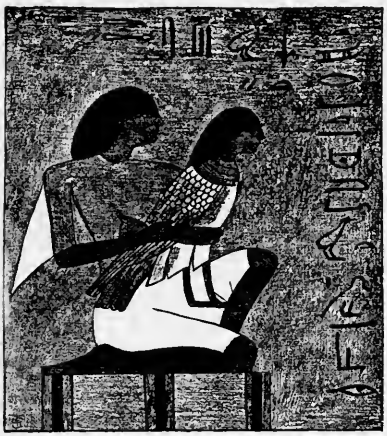
man and the celestials, the protector of science and the divine incarnation of the Word, the Logos—a conception which plays an important part in Egyptian theology.

Another way of representing the soul is as the vital force, called *sekhem*, represented in hieroglyphics by a symbol that seems to be a fan, representing breath, vitality, and energy.[12]

Finally, the personality of man is covered by all that appertains to his name, and thus it is represented in Egyptian by the hieroglyph *ren*,[13] which means "name."

The body when mummified is called *sahu*[14] and is pictured as

RECEIVING THE BREATH OF LIFE.*



THE DEAD MAN AND HIS SOUL.†

an upright mummy.[15] When the deceased has been justified before the judgment throne of Osiris, and when his heart has been returned to him, he is regarded as having received the benediction of truth and becomes *maa-kheru*,[16] a word which finds an equivalent in the German *selig*, and is translated in English, "triumphant,"

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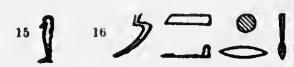
12  13  14  15 16 

* From Naville, *Das Aegyptische Todtenbuch*, I, pl. LXIX. Maspero, *Dawn of Civilization*, p. 217.

† From Guieyesse-Lefébure, *Le Papyrus de Soutimès*, pl. VII.—Maspero, *Dawn of Civilization*, p. 183.

"justified," "victorious," or "sainted." When the body has been sainted, it is supposed to be in possession of a spiritual body; it becomes luminous and is possessed of an incorruptible *sahu*, a transfigured body.

Man's resurrection soul is characterized by the bird *bennu*,[17] the Egyptian phœnix.

The idea of resurrection has always been the main doctrine of the religious life of Egypt. Here all longings find their satis-

WEIGHING THE HEART.

Anubis adjusts the tongue of the balance the construction of which is noteworthy. A feather, the emblem of truth, serves him for a weight. (From the Papyrus of Ani.)

faction, here all interests converge, and here all hopes are centered. When a mummy is removed in a boat to its eternal resting-place, a near relation of the deceased stands in the bow of the boat and calls to the helmsman:

"Steer to the West, to the land of the justified.
The women of the boat weep much, very much.

[17] 

In peace, in peace to the West, thou blessed one, go in peace!

. . . . . .

When time has become eternity then shall we see thee again.
For, behold, thou goest away to that country in which all are equal."[18]

* * *

All the amulets which were worn by the living or were placed upon the mummy to accompany the dead to the other world, are intended to serve the purpose of insuring a happy resurrection on the day when time will become eternity.

The most common symbols used are the *ankh,*[19] called also the "key of life," or *crux ansata* (the handle cross), or the Egyptian cross. It means "life" and is seen in the hands of the gods as an emblem of their divinity.

Another symbol is the *tet* or *ded,*[20] the backbone of Osiris, a symbol of stability.

A third symbol is the scepter *usr,*[21] meaning "strength," having on top a hook not unlike the head of the oryx (an animal sacred to Set) and ending below in a horse-shoe form.

Still another symbol is the feather[22] of truth worn by the goddess Maat on her head. It means "purity," "faithfulness," and "justification."

The vulture,[23] representing "Mother Isis," was placed on the neck of the mummy on the day of the funeral.

The *uræus* (snake),[24] like the vulture, is a symbol of Isis, the two being sometimes combined. The former represents Upper Egypt and is frequently painted with outstretched wings as hovering over the king; the latter received particular veneration in the Delta. Both were also worshiped as special goddesses, the vulture under the name Nekhbit, the *uræus* (snake) under the name Uazit.

The buckle or tie, called *thet,*[25] is one of the commonest amulets found in the graves. It is commonly made of red jasper, cornelian, porphery, red glass, red faience, or sycamore wood; and we are

[18] Ermann, *Life in Ancient Egypt,* chapter on "The Dead," pp. 320-321.

19  20  21  22  23  24  25 

told that the red color represents the blood of Isis. It is placed on the neck of the dead.

The symbol *nefer,*[26] originally representing the heart with the trachea, but later on interpreted as a lute, means beauty, gladness, joy, and good luck. It is frequently trebled so as to mean "thrice blest."

The symbolical eye, *utat,* made of glazed faience, wood, granite, haematite, cornelian, lapis lazuli, or precious metals, is shaped either as the right[27] or the left[28] eye or both in combination. Sometimes the right eye is called the sun and the left eye the moon; and in other passages the former is explained as the eye of Hor in the south, meaning the sun in day-time, and the left eye, the eye of Hor in the north, meaning the moon during the night. The eyes of Hor are endangered by Set but are known to be always victorious. Frequently they bear the inscription *uza,* i.e., "prosperous" or "hale," and the souls of the dead were believed to be safe under their protection.

In the Book of the Dead, the *utats,* the eyes of Hor, are painted with wings and human legs.

The crook *hek*[29] signifies the care that the gods take of mortals, and its use continues in the Christian Church as an emblem of episcopal responsibility.

Other symbols representing royalty are the white crown of the south, *het,*[30] the red crown of the north, *tesher,*[31] and the double crown[32] of both Upper and Lower Egypt, called in later times *pschent.*

The scarab, *kheper,*[33] the Egyptian dung-beetle (*ateuchus sacer*) was considered with special awe, and it meant generation or regeneration, transformation, resurrection, self-creative power, and immortal life.

The Egyptians had observed the scarab roll a little mud ball and hide it in a safe place. In due time the young beetles came out of this mysterious ball, and it was assumed that the scarab had no sex, but that it possessed the power of regenerating itself.

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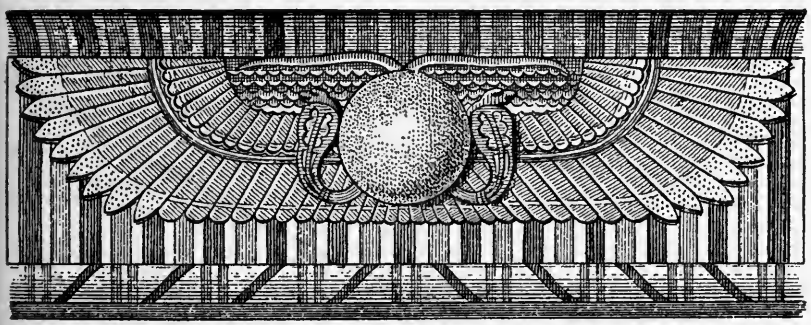
26  27  28  29  30 31 32  33 

The heart, *ab*,[34] is also considered as an important amulet, and Mr. Budge quotes one instance in which a heart amulet bears, on one side, the inscription of the name of the goddess Neit, a picture of the bird *Bennu*, and the legend *Nuk ba Khepara*, that is, "I am the soul of life eternal"; and, on the other side, the chapter on "The Heart" quoted from the Book of the Dead.

We must mention also the symbol *hefnu*, which means "a myriad" and is represented as a frog,[35], being the emblem of the goddess Hekt, a form of Hathor, wife of the god Khnemu. Hekt also was believed to have a favorable influence upon man's resurrection. Even as late as in the Hellenistic period, and still in the Roman period of Egyptian history, we find frogs on lamps, and in



THE SUN OF RIGHTEOUSNESS WITH HEALING IN HIS WINGS.

one instance the frog bears the inscription in Greek, "I am the resurrection."[36]

An enumeration of Egyptian symbols would not be complete without finally mentioning the emblem of the winged disk, which appears over every temple entrance in Egypt. There is a legend about its introduction, which relates that Râ Harmakhis, "the Ever-living Sun-god," was confronted with the enemies of the gods of the Egyptians, and his son, Hor Behudti, "Hor as a sparrow hawk," struck terror among the host of Set, by assuming the overawing form of a winged disk.

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[34]  [35] [36] ΕΓΩ ΕΙΜΙ ΑΝΑΣΤΑΣΙΣ.

Thoth, the scribe of the gods, says:

"'The darter of rays who came forth from Râ, he conquered the enemies in his form [of a winged sun-disk]; from this day he shall be called the Darter of Rays who emergeth from the horizon.'

"Hamarkhis spake unto Thoth:

"'Set this sun at every place at which I tarry, at the places of the gods in the South Land, at the places of the gods in the North Land, [at the places of the gods] in the Underworld, that it may banish evil from their vicinity.'

"Thoth set this form at every spot, at every place, how many soever there were, at which any gods or goddesses might be. And this is the winged sun-disk which is over the sanctuaries of all the gods and goddesses in Egypt, for their sanctuary is also that of Horbehûdti."[37]

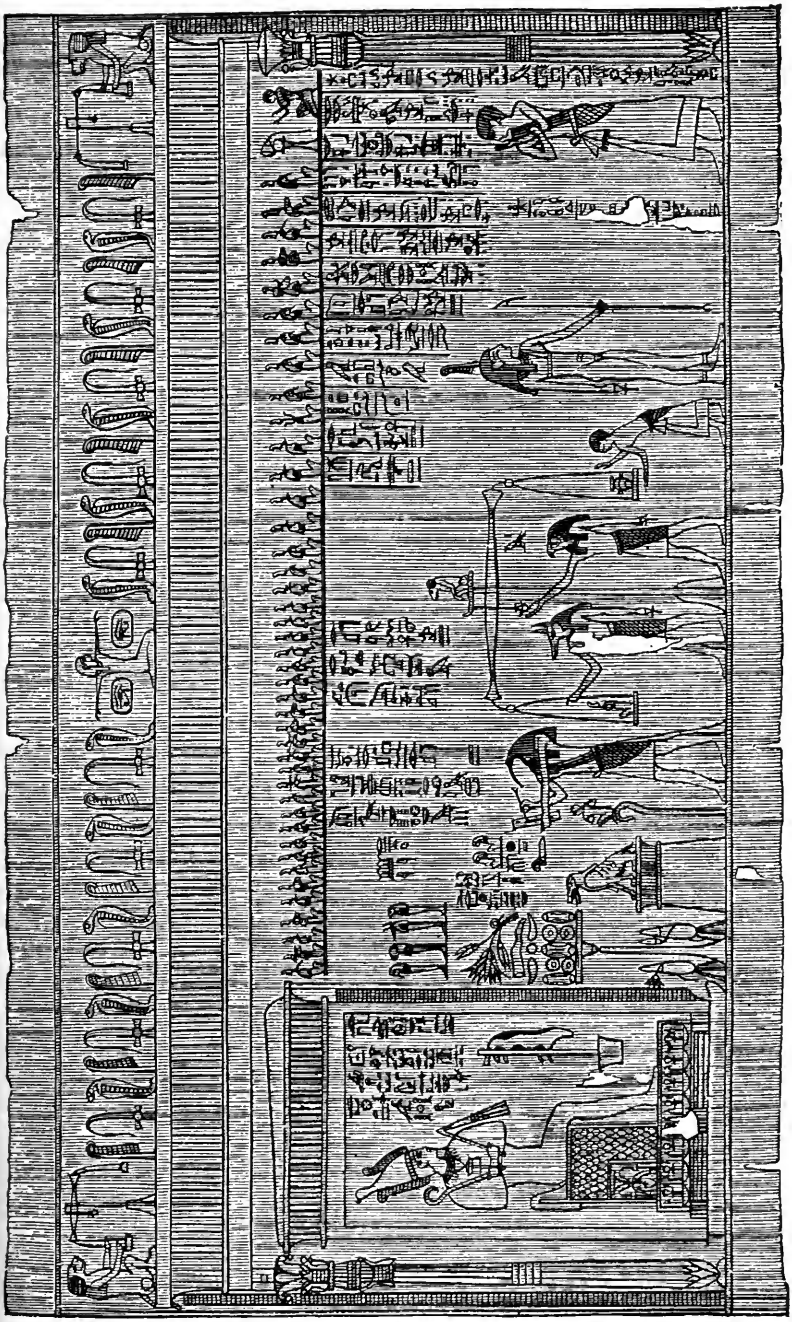
The winged disk, accordingly, as related in this legend, "banishes evil from the temples." It is the emblem of rescue from enemies and of salvation. The same emblem is used in other Oriental countries, in Arabia, Phœnicia, Syria, and especially in Babylonia, and we must assume that even the Israelites had no objection to it. At any rate, we find an allusion to it in the prophet Malachi (iv. 2), who apparently refers to this emblem of the deity, when he speaks of Yahveh as the "Sun of righteousness....with healing in his wings."

* * *

A prominent feature was the effect which the belief in immortality had on Egyptian morals. The soul could pass easily in its migrations through the shadows of the under-world if it had not committed any offense against either the gods or its fellow beings. It had to know the magic spells that were required to overcome the powers of darkness, and when finally it reached the hall of truth, the heart of the deceased was weighed in the balance with truth, which is represented pictorially by a feather.

The deceased makes a negative confession to forty-two judges of the sins which he has abstained from committing, and we quote

[37] Alfred Wiedemann, *Religion of the Ancient Egyptians*, p. 74.



THE HALL OF TRUTH.

the following examples from the Papyrus of Nu (Budge, *Egyptian Ideas of the Future Life,* pp. 130-134):

"I have not done iniquity.—I have not committed theft.—I have not made light the bushel.—I have not acted deceitfully.—I have not uttered falsehood.—I have not uttered vile words.—I have not eaten my heart (i. e. lost my temper and become angry).—I have not pried into matters to make mischief.—I have not set my mouth in motion against any man.—I have not polluted myself.—I have not made any man to be afraid.—I have not made myself deaf unto the words of right and truth.—I have not made another person to weep.—I have not behaved with insolence.—I have not increased my wealth except by means of such things as are mine own possessions."

By his justification he becomes identified with Osiris who now lives in him as a power of salvation. We quote from the Papyrus of Ani (*Book of the Dead,* Vol. I, p. 29, Chicago, The Open Court Publishing Co.), where Horus, the son of Isis, the avenger of his father Osiris, and the saviour of mankind, addresses Osiris Un-nefer:

"I have come to thee, O Un-nefer, and I have brought unto thee the Osiris Ani. His heart is [found] righteous, and it hath come forth from the balance; it hath not sinned against any god or any goddess. Thoth hath weighed it according to the decree pronounced unto him by the company of the gods; and it is most true and righteous. Grant that cakes and ale may be given unto him, and let him appear in the presence of the god Osiris; and let him be like unto the followers of Horus for ever and for ever."

Such in main outline are the leading facts in the Egyptian conception of the soul and its life after death, and closely considered they are but the natural outcome of those views which can be observed in all the prehistoric nations of the world; but in the case of Egypt they are reduced to a clear conception, symbolized by appropriate emblems, stated in religious doctrines, systematically applied to practical life in the shape of moral maxims, and pictured graphically in religious art.

EDITOR.

MAGIC SQUARES.

MAGIC squares are of themselves only mathematical curios, but they involve principles whose unfolding should lead the thoughtful mind to a higher conception of the wonderful laws of symphony and order which govern the science of numbers.

The earliest record of a magic square is found in Chinese literature dated about A. D. 1125,* but since then this interesting subject has been more or less studied and developed by mathematicians of all nations.

It is the writer's purpose to present some general and comprehensive methods for constructing magic squares which he believes to be original, and also to briefly review what is commonly known concerning their construction.

THE GENERAL QUALITIES AND CHARACTERISTICS OF MAGIC SQUARES.

A magic square consists of a series of numbers arranged in quadratic form so that the sum of each vertical, horizontal and corner diagonal column is the same amount. These squares can be made with either an odd or an even number of cells, but as odd squares are constructed by methods which differ from those that govern the formation of even squares, the two classes will be considered under separate headings.

ODD MAGIC SQUARES.

In these squares it is not only requisite that the sum of all columns shall be the same amount, but also that the sum of any

* See p. 19 of *Chinese Philosophy* by Dr. Paul Carus.

two numbers that are geometrically equidistant from the center number shall equal twice that number. Unless these conditions are fulfilled, the square cannot be considered perfect.

The square of 3×3 shown in Fig. 1 covers the smallest aggregation of numbers that is capable of magic square arrangement, and it is also the only possible arrangement of nine different numbers, relatively to each other, which fulfills the required conditions. It will be seen that the sum of each of the three vertical, the three horizontal, and the two corner diagonal columns in this square is 15, making in all eight columns having that total: also that the sum of any two opposite numbers is 10, which is twice the center number. It is therefore a perfect square of 3×3.

The next largest odd magic square is that of 5×5, and there are a great many different arrangements of twenty-five numbers,

8	1	6
3	5	7
4	9	2

Totals = 15.

Fig 1.

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

Totals = 65.

Fig. 2.

which will show perfect results, each arrangement being the production of a different constructive method. Fig. 2. illustrates what is probably the oldest and best known arrangement of this square.

The sum of each of the five horizontal, the five vertical, and the two corner diagonal columns is 65, and the sum of any two numbers which are geometrically equidistant from the center number is 26, or twice the center number.

In order to intelligently follow the rule used in the construction of this square it may be conceived that its upper and lower edges are bent around backwards, and united to form a horizontal cylinder with the numbers on the outside, the lower line of figures thus coming next in order to the upper line. It may also be conceived that the square is bent around backwards in a direction at right

angles to that which was last considered, so that it forms a vertical cylinder with the extreme right and left hand columns adjacent to each other.

An understanding of this simple conception will assist the student to follow the new methods of building odd magic squares that are to be described, all of these methods being based on a right or left hand diagonal formation.

Referring to Fig. 2, it will be seen that the square is started by writing unity in the center cell of the upper row, the consecutive numbers proceeding diagonally therefrom in a right hand direction. Using the conception of a horizontal cylinder, 2 will be located in the lower row, followed by 3 in the next upper cell to the right. Here the formation of the vertical cylinder being conceived the next upper square will be where 4 is written, then 5; further progress being here blocked by 1 which already occupies the next upper cell in diagonal order.

When a block thus occurs in the regular spacing (which will be at every fifth number in a 5×5 square) the next number must in this case be written in the cell vertically below the one last filled, so that 6 is written in the cell below 5, and the right hand diagonal order is then continued in cells occupied by 7 and 8. Here the horizontal cylinder is imagined, showing the location of 9, then the conception of the vertical cylinder will indicate the location of 10; further regular progression being here once more blocked by 6, so 11 is written under 10 and the diagonal order continued to 15. A mental picture of the combination of vertical and horizontal cylinders will here show that further diagonal progress is blocked by 11, so 16 is written under 15. The vertical cylinder will then indicate the cell in which 17 must be located, and the horizontal cylinder will show the next cell diagonally upwards to the right to be occupied by 18, and so on until the final number 25 is reached and the square completed.

Fig. 3 illustrates the development of a 7×7 square constructed according to the preceding method, and the student is advised to follow the sequence of the numbers to impress the rule on his memory. A variation of the last method is shown in Fig. 4, illustrating

another 7×7 square. In this example 1 is placed in the next cell horizontally to the right of the center cell, and the consecutive numbers proceed diagonally upward therefrom, as before, in a right hand direction until a block occurs. The next number is then written in the second cell horizontally to the right of the last cell filled (instead of the cell below as in previous examples) and the upward diagonal order is resumed until the next block occurs.

30	39	48	1	10	19	28
38	47	7	9	18	27	29
46	6	8	17	26	35	37
5	14	16	25	34	36	45
13	15	24	33	42	44	4
21	23	32	41	43	3	12
22	31	40	49	2	11	20

Fig. 3.

4	29	12	37	20	45	28
35	11	36	19	44	27	3
10	42	18	43	26	2	34
41	17	49	25	1	33	9
16	48	24	7	32	8	40
47	23	6	31	14	39	15
22	5	30	13	38	21	46

Totals = 175.

Fig. 4.

10	18	1	14	22
11	24	7	20	3
17	5	13	21	9
23	6	19	2	15
4	12	25	8	16

Totals = 65.

Fig. 5.

Then two cells to the right again, and regular diagonal order continued, and so on until all the cells are filled.

The preceding examples may be again varied by writing the numbers in left hand instead of right hand diagonal sequence, making use of the same spacing of numbers as before when blocks occur in the regular sequence of construction.

We now come to a series of very interesting methods for building odd magic squares which involve the use of the knight's move in chess, and it is worthy of note that the squares formed by these methods possess curious characteristics in addition to those

previously referred to. To chess-players the knight's move will require no comment, but for those who are not familiar with this game it may be explained as a move of two squares straight forward in any direction and one square to either right or left.

The magic square of 5×5 illustrated in Fig. 5 is started by placing 1 in the center cell of the upper row, and the knight's move employed in its construction will be two cells upward and one cell to the right.

Using the idea of the horizontal cylinder 2 must be written in the second line from the bottom, as shown, and then 3 in the second line from the top. Now conceiving a combination of the horizontal and vertical cylinders, the next move will locate 4 in the extreme lower left hand corner, and then 5 in the middle row. We now find that the next move is blocked by one, so 6 is written below 5, and the knight's moves are then continued, and so on until the last number, 25, is written in the middle cell of the lower line, and the square is thus completed.

In common with the odd magic squares which were previously described, it will be found that in this square the sum of each of the five horizontal, the five perpendicular, and the two corner diagonal columns is 65, also that the sum of any two numbers that are geometrically equidistant from the center is 26, or twice the number in the center cell, thus filling all the general qualifications of a perfect square.

In addition, however, to these characteristics it will be noted that each spiral row of figures around the horizontal and vertical cylinders traced either right handed or left handed also amounts to 65. In the vertical cylinder, there are five right hand, and five left hand spirals, two of which form the two corner diagonal columns across the square, leaving eight new combinations. The same number of combinations will also be found in the horizontal cylinder. Counting therefore five horizontal columns, five vertical columns, two corner diagonal columns, and sixteen right and left hand spiral columns, there will be found in all twenty-eight columns each of which will sum up to 65, whereas in either of the 5×5

squares previously considered there will be found only twelve columns that will amount to that number.

This method of construction is subject to a number of variations. For example, the knight's move may be upwards and to the left hand instead of to the right, or it may be made downwards and either to the right or left hand, and also in other directions. There are in fact eight different ways in which the knight's move may be started from the center cell in the upper line. Six of these moves are indicated by figure 2's in different cells of Fig. 6, and each of these moves if continued in its own direction, varied by regular breaks as before described, will produce a different but perfect square. The remaining two possible knight's moves, indicated by cyphers, will not produce perfect squares.

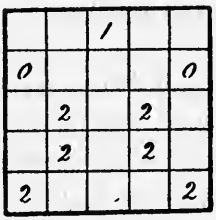


Fig. 6.

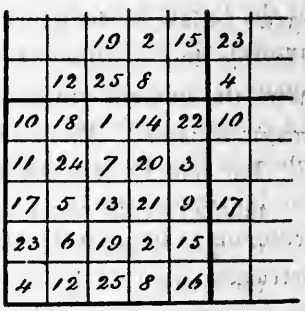


Fig. 7.

It may here be desirable to explain another method for locating numbers in their proper cells which some may prefer to that which involves the conception of the double cylinder. This method consists in constructing parts of auxiliary squares around two or more sides of the main square, and temporarily writing the numbers in the cells of these auxiliary squares when their regular placing carries them outside the limits of the main square. The temporary location of these numbers in the cells of the auxiliary squares will then indicate into which cells of the main square they must be permanently transferred.

Fig. 7 shows a 5×5 main square with parts of three auxiliary

squares, and the main square will be built up in the same way as Fig. 5.

Starting with 1 in the center of the top line, the first knight's move of two cells upwards and one to the right takes 2 across the top margin of the main square into the second cell of the second line from the bottom in one of the auxiliary squares, so 2 must be transferred to the same relative position in the main square. Starting again from 2 in the main square, the next move places 3 within the main square, but 4 goes out of it into the lower left hand corner of an auxiliary square, from which it must be transferred to the same location in the main square, and so on throughout.

The method last described and also the conception of the double cylinders may be considered simply as aids to the beginner. With a little practice the student will be able to select the proper cells in the square as fast as the figures can be written therein.

Having thus explained certain specific and novel lines of construction, the general principles governing the development of all odd magic squares by these methods may now be formulated.

1. The center cell in the square must always contain the middle number of the series of numbers used, i. e., a number which is equal to one half the sum of the first and last numbers of the series.
2. No perfect magic square can therefore be started from its center cell, but it may be started from any cell other than the center one.
3. With certain specific exceptions which will be referred to later on, odd magic squares may be constructed by either right or left hand diagonal sequence, or by a number of so-called knight's moves, varied in all cases by periodical and well defined departures from normal spacing.
4. The directions and dimensions of these departures from normal spacing, or "break moves," as they may be termed, are governed by the relative spacing of cells occupied by the first and last numbers of the series, and may be determined as follows:

RULE: Place the first number of the series in any desired cell (excepting the center one) and the last number of the series in the cell which is geometrically opposite to the cell containing the first number. The relative spacing of these two cells must then be repeated whenever a block occurs in the regular progression.

EXAMPLES.

Using a blank square of 5×5, 1 may be written in the middle cell of the upper line. The geometrically opposite cell to this being the middle cell in the lower line, 25 must be written therein. 1 will therefore be located four cells above in the middle vertical column, or what is the same thing, and easier to follow, one cell below 25. When, therefore, a square of 5×5 is commenced with the first number in the middle cell of the upper line, the break move will *always* be one cell downwards, irrespective of the method of regular

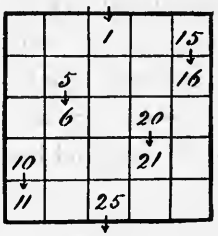


Fig. 8.

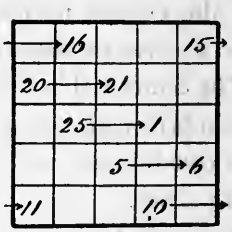


Fig. 9.

advance. Fig. 8 shows the break moves in a 5×5 square as above described using a right hand upward diagonal advance.

Again using a blank 5×5 square, 1 may be written in the cell immediately to the right of the center cell, bringing 25 into the cell to the left of the center cell. The break moves in this case will therefore be two cells to the right of the last cell occupied, irrespective of the method used for regular advance. Fig. 9 illustrates the break moves in the above case, when a right hand upward diagonal advance is used. The positions of these break moves in the square will naturally vary with the method of advance, but the spacing of the moves themselves will remain unchanged.

NOTE: The foregoing break moves were previously described in several specific examples (See Figs. 1, 2, 3, 4, and 5) and the student will now observe how they agree with the general rule.

Once more using a blank square of 5×5, 1 may be written in the upper left hand corner and 25 in the lower right hand corner. 1 will then occupy a position four cells removed from 25 in a left hand upward diagonal, or what is the same thing and easier to follow, the next cell in a right hand downward diagonal. This will therefore be the break move whenever a block occurs in the regular spacing. (See Fig. 10.)

As a final example we will write 1 in the second cell from the left in the upper line of a 5×5 square, which calls for the placing

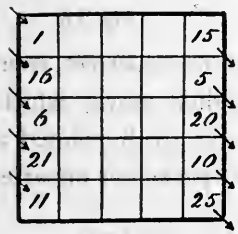


Fig. 10.

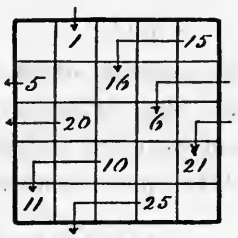


Fig. 11.

of 25 in the second square from the right in the lower line. The place relation between 25 and 1 may then be described by a knight's move of two cells to the left and one cell downwards, and this must be the break move whenever a block occurs in the regular spacing. (See Fig. 11.)

As before stated odd magic squares may be commenced in any cell excepting the center one, and perfect squares may be built up from such commencements by a great variety of regular moves, such as right hand diagonal sequence, upwards or downwards, left hand diagonal sequence upwards or downwards, or a number of knight's moves in various directions. There are four possible moves from each cell in diagonal sequence, and eight possible moves from each cell by the knight's move. The greater number of these moves

will produce perfect magic squares, but there will be found certain exceptions which can be shown most readily by diagrams.

Fig. 12 is a 5×5 square in which the pointed arrow heads indicate the directions of diagonal sequence by which perfect squares may be constructed, while the blunt arrow heads show the directions

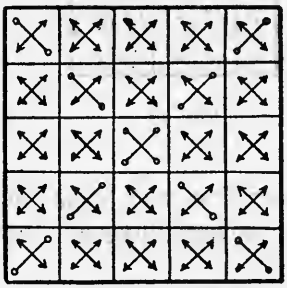


Fig. 12.

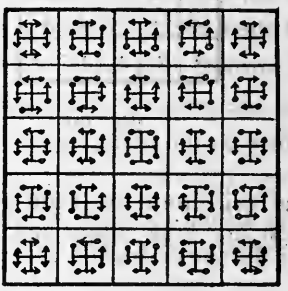


Fig. 13.

of diagonal sequence which will lead to imperfect results. Fig. 13 illustrates the various *normal* knight's moves which may be started from each cell and also indicates with pointed and blunt arrow heads the moves which will lead to perfect or imperfect results.

EXAMPLES OF 5×5 MAGIC SQUARES.

Figs. 14, 15, and 16 show three 5×5 squares, each having 1 in the upper left hand corner cell and 25 in the lower right hand corner cell, and being constructed respectively with a right hand

1	17	8	24	15
16	7	23	14	5
6	22	13	4	20
21	12	3	19	10
11	2	18	9	25

Fig. 14.

1	21	16	11	6
12	7	2	22	17
23	18	13	8	3
9	4	24	19	14
20	15	10	5	25

Fig. 15.

1	11	21	6	16
22	7	17	2	12
18	3	13	23	8
14	24	9	19	4
10	20	5	15	25

Fig. 16.

upward diagonal sequence and right and left hand horizontal knight's moves, the break move being necessarily the same in each example. (See Fig. 10.)

Figs. 17, 18, 19, and 20 show four 5×5 squares, each having 1 in the second cell from the left in the upper line and 25 in the

8	1	24	17	15
5	23	16	14	7
22	20	13	6	4
19	12	10	3	21
11	9	2	25	18

Fig. 17.

15	1	17	8	24
23	14	5	16	7
6	22	13	4	20
19	10	21	12	3
2	18	9	25	11

Fig. 18.

second cell from the right in the lower line, and being built up respectively with right and left hand upward diagonal sequence

22	1	10	14	18
11	20	24	3	7
5	9	13	17	21
19	23	2	6	15
8	12	16	25	4

Fig. 19.

23	1	9	12	20
15	18	21	4	7
2	10	13	16	24
19	22	5	8	11
6	14	17	25	3

Fig. 20.

and upward right and downward left hand knight's moves, and with similar break moves in each example. (See Fig. 11.)

18	10	22	14	1
11	3	20	7	24
9	21	13	5	17
2	19	6	23	15
25	12	4	16	8

Fig. 21.

9	12	20	23	1
18	21	4	7	15
2	10	13	16	24
11	19	22	5	8
25	3	6	14	17

Fig. 22.

12	23	9	20	1
4	15	21	7	18
16	2	13	24	10
8	19	5	11	22
25	6	17	3	14

Fig. 23.

Figs. 21, 22, and 23 illustrate three 5×5 squares, each having 1 in the upper right hand corner and 25 in the lower left hand

corner, and being built up respectively with upward and downward right hand normal knight's moves, and a downward right hand elongated knight's move.

For the sake of simplicity these examples have been shown in 5×5 squares, but the rules will naturally apply to all sizes of odd magic squares by using the appropriate numbers. The explanations have also been given at some length because they cover general and comprehensive methods, a good understanding of which will make the student a master of the entire subject of odd magic squares.

It is clear that no special significance can be attached to the so-called knight's move, *per se,* as applied to the construction of magic squares, it being only one of many methods of regular spacing, all of which will produce equivalent results. For example, the 3×3 square shown in Fig. 1 may be said to be built up by a succession of abbreviated knight's moves of one cell to the right and one cell upwards. Squares illustrated in Figs. 2, 3, and 4 are also constructed by this abbreviated knight's move, but the square illustrated in Fig. 5 is built up by the normal knight's move.

80	58	45	23	1	69	47	34	12
9	68	46	33	11	79	57	44	22
10	78	56	43	21	8	67	54	32
20	7	66	53	31	18	77	55	42
30	17	76	63	41	19	6	65	52
40	27	5	64	51	29	16	75	62
50	28	15	74	61	39	26	4	72
60	38	25	3	71	49	36	14	73
70	48	35	13	81	59	37	24	2

Totals = 369.

Fig. 24.

It is equally easy to construct squares by means of an elongated knight's move, say, four cells to the right and one cell upwards as shown in Fig. 24, or by a move consisting of two cells to the right and two cells downwards, as shown in Fig. 25, the latter being

equivalent to a right hand downward diagonal sequence wherein alternate cells are consecutively filled.

There are in fact almost innumerable combinations of moves by which perfect odd magic squares may be constructed.

39	34	20	15	1	77	72	58	53
49	44	30	25	11	6	73	68	63
59	54	40	35	21	16	2	78	64
69	55	50	45	31	26	12	7	74
79	65	60	46	41	36	22	17	3
8	75	70	56	51	37	32	27	13
18	4	80	66	61	47	42	28	23
19	14	9	76	71	57	52	38	33
29	24	10	5	81	67	62	48	43

Totals = 369.

Fig. 25.

The foregoing methods for building odd magic squares by a continuous process, involving the regular spacing of consecutive numbers varied by different well defined break moves is believed to be new and original with the writer, but other methods of construction have been known for many years.

One of the most interesting of these older methods involves the use of two or more primary squares, the sums of numbers in similarly located cells of which constitute the correct numbers for transfer into the corresponding cells of the magic square that is to be constructed therefrom.

This method has been ascribed primarily to De la Hire but has been more recently improved by Prof. Scheffler.

It may be simply illustrated by the construction of a few 5×5 squares as examples. Figs. 26 and 27 show two simple primary squares in which the numbers 1 to 5 are so arranged that like numbers occur once and only once in similarly placed cells in the two squares; also that pairs of unlike numbers are not repeated in the same order in any similarly placed cells. Thus, 5 occupies the extreme right hand cell in the lower line of each square, but this com-

bination does not occur in any of the other cells. So also in Fig. 27 3 occupies the extreme right hand cell in the upper line, and in Fig. 26 this cell contains 5. No other cell, however, in Fig. 27 that contains 3 corresponds in position with a cell in 26 that contains 5. Leaving the numbers in Fig. 26 unaltered, the numbers in Fig. 27 must now be changed to their respective key numbers, thus producing the key square shown in Fig. 28. By adding the cell numbers of the primary square Fig. 26 to the corresponding cell numbers

Prime numbers,. . . 1, 2, 3, 4, 5.
Key numbers,. . . . . 0, 5, 10, 15, 20.

1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5

Fig. 26.

1	4	2	5	3
4	2	5	3	1
2	5	3	1	4
5	3	1	4	2
3	1	4	2	5

Fig. 27.

0	15	5	20	10
15	5	20	10	0
5	20	10	0	15
20	10	0	15	5
10	0	15	5	20

Fig. 28.

1	17	8	24	15
16	7	23	14	5
6	22	13	4	20
21	12	3	19	10
11	2	18	9	25

Fig. 29.

of the key square Fig. 28, the magic square shown in Fig. 29 is formed, which is also identical with the one previously given in Fig. 14.

The simple and direct formation of Fig. 14 may be thus compared with the De la Hire method for arriving at the same result.

It is evident that the key square shown in Fig. 28 may be dispensed with by mentally substituting the key numbers for the prime

numbers given in Fig. 27 when performing the addition, and by so doing only two primary squares are required to construct the magic square. The arrangement of the numbers 1 to 5 in the two primary squares is obviously open to an immense number of variations, each of which will result in the formation of a different but perfect magic square. Any of these squares, however, may be more readily constructed by the direct methods previously explained.

A few of these variations are given as examples, the key numbers remaining unchanged. The key square Fig. 32 is formed from the primary square Fig. 31, and if the numbers in Fig. 32 are added to those in the primary square Fig. 30, the magic square given in Fig. 33 will be produced. This square will be found identical with that shown in Fig. 15.

1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5

Fig. 30.

1	5	4	3	2
3	2	1	5	4
5	4	3	2	1
2	1	5	4	3
4	3	2	1	5

Fig. 31.

0	20	15	10	5
10	5	0	20	15
20	15	10	5	0
5	0	20	15	10
15	10	5	0	20

Fig. 32.

1	21	16	11	6
12	7	2	22	17
23	18	13	8	3
9	4	24	19	14
20	15	10	5	25

Fig. 33.

Fig. 30 cannot be used as a key square, but if two primary squares are constructed in which every horizontal and perpendicular column contains the numbers 1 to 5 placed according to rules previously given, and having a different arrangement of numbers in each primary square, then either of these squares may be made

the key square, and two different magic squares may be constructed therefrom, as shown in the next examples.

The magic square shown in Fig. 37 is made by the addition of numbers in the primary square Fig. 34 to the numbers occupying similar cells in the key square Fig. 36, the latter being derived from the primary square Fig. 35. If the key square shown in Fig. 38 is now constructed from the primary square Fig. 34 and the key numbers therein added to the prime numbers in Fig. 35, the magic square shown in Fig. 39 is obtained. This square has not been given before in this treatise, but it may be directly produced by

3	1	4	2	5
5	3	1	4	2
2	5	3	1	4
4	2	5	3	1
1	4	2	5	3

Fig. 34.

2	1	5	4	3
1	5	4	3	2
5	4	3	2	1
4	3	2	1	5
3	2	1	5	4

Fig. 35.

5	0	20	15	10
0	20	15	10	5
20	15	10	5	0
15	10	5	0	20
10	5	0	20	15

Fig. 36.

8	1	24	17	15
5	23	16	14	7
22	20	13	6	4
19	12	10	3	21
11	9	2	25	18

Fig. 37.

10	0	15	5	20
20	10	0	15	5
5	20	10	0	15
15	5	20	10	0
0	15	5	20	10

Fig. 38.

12	1	20	9	23
21	15	4	18	7
10	24	13	2	16
19	8	22	11	5
3	17	6	25	14

Fig. 39.

an elongated knight's move consisting of two cells to the right and two downwards, using the normal knight's move of two cells to the left and one cell downwards as a break move at every block in the regular spacing.

It will be observed in all the preceding examples that the number 3 invariably occupies the center cell in every primary square, thus bringing 10 in the center of all key squares, and 13 in the center of magic squares, no other number being admissible in the

center cell of a 5×5 magic square. A careful study of these examples should suffice to make the student familiar with the De la Hire system for building odd magic squares, and this knowledge is desirable in order that he may properly appreciate the more direct methods which have been described.

Before concluding this branch of the subject, mention may be made of another method for constructing odd magic squares which is said to have been originated by Bachet de Mezeriac. The application of this method to a 5×5 square will suffice for an example.

The numbers 1 to 25 are written consecutively in diagonal columns, as shown in Fig. 40, and those numbers which come out-

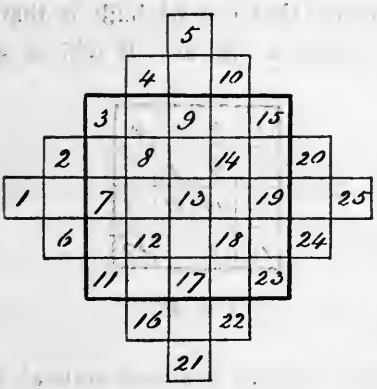


Fig. 40.

3	16	9	22	15
20	8	21	14	2
7	25	13	1	19
24	12	5	18	6
11	4	17	10	23

Fig. 41.

side the center square are transferred to the empty cells on the opposite sides of the latter without changing their order. The result will be the magic square of 5×5 shown in Fig. 41. It will be seen that the arrangement of numbers in this magic square is similar to that in the 7×7 square shown in Fig. 4, which was built by writing the numbers 1 to 49 consecutively according to rule. The 5×5 square shown in Fig. 41 may also be written out directly by the same rule without any preliminary or additional work.

EVEN MAGIC SQUARES.

In perfect squares of this class it is necessary that the sum of each column shall be the same amount, and also that the sum of

any two numbers that are geometrically equidistant from the center of the square shall equal the sum of the first and last numbers of the series.

The numbers in the two corner diagonal columns in even magic squares may be determined by writing the numbers of the series in arithmetical order in horizontal columns, beginning with the first number in the left hand cell of the upper line and writing line after line as in a book, ending with the last number in the right hand cell of the lower line. The numbers then found in the two diagonal columns will be in magic square order, but the position of the other numbers must generally be changed.

The smallest even magic square that can be built is that of 4×4, and one of its forms is shown in Fig. 42. It will be seen

1	15	14	4
12	6	7	9
8	10	11	5
13	3	2	16

Fig. 42.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Fig. 43.

that the sum of each of the four horizontal, the four vertical, and the two corner diagonal columns in this square is 34, making in all ten columns having that total; also that the sum of any two geometrically opposite numbers is 17, which is the sum of the first and last numbers of the series. It is therefore a perfect square of 4×4.

The first step in the construction of this square is shown in Fig. 43, in which only the two corner diagonal columns, which are written in heavy figures, have the correct summation. The numbers in these two columns must therefore be left as they are, but the location of all the other numbers, which are written in light figures, must be changed. A simple method for effecting this change consists in substituting for each number the complement between it and 17. Thus, the complement between 2 and 17 is 15, so 15 must be written in the place of 2, and so on throughout. All of the light figure

numbers being thus changed, the result will be the perfect magic square shown in Fig 42.

The same relative arrangement of figures may be attained by leaving the light figure numbers in their original positions as shown in Fig. 43, and changing the heavy figure numbers in the two corner diagonal columns to their respective complements with 17. It will be seen that this is only a reversal of the order of the figures

16	2	3	13
5	11	10	8
9	7	6	12
4	14	15	1

Fig. 44.

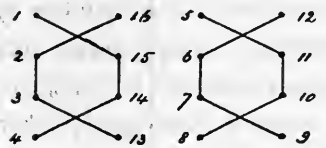


Fig. 45..

in the two corner diagonal columns, and the resulting magic square which is shown in Fig. 44 is simply an inversion of Fig. 42.

Fig. 45 is a geometrical diagram of the numbers in Fig. 42, and it indicates a regular law in their arrangement, which also holds good in many larger even squares, as will be seen later on.

There are many other arrangements of sixteen numbers which will fulfil the required conditions but the examples given will suffice to illustrate the principles of this square.

1	35	34	3	32	6
30	8	28	27	11	7
24	23	15	16	14	19
13	17	21	22	20	18
12	26	9	10	29	25
31	2	4	33	5	36

Fig. 46.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Fig. 47.

The next even magic square is that of 6×6, and one of its many variations is shown in Fig. 46. An analysis of this square with the aid of geometrical diagrams will point the way not only

to its own reconstruction but also to an easy method for building 6×6 squares in general.

Fig. 47 shows a 6×6 square in which all the numbers from 1 to 36 are written in arithmetical sequence, and the twelve numbers in the two corner diagonal columns will be found in magic square order, all other numbers requiring rearrangement. Leaving there-

1	35	34	33	32	6
30	8	28	27	11	25
24	23	15	16	20	19
18	17	21	22	14	13
12	26	10	9	29	7
31	5	4	3	2	36

Fig. 48.

fore the numbers in the diagonal columns unchanged, the next step will be to write in the places of the other numbers their complements with 37, making the square shown in Fig. 48. In this square twenty-four numbers (written in heavy figures) out of the total of

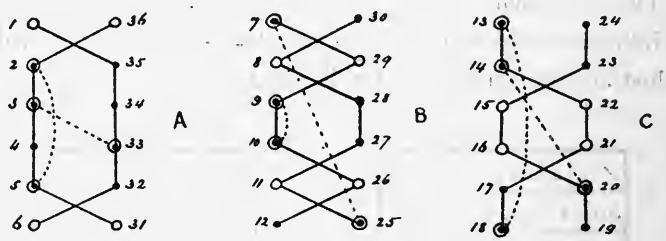


Fig. 49.

thirty-six numbers, will be found in magic square order, twelve numbers (written in light figures) being still incorrectly located. Finally, the respective positions of these twelve numbers being reversed in pairs, the magic square given in Fig. 46 will be produced.

Fig. 50 shows the geometrical diagrams of this square, A being a diagram of the first and sixth lines, B of the second and fifth lines, and C of the third and fourth lines. The striking ir-

regularity of these diagrams points to the imperfection of the square which they represent, in which, although the sum of each of the two corner diagonal, the six horizontal, and the six perpendicular columns is 111, yet only in the two diagonal columns does the sum of any two numbers which occupy geometrically opposite cells, amount to 37, or the sum of the first and last numbers of the series. Owing to their pronounced irregularities, these diagrams convey but little meaning, and in order to analyze their value for further constructive work it will be necessary to go a step backwards and make diagrams of the intermediate square Fig. 48. These diagrams are shown in Fig. 49, and the twelve numbers therein which must be transposed (as already referred to) are marked by small circles around dots, each pair of numbers to be transposed in position

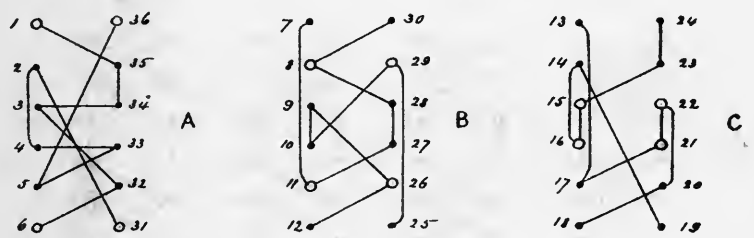


Fig. 50.

being connected by a dotted line. The numbers in the two corner diagonal columns which were permanently located from the beginning are marked with small circles.

We have here correct geometrical figures with definite and well defined irregularities. The series of geometrical figures shown in A, B, and C remain unchanged in shape for all variations of 6×6 squares, but by modifying the irregularities we may readily obtain the data for building a large number of different 6×6 squares, all showing, however, the same general characteristics as Fig. 46.

A series of these diagrams, with some modifications of their irregularities, is given in Fig. 51, and in order to build a variety of 6×6 magic squares therefrom it is only necessary to select three diagrams in the order A, B, and C, *which have each a different form*

of irregularity, and after numbering them in arithmetical sequence from 1 to 36, as shown in Fig. 49, copy the numbers in *diagrammatic order* into the cells of a 6×6 square.

It must be remembered that the cells in the corner diagonal columns of even magic squares may be correctly filled by writing

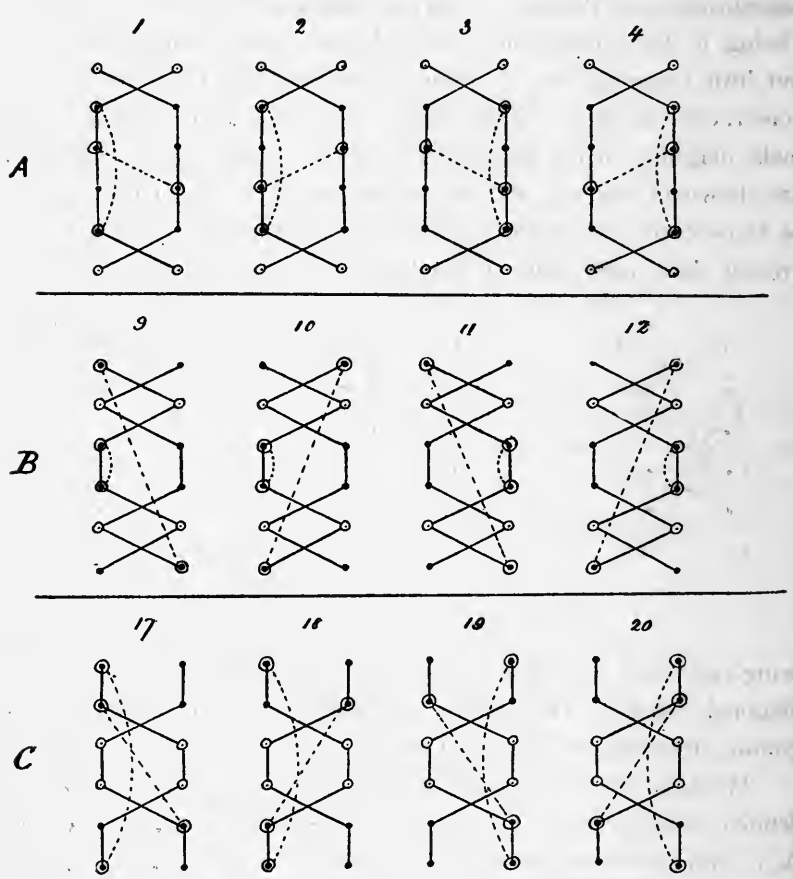


Fig. 51 (First Part).

the numbers in arithmetical order according to the rule previously given, so in beginning any new even square it will be found helpful to first write the numbers in these columns, and they will then serve as guides in the further development of the square.

Taking for example the 6×6 magic square shown in Fig. 46,

it will be seen from Fig. 49 that it is constructed from the diagrams marked 1—9 and 17 in Fig. 51. Comparing the first line of Fig. 46 with diagram A, Fig. 49, the sequence of numbers is 1,—35,—34 in unbroken order; then the diagram shows that 33 and 3 must be transposed, so 3 is written next (instead of 33) then 32 and 6 in

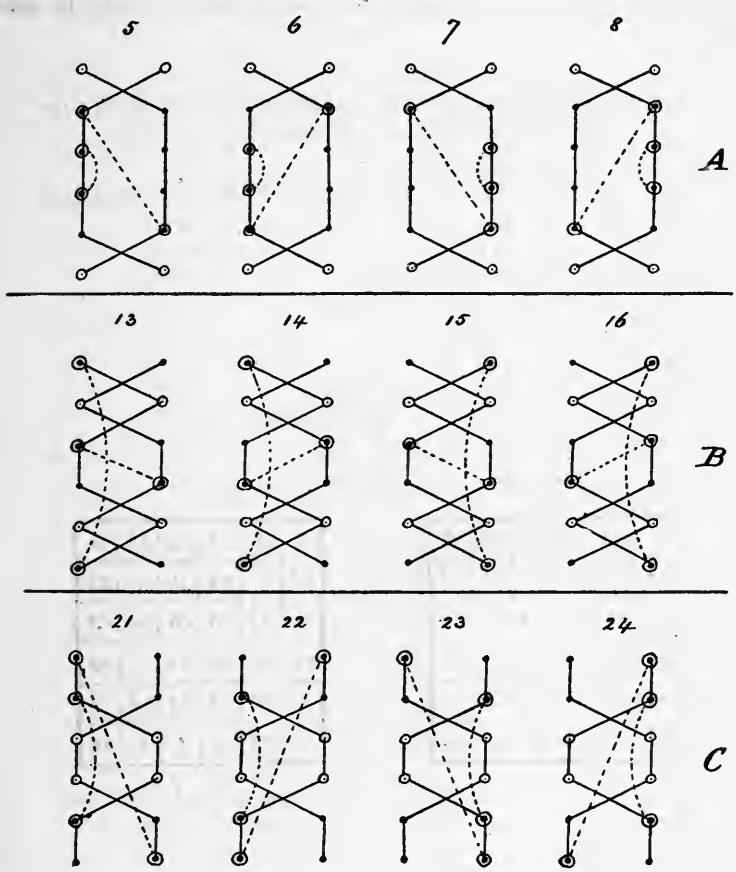


Fig. 51 (Second Part).

unbroken order. In the last line of this square (still using diagram A) 31 comes first, then, seeing that 5 and 2 must be transposed, 2 is written instead of 5; then 4; then as 3 and 33 must be transposed, 33 is written instead of 3, 5 instead of 2, and the line is finished with 36. Diagram B gives the development of the second

and fifth lines of the square in the same manner, and diagram C the development of the third and fourth lines, thus completing the square.

The annexed table shows 128 changes which may be rung on the twenty-four diagrams shown in Figure 51, each combination giving a different 6×6 square, and many others might be added to the list.

TABLE SHOWING 128 CHANGES WHICH MAY BE RUNG ON THE TWENTY-FOUR DIAGRAMS IN FIG. 51.

A	B	C
1, 2, 3 or 4	9	17, 18, 19 or 20 = 16 changes
" " " "	10	" " " " = 16 "
" " " "	11	" " " " = 16 "
" " " "	12	" " " " = 16 "
5, 6, 7 or 8	13	21, 22, 23 or 24 = 16 "
" " " "	14	" " " " = 16 "
" " " "	15	" " " " = 16 "
" " " "	16	" " " " = 16 "
		Total changes = 128 "

EXAMPLES.

1	35	4	33	32	6
12	8	28	27	11	25
24	17	15	16	20	19
13	23	21	22	14	18
30	26	9	10	29	7
31	2	34	3	5	36

Square derived from diagrams 2, 10, and 18.

1	5	33	34	32	6
30	8	28	9	11	25
18	23	15	16	20	19
24	14	21	22	17	13
7	26	10	27	29	12
31	35	4	3	2	36

Square derived from diagrams 8, 13, and 22.

The next size of even magic square is that of 8×8, and instead of presenting one of these squares ready made and analyzing it, we will now use the information which has been offered by previous examples in the construction of a new square of this size.

Referring to Fig. 45, the regular geometrical diagrams of the 4×4 square naturally suggest that an expansion of the same may be utilized to construct an 8×8 square. This expanded diagram

is accordingly shown in Fig. 52, and in Fig. 53 we have the magic square that is produced by copying the numbers in diagrammatic order.

As might be anticipated, this square is perfect in all its characteristics, and the ease with which it has been constructed points to the simplicity of the method employed.

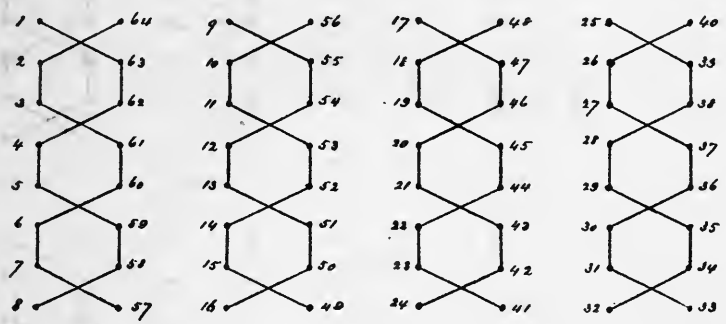


Fig. 52.

The magic square shown in Fig. 53 is, however, only one of a multitude of 8×8 squares, all of which have the same general

1	63	62	4	5	59	58	8
56	10	11	53	52	14	15	49
48	18	19	45	44	22	23	41
25	39	38	28	29	35	34	32
33	31	30	36	37	27	26	40
24	42	43	21	20	46	47	17
16	50	51	13	12	54	55	9
57	7	6	60	61	3	2	64

Totals = 260.

Fig. 53.

characteristics and may be constructed with equal facility from various regular diagrams that can be readily derived from transpositions of Fig. 52. Five of these variations are illustrated in Fig. 54, which also show the transpositions by which they are formed from the original diagrams. To construct a perfect magic square

from either of these variations it is only necessary to make four copies of the one selected, annex the numbers 1 to 64 in arithmetical

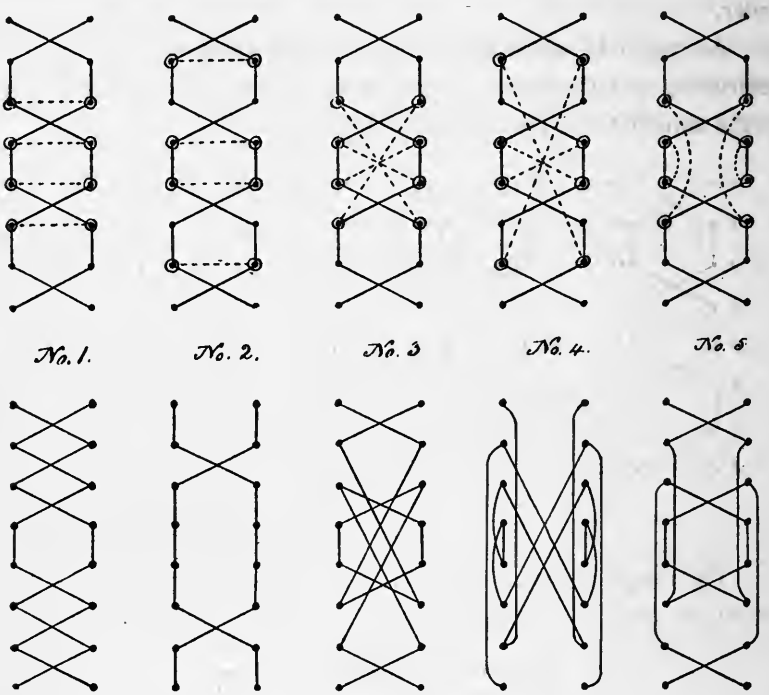


Fig. 54.

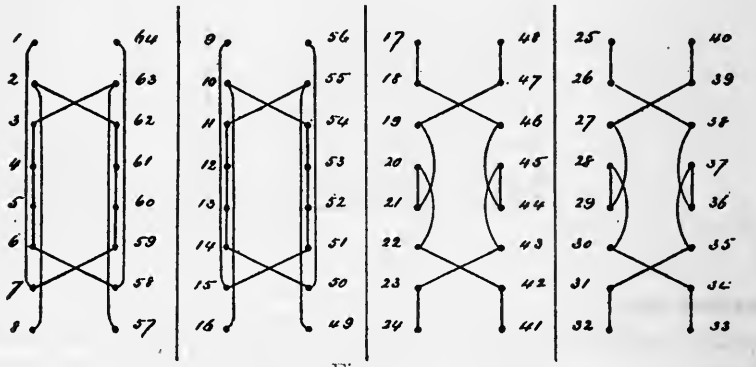


Fig. 55.

order as before explained, and then copy the numbers in diagrammatic sequence into the cells of an 8×8 square.

It will be noted in the construction of the 4×4 and 8×8 squares that only one form of diagram has been hitherto used for each square, whereas three different forms were required for the 6×6 square. It is possible, however, to use either two, three, or

1	7	59	60	61	62	2	8
16	10	54	53	52	51	15	9
48	47	19	21	20	22	42	41
33	34	30	28	29	27	39	40
25	26	38	36	37	35	31	32
24	23	43	45	44	46	18	17
56	50	14	13	12	11	55	49
57	63	3	4	5	6	58	64

Totals = 260.

Fig. 56.

four different diagrams in the construction of an 8×8 square, as shown in the annexed examples. Fig. 55 illustrates two different forms from which the magic square Fig. 56 is constructed. Fig. 57

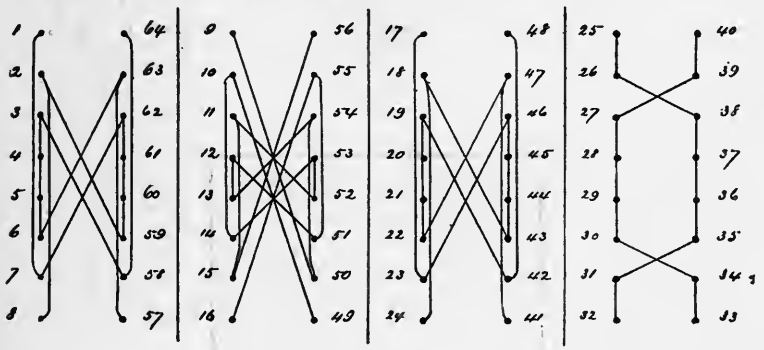


Fig. 57

shows three different forms which are used in connection with the square in Fig. 58, and in a similar manner Figs. 59 and 60 show four different diagrams and the square derived therefrom. The foregoing examples are sufficient to illustrate the immense number

1	7	62	61	60	59	2	8
49	10	14	53	52	11	15	56
48	42	19	20	21	22	47	41
40	39	27	28	29	30	34	33
32	31	35	36	37	38	26	25
24	18	43	44	45	46	23	17
9	50	54	13	12	51	55	16
57	63	6	5	4	3	58	64

Totals = 260.

Fig. 58.

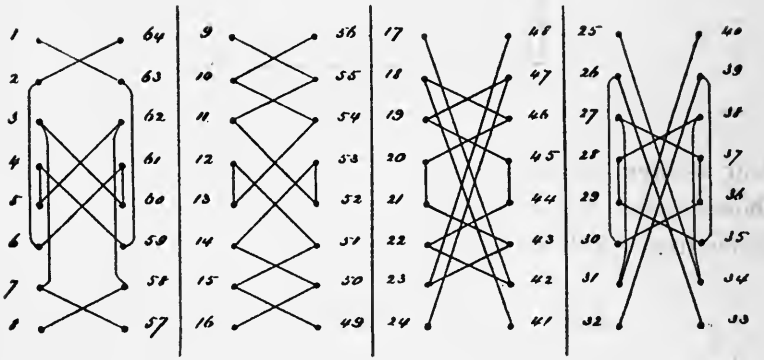


Fig. 59.

1	63	59	4	5	62	58	8
56	10	54	13	12	51	15	49
24	47	19	45	44	22	42	17
25	34	38	28	29	35	39	32
33	26	30	36	37	27	31	40
48	23	43	21	20	46	18	41
16	50	14	53	52	11	55	9
57	7	3	60	61	6	2	64

Totals = 260.

Fig. 60.

of different 8×8 magic squares that may be constructed by the aid of various diagrams.

We now come to the magic square of 10×10, and employing the comparative method of the last examples, it will be easy to expand the three diagrams of the 6×6 square (Fig. 49) into five

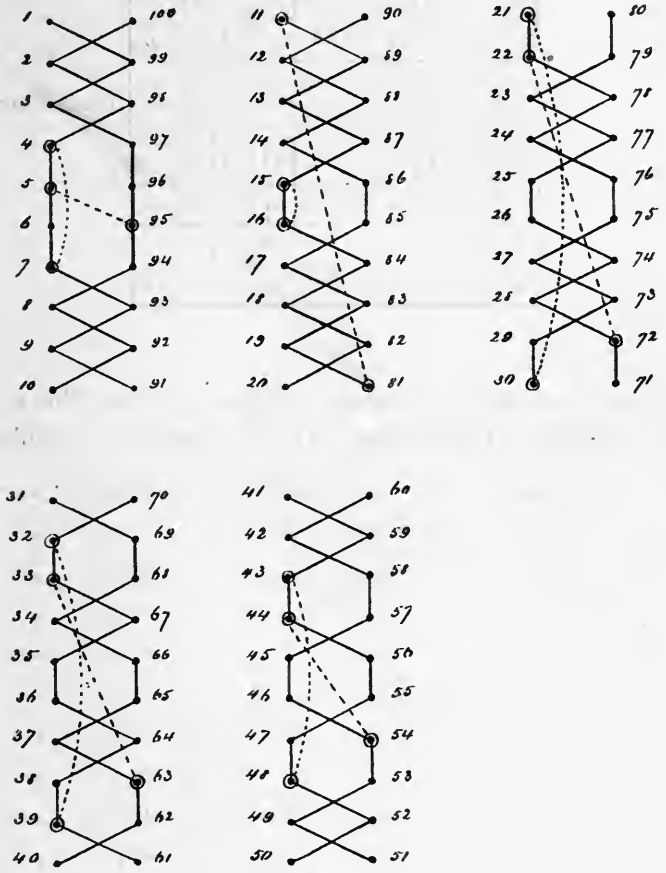


Fig. 61.

diagrams that are required for the construction of a series of 10×10 squares. These five diagrams are shown in Fig. 61, and in Fig. 62 we have the magic square which is made by copying the numbers from 1 to 100 in diagrammatic order into the cells of a 10×10 square.

It will be unnecessary to proceed further with the construction of other 10 × 10 squares, for the student will recognize the striking

1	99	3	97	96	5	94	8	92	10
90	12	88	14	86	85	17	83	19	11
80	79	23	77	25	26	74	28	22	71
31	69	68	34	66	65	37	33	62	40
60	42	58	57	45	46	44	53	49	51
50	52	43	47	55	56	54	48	59	41
61	32	38	64	36	35	67	63	39	70
21	29	73	27	75	76	24	78	72	30
20	82	18	84	15	16	87	13	89	81
91	9	93	4	6	95	7	98	2	100

Totals = 505.

Fig. 62.

resemblance between the diagrams of the 6 × 6 and the 10 × 10 squares, especially in connection with their respective irregularities,

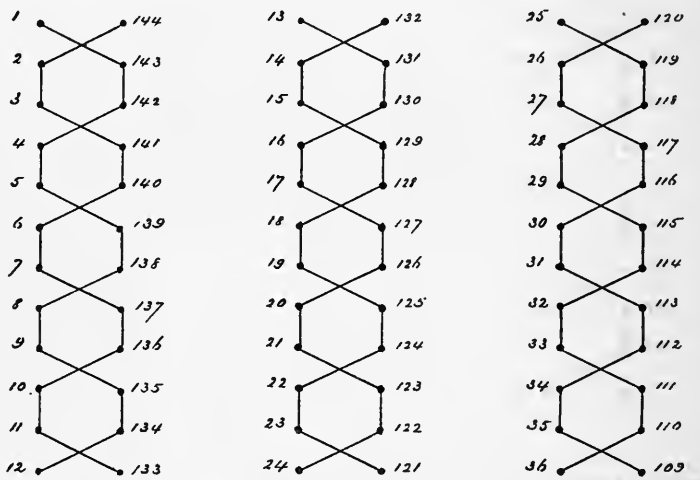


Fig. 63 (First part).

which point to the apparent impossibility of building perfect 10 × 10 squares.

It will also be seen that the same methods which were used for

varying the 6 × 6 diagrams, are equally applicable to the 10 × 10 diagrams, so that an almost infinite variety of changes may be rung on them, from which a corresponding number of 10 × 10 squares

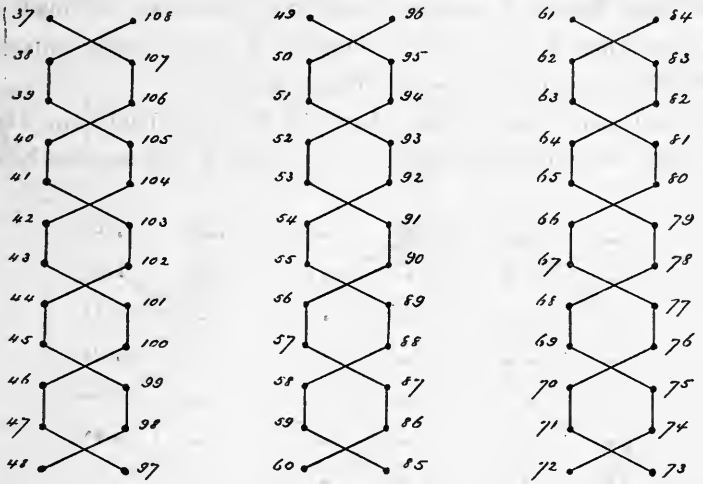


Fig. 63 (Second part).

1	143	142	4	5	139	138	8	9	135	134	12
132	14	15	129	128	18	19	125	124	22	23	121
120	26	27	117	116	30	31	113	112	34	35	109
37	107	106	40	41	103	102	44	45	98	98	48
49	95	94	52	53	91	90	56	57	87	86	60
84	62	63	81	80	66	67	77	76	70	71	73
72	74	75	69	68	78	79	65	64	82	83	61
85	59	58	86	89	55	54	92	93	51	50	96
97	47	46	100	101	43	42	104	105	39	38	108
36	110	111	33	32	114	115	29	28	118	119	25
24	122	123	21	20	126	127	17	16	130	131	13
133	11	10	136	137	7	6	140	141	3	2	144

Totals = 870

Fig. 64.

may be derived, each of which will be different but will resemble the series of 6 × 6 squares in their curious and characteristic imperfections.

We have thus far studied the construction of all even magic squares up to and including that of 10 × 10, and it is worthy of remark that when one half the number of cells in one side of an even magic square is an even number the square can be made perfect, but when it is an uneven number it is apparently impossible to build the square with perfect characteristics.

Even magic squares may therefore be divided into two classes —perfect and imperfect—the 4 × 4 and the 8 × 8 squares belong-

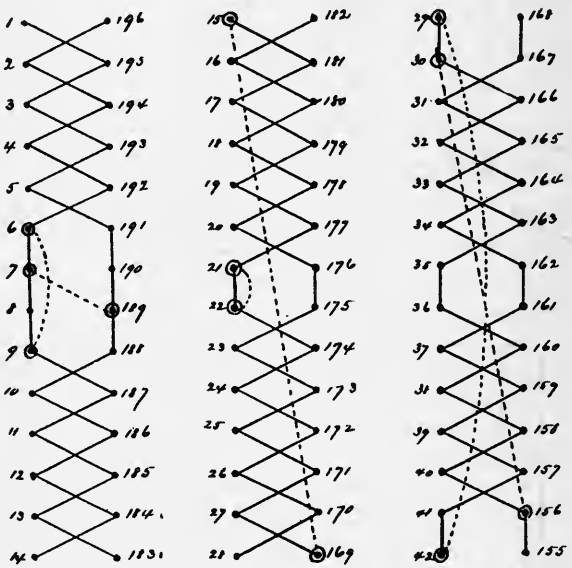


Fig. 65 (First Part).

ing to the first class, and the 6 × 6 and 10 × 10 belonging to the second class.

Fig. 63 shows a series of diagrams from which the 12 × 12 square in Fig. 64 is derived. The geometrical design of these diagrams is the same as that shown in Fig. 52 for the 8 × 8 square, and it is manifest that all the variations that were made in the 8 × 8 diagrams are also possible in the 12 × 12 diagrams, besides an immense number of additional changes which are allowed by the increased size of the square.

In Fig. 65 we have a series of diagrams illustrating the development of the 14×14 magic square shown in Fig. 66. These diagrams being plainly derived from the diagrams of the 6×6 and 10×10 squares, no explanation of them will be required, and it is

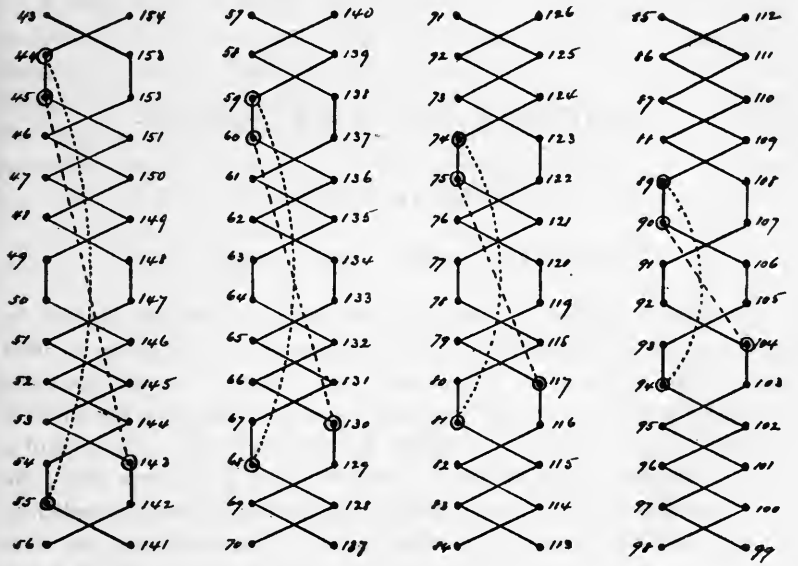


Fig. 65 (Second Part).

evident that the diagrammatic method may be readily applied to the construction of all sizes of even magic squares.

[TO BE CONCLUDED.]

W. S. ANDREWS.

NEW YORK.

CRITICISMS AND DISCUSSIONS.

A CIRCULAR POLYGON.

LIMITS IN CONTINUA A RESULT OF PROCESS.

The current doctrine of the text-books regards the straight line and the circle as essentially different things. The straight line is regarded as the limit toward which the circle tends but which it never reaches. So also the circle is regarded as the limit toward which the regular polygon tends but which it *never* reaches. The theorems regarding the circumference and the area of a circle are derived on the supposition that the circle is the limit which the regular polygon almost but never quite reaches and that the error is negligible. But we always have the reservation that the circle is *not* a polygon, say what you will, and that there *is* an error, however small it may be; less than any assignable quantity, but yet an error after all. The difference between the circle and polygon is so small that for all practical purposes we may consider them as one, but of course they are not one, and never can be, etc., etc.

And through all the array of verbiage we feel that there is a fallacy somewhere; it is and it isn't, all in the same breath; the error is inexpressible and yet the two forms do not coincide. We can push the polygon almost to the circle; what is that invisible barrier which keeps it back?

There is no barrier except our own narrow definitions and methods. The straight line is a circle of special form, not the limit of a circle; the circle is a polygon, not the limit of a polygon. There is no error. The circle straightens out into a straight line and sweeps over it into a circle on the other side. The inscribed polygon merges into the circle and sweeps over it into a polygon again on the other side.

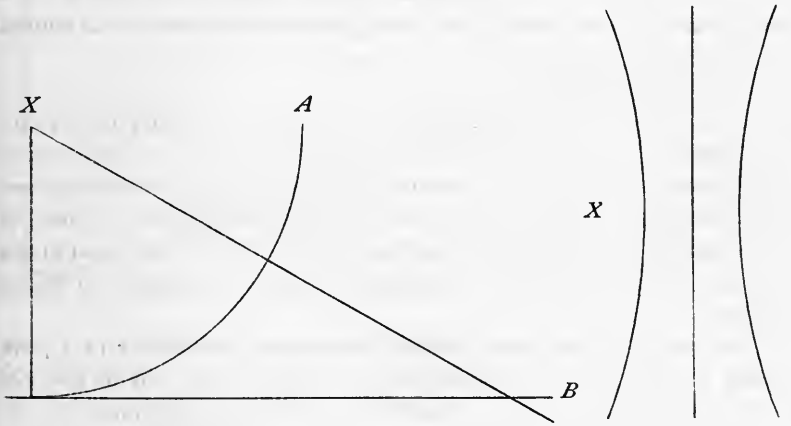
Let us see what is meant by a limit, and why forms have limits.

A limit is that constant value (or form) which a variable value (or form) approaches indefinitely near but never quite reaches. The test of a limit is, where r is the limit of x, $r - x = 0$, and $r - x < i$, where i is any infinitely small value.

The subject of limits as taught in the elementary text-books is very crude and fogged with lack of perspective.

In the first place no distinction is made between the limit in the case of geometric forms (continua) and that of numbers (discreta). The two cases are quite different and the distinction must be recognized.

It seems to be a rule that geometric forms have or have not a limit, dependent entirely upon the method of generation; one method of generation having a limit and the other not, for the same variable. For example, if the angle X is generated by the movement of the intersection A, it has no limit; but if by the movement of the intersection B, its limit is a right angle. So likewise if we generate the arc x by the swelling of a cartwheel rim, the limit is a straight line. But if we generate it by the tracing-point of a Peaucellier



linkage, it has no limit; it straightens out into a straight line and then curves the other way. In both these cases, it is the same variable, a line of constant curvature. The elementary text-books blindfold their readers with a, not necessarily faulty, but narrow definition. A circle is a line which always changes its direction and a straight line is one which does not change etc. And then triumphantly ask how one can be the other.

Throw away the blinders and get a broader view by taking a broader definition, viz., a line of constant curvature, and the contradiction ends.

The old contradiction between a tangent and a secant has begun its evanescence by considering the tangent as a secant cutting in two coincident points, one double point.

But when it comes to swelling an inscribed polygon into a circle, then, they say, the law laid down above fails, since there is no instrument to do the swelling, and however far you continue the process, there are points of circumference yet unoccupied by vertices of the polygon. The same objection

would have been made in the case of the circle and straight line, previous to 1864 when Peaucellier invented his linkage; showing that the question of limit does not depend upon the inventiveness of man; but only our appreciation. Such an instrument could have been imagined *in nubibus*, and the same argument used as here, and the argument would have been just as sound. The only difference would have been its effect upon the hearers.

Let us look at some examples of limits.

(*a*) A point moving half the distance remaining between itself and the goal each second; when will it reach the goal? Never, because between it and the goal will ever remain the half of some distance. (*b*) A point moving away half the distance between it and a pursuing point each instant of time; when will the pursuing point catch the other? Never, because the pursuing point is always the half of some distance ahead. But this is nonsense, for a pursuing point moving twice as fast as the pursued can overtake it, as witness the minute hand of a clock and the hour hand.

Where is the fallacy?

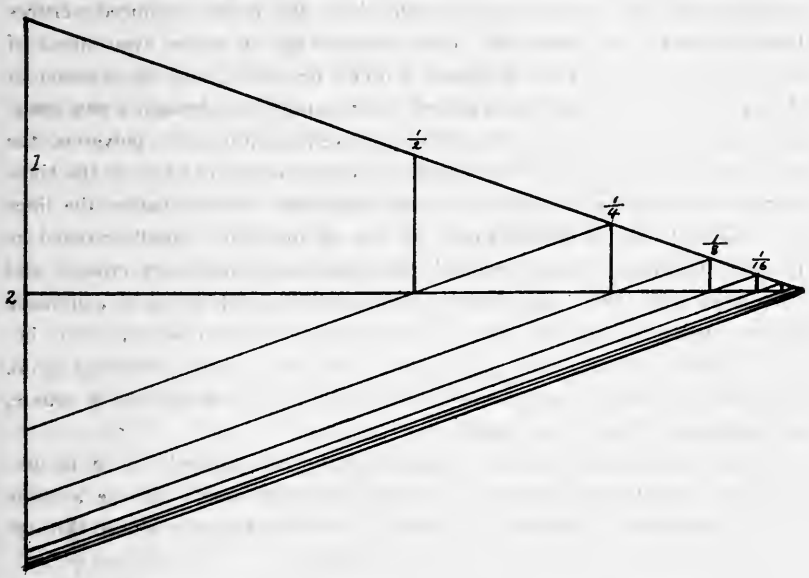
In (*a*) we have an infinite number of operations, stretching over an infinite number of seconds and therefore never ended. In (*b*) we have an infinite number of operations crowded into a limited time and therefore completed sometime. In (*a*) the succession of events is regular, but the speed of the moving point is decreasing to infinite slowness. In (*b*) the speed of the moving point is regular, but the succession of events is increasing to infinite rapidity.

This shows how the same variable (the distance passed over by a point moving one half the preceding distance at each operation) may or may not have a limit, according to the special law governing its generation.

The introduction of a *timed succession* of events (finite intervals) produces a decreasing speed and a limit. A timed (finite intervals or constant) speed produces an increasing rapidity of succession of events and no limit. A horse straining at his halter finds the distance between him and the door diminished one half each second. Can he ever get out? Never! A horse straining at his halter finds the distance between him and the door diminished one half at each instant of strain. Can he get out? Certainly, a steady strain will carry him through the door. In the first case there is a timed succession of events. In the second case there is a continuous and steady strain, a timed rate of progress, finite speed.

In the case of the summation of a series of discrete terms the use of discrete terms seems to be the equivalent of a timed succession of events, and the series has a limit, if convergent. An illustration of the difference between the summation of discreta and continua is given in the series $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \ldots$. If we consider these terms as ordinates erected at finite intervals, the summation has a limit, 2. But if we crowd the ordinates into a triangle

as shown, the sum is easily seen, by reason of the similar triangles to be exactly 2, and there is no unattainable limit, no residual error. We actually reach the sum, 2. In each case we have dealt with *exactly the same ordinates;* and in one case *arranged* so as to have a limit to the sum, in the other case



no limit. Which result we shall get is entirely a question of arrangement. In this instance, and for other geometric series, the sum of an infinite converging series is a real, tangible quantity, and not an elusive limit, just out of reach. A limit is the limit of a process and not necessarily any intrinsic property of the variable itself.

If we imagine the inscribed polygon swelled toward the circle by doubling the number of sides, etc., the circle seems to be the limit of the operation, for the process of doubling introduces the timed succession of events which results in a limit. But imagine a process which forced each centre of a chord (inscribed square) into a symmetrical position (i. e. on to the circumference of the circle, through the undisturbed points) and this process kept up at an *even speed of surface change,* like the constant strain of the horse at his halter, or the even movement of the minute hand. The succession of events increases to infinite rapidity, and the inscribed polygons sweep through the circle into the circumscribed polygons. The newly produced vertices are arranged on the circumference of the initial circumscribing circle until the circle itself is reached, and then they arrange themselves on circles (of increasing sizes) the alternate vertices being forced out until the undisturbed ones evanesce on straight lines and the polygons become of lessening number

of sides until the circumscribing square is reached, and the process repeats itself into a new circle around this new square, and so on. If instead of saying "alternate vertices etc.," suppose we say, reversal of the process which produces the circle from the circumscribed square by forcing the vertices inward until they evanesce on straight lines, the newly produced vertices being symmetrically arranged. This process kept up at an even speed of surface change sweeps the polygons through the circle, and, by reversal of the swelling process, into the inscribed square, and so on through a new cycle. In imagination we can see the polygons swelling into other polygons, the transition figure between the sets being the circle; as the parabola is the transition curve between the ellipse and the hyperbola. If we imagine the lines to be general lines of infinite length we can see the plane, initially crossed by the four bunches of lines, gradually becoming more and more crossed and re-crossed with lines, except the central portion which is more and more sharply delimited from the rest by the bounding polygon, which finally becomes a circle. As the process goes on we can see the lines coalescing again, the plane becoming less darkened until finally we arrive again at a square, and the process begins over again.

That we have no mechanism for producing these results is of no importance. Until 1864 we had no mechanism which would enlarge a circle into a straight line. Nor have we now any for sweeping the ellipse through its transition curve, the parabola, into the hyperbola.

To conform to all this, the narrow definition of polygon must be enlarged into a configuration of lines; a regular polygon as a symmetrical configuration, one phase of which is the circle, a regular configuration of an infinite number of lines.

A pregnant illustration of this idea is the historic problem of squaring the circle. In numbers this is impossible because π, among other reasons, is the limit of an infinite series of discrete terms. In geometry, with a ruler and compass, the length of the circumference is also the limit of an infinite series of operations and is therefore unattainable. But change the process by using the integraph, and what was before a limit and just out of reach becomes attainable, and we get a straight line equal in length to the circumference.

ARTHUR LATHAM BAKER.

MANUAL TRAINING HIGH SCHOOL, BROOKLYN, N. Y.

A MOSLEM ACCOUNT AS TO THE ORIGIN OF CHRISTIAN SECTS IN SYRIA.

To the Editor of The Monist.

The account of Christianity in the work of Shahrastáni discussed in *The Monist* of January last, more especially the concluding paragraph (p. 122 inf.),

alluding to three chief sects of Christians in Syria, reminds me of a certain extract from Mirkhond (Mírkhavand), which somewhat puzzles me, and which no one to whom I have applied here has been inclined or able to explain to my satisfaction.

I offer a translation from the Persian original (*Raudat-al-safá*, or "Garden of Purity," Book I) without any commentary, leaving it to you what use you will make of it. I have tried to follow the original as closely as possible, especially in the characteristic terms, among which "the God of the earth"—*khudái-zamin*—has rather a strange sound....

The passage reads as follows:

"OF YÚNUS THE JEW LEADING ASTRAY THE CHRISTIANS.

"According ot Khamdín-ibn-'Abbás the followers of Jesus remained on the sacred path for eighty years after his ascension. Then Yúnus the Jew led them away into the valley of error and unbelief.

"It happened in this wise:

"Yúnus the Jew came among the Christians wearing a hermit's or monk's gown. Four months did he stay at the house of a pious Christian, showing to no one his unblessed face. His devout life produced great confidence among the Christians, and when, after that period, he said, 'Send me three of your learned men, in whom you place perfect confidence, that I may lay a divine secret before each of them separately,' they sent to him Nestor and Yakúb and Malek.

"And in private he said to one of them, 'I am a messenger of Christ to the people, to lighten the burden of their hearts on account of (*sic*!) his word.' And further he said, 'Do you know that Jesus restored life to the dead, and did such and such things?' The learned man replied: 'Aye.' Then Yúnus asked him, 'Could any one but God do such things?' He said, 'No.' Yúnus said, 'Know then for certain, that Jesus is the Providence of that world, who came down from heaven, and having borne his earthly lot to the end, went back to heaven.'

"To the second learned man he said, privately, 'Are you aware that the Lord Jesus performed such acts as no one but the Lord Creator could have done?' The other assented. Yúnus said, 'Do you know that the Lord Jesus is sinless?' He said, 'Aye.' Yúnus said, 'Then you ought to believe that Jesus is the son of God, who sent him to the earth and took him up again into heaven.'

"And with the third sage, again in private, he spoke similar words, saying, 'He is the God of the earth, who, when men intended to kill him, was concealed, and who will shortly return among the people. I have been sent to bring these tidings.'

"Having communicated to them such false doctrine, he went into the oratory, where he locked himself in. But that very night he went the way

to hell. And on the morrow, when the Christians inquired from the three learned men what Yúnus spoke to them, each of them had a different message from the other two. So the people said, 'We had better hear Yúnus himself.' And they went and burst open the door of the oratory and found that Yúnus had been killed. And the Christians were divided into three sects, each one adopting one of the three before-mentioned creeds."

H. WERNEKKE.

WEIMAR, GERMANY, February 27, 1905.

EDITORIAL COMMENT.

It appears that the communication of Professor Wernekke, ultimately based upon the report of Khamdín-ibn-'Abbás, is the ancient Moslem view as to the origin of Christian sects. According to Mohammed, Jesus was born of a virgin, and is the greatest prophet of past ages, but the Christians are accused of misinterpreting the doctrine of their leader. Among other things it is claimed that Jesus when speaking of the Comforter who would come and initiate Christians into the truth (John xv. 26) referred to Mohammed; for they claim that the Greek word παρακλητος (i. e., Comforter) is but a corruption of παρακλυτος (i. e., the Renowned One) which is the meaning of the name Mohammed. The present account is characteristic of the Moslem view. It assumes that the primitive Christians were Christ's true followers, but that their faith was perverted by a scheming villain, and even in the Orient the odium of heresy is laid at the door of the Jews. P. C.

BOOK REVIEWS.

THE COLOR LINE. A Brief in Behalf of the Unborn. By *William Benjamin Smith.* Pp. xv, 261. New York: McClure, Phillips & Co.

It will presently appear that this work is notably interesting on several accounts apart from the gravity of its subject. That the race problem, particularly in the form in which it confronts the American people, is indeed a momentous subject, none perhaps will deny. But who is the author? What are his credentials? Is there good reason to suppose him qualified to undertake so formidable a task? Is he capable of conceiving it adequately in both its abstract and its concrete bearings, in its present and its future significance, as at once a most intricate problem of pure science and a frightfully complicated practical question for the decision of statesmen? Is he one from whom may be expected a really serious, enlightened plea, free alike from ignorance, from provincial prejudice, and from blinding sentiment? Such are the questions that busy men, before giving serious attention to any discussion of a great subject, are naturally wont to ask, and in these crowded days of abounding authorship they are right.

Doubtless many will be interested in the information that the *Color Line* was written by the doubting "'David" of the *Reign of Law,* though in truth it must be said that the "original" of David was much transformed and but little transfigured or glorified by Mr. Allen's fantasy. The book in hand is the first of its kind by a mathematician; and all the qualities of the mathematical mind, excepting that of proverbial dryness, are evident throughout, in its grasp and penetration, in the clearness and steadiness of its vision, in the sharp precision with which its problems are stated, and in the boldness, energy, and relentless logical rigor with which they are handled. Professor Smith, who is head of the mathematical department of Tulane University, is among the first Americans who gained the doctorate at a German University, where he won prizes for brilliant achievement in the austerest of the sciences, physics and mathematics. As an inspiring teacher of "the universal art apodictic" and as a writer on geometry both pure and analytic, and on infinitesimal analysis, his reputation is national. The present book, however,

is not his first achievement outside the domain of mathematics. Neither is it his first essay beyond the limits of purely academic authorship. Far from it. His *Life of James Sidney Rollins, "Pater Universitatis Missouriensis,"* written by request and printed for private distribution, his series of papers in defence of the gold standard—a defence which in view of his Southern residence and professional connection seems scarcely less than heroic, demonstrating both patriotism and spiritual independence — these taken together with his numerous contributions to the discussion of the tariff question, will serve to indicate something of the range of his interest and activity, without pausing to name the chief products of his pen, a series of critical memoirs in the field of New Testament literature that have secured him and American Biblical scholarship the profound respect of critical circles in England, Holland, and Germany.

"They knew not," said Leibnitz of his friends who feared he would specialize too narrowly, "that my mind could not be satisfied with one kind of things." It may indeed be that Leibnitz was, as DeQuincy calls him, "the last of the universals." It is consoling to know, however, that any such fine *mot* is at best but a partial truth, for, if inexpertness is the curse of the world, the defect of expertness is depth at the expense of breadth, and many a larger question has to await the single intelligence that shall be at once deep and *comprehensive*. In this view it is matter for just pride and congratulation that our most difficult social problem has received painstaking study and candid treatment by an American scholar of whom it has been said that in his best moments of well-being he appears to hold the entire body of the intellectual achievements of the race in something very like true perspective. If this seem to be fulsome praise, we admit the appearance but deny the reality. It accords at any rate with our sober judgment deliberately formed in the course of years. And we gladly record the judgment here as valid for us in despite of the fact that the conclusions of the "Brief," while they commend themselves to our understanding, are far from compatible with our liveliest sentiments and severely condemn our former standards of conduct. For we admit, or avow, or confess, as you will, that in the matter of social equality our sympathies have always hitherto favored the standard of *individual* as distinguished from *racial* excellence. We vividly recall, in view of Professor Smith's terrific arraignment, the fearful risk we assumed of social ostracism when as a resident in a Southern community we repeatedly invited to our home a very black negro in order to enjoy the exceeding wit and intelligence and candor of his conversation.

What of it? Well, in so doing, we were entirely unconscious that we were doing wrong; quite the contrary in fact; presumably we were ignorant, we had not reflected. Were we innocent? Far from it, if the doctrines of this book be sound. By these, which in matters ethical transcend the common

categories and align themselves with the solemn secularities of the cosmic processes, our conduct was very wicked; not that any paltry *specimen* of it was especially reprehensible, it was bad in *kind,* for its kind is such as needs but to be generalized, adopted in common practice, to work the irreversible doom of the highest race; we sinned against an *idea,* more sacred even than that of family, our offence was one against "the most sacred thing on earth," the idea and norm of the Caucasian race. For, so the "Brief" contends, it is not merely the privilege, it is the highest duty of this race in the South, in the North, everywhere, "to keep open at all times, at all hazards, and at all sacrifices, an impassable social chasm between the Black and the White, no matter what the virtues or abilities or accomplishments" of any individual Black may chance to be. Why? Because of the *sole* alternative. And what is that? The answer is: miscegenation, mongrelization, race amalgamation, *pammixia,* the deadly enemy of race improvement and chief among the agencies of inheritable organic degeneration.

Such in brief is the cardinal thesis of this brilliant book. Of its correctness the author obviously entertains not an appreciable doubt, but he does not mistake his own conviction for that of others; and accordingly, against every conceivable objection and counter hypothesis, he defends his doctrine with a splendid army of fact and argument assembled from every department of the commonwealth of knowledge. History and biology, literature and psychology, mathesis and art, philosophy, anthropology, sociology, and statistics, all are made to contribute to the defence of his position. Is the defence everywhere successful? As to that readers will doubtless differ, but it is entirely safe to affirm that the assailing forces are sadly in need of repose and of new recruits and better discipline.

That race amalgamation *is* the inevitable corollary of social equality is the testimony of observation and common sense alike, and is proved by the uncontradicted witness of history. That amalgamation of two organically unequal races yields a product organically inferior to the superior race is the doctrine at once of history and biology. That the Negro is, not merely a "backward race," but really, organically, mentally, hopelessly inferior to the White, is a proposition supported, not alone by the best ascertained of facts biological, ethnological, and anthropological, but by the total immensity, "the infinite variety, of consentient testimony of all historic time and place." These propositions once granted, the author's main thesis follows beyond a doubt; nay, it fairly leaps into the field of vision, not merely however as a truth to be beheld but as a mistress of conduct, a commander of conscience. Their establishment is, therefore, the principal performance, the chief contribution of the book.

Incidentally, however, and by way of supplement, other weighty words are spoken. We do not remember to have seen elsewhere a weightier or

juster deliverance concerning the inherent limitations of the power of education than that contained in Chapter V. Let the following serve as example:

"It is a colossal error to suppose that race improvement, in the strictest sense of the term, can be wrought by education. The reason is simple and easily understood: Race-improvement is organic; education is contra-organic. Any change or amelioration that affects the race, the stock, the blood, must be inherited; but education is not inherited, it is not inheritable. It must be renewed generation after generation in each individual. The Sisyphus-stone of culture is rolled with infinite toil up the steep ascent by the fathers; it thunders instantly back, and must be rolled up again with equal agony and bloody sweat by their children."

Judged as literature, this chapter, "A Dip into the Future" is the best in the book. It maintains throughout a soberness, dignity, and elevation consonant with the subject it contemplates, suitable to the vision it beholds—the slow indeed but sure extinction of a race of men. For such is the doom that awaits the black man of the United States. But the evanescence of the Negro is not only assured, it has actually begun: the indications of the *rates* of growth, of birth, of death, and of crime, taken with other indicia, make it certain that the secular diminuendo has definitely entered upon the destined course. Even "the Negro must feel that competition is becoming sharper, that his territory is becoming narrower, that twentieth century citizenship is, like the Gospel commandment, made for those who can receive it, that he is unequal to the load cast upon him, that he is sinking beneath the burden of an honor unto which he was not born." A sombre forecast indeed. Nevertheless, "all that breathe will share their destiny. It is appointed unto men once to die." Besides, "in the upward mounting of the forms of life, there are no other stepping-stones than their dead selves. The vision of a race vanishing before its superior is not at all dispiriting, but inspiring rather. It is but a part of the increasing purpose of the ages, a forward creeping of the eternal dawn."

From beginning to end the appeal is from the individual standard to the race standard; from traditional maxims however kindly, to the warning dictates of science however stern and cold; from the relative impotence of education to the "omniprepotence of heredity"; from sentiment that feels deeply but does not see, to the imagination and the reason that depict and behold the future; from interesting academic speculation as to what might happen if things unknown were known, to the overwhelming body of ascertained fact and the doctrine of probability. Whether one does or does not agree with Professor Smith's conclusions, the candid reader will allow the book is one with which future discussions of its difficult problems will be compelled to reckon.

COLUMBIA UNIVERSITY, NEW YORK. CASSIUS J. KEYSER.

THE CONTEMPORARY DEVELOPMENT OF DIPLOMACY. By *David Jayne Hill, LL. D.* A Paper Read Before the International Congress of Arts and Science at St. Louis, on September 23, 1904.

The author of this pamphlet is an American diplomat who has done considerable service as assistant secretary of state and is now minister of the United States to Switzerland. His essay on the contemporary development of diplomacy is practically an outline of, or introduction to, a systematic presentation of diplomacy as it ought to be, the diplomacy of the future. Diplomacy has formerly been, and in some circles it is still, considered as a profession which is not bound by any principles of morality. International ethics is an ideal unknown to the diplomats of the old school, typified in Machiavelli, represented by Talleyrand, and formulated by Ancillon and Count Garden. Their view is well expressed in Henry Wotton's definition of an ambassador as "a clever man sent abroad to lie for his country." The forerunners of a new conception which would base diplomacy and all international relations upon principles of justice and fairness are mainly Gentilis and Grotius, worked out in more recent days by Bluntschli and David Dudley Field.

The civilized states of the Old World, foremost among them Germany, England, and France, recognize the change that has set in, and new methods, though inconsistent with the old ideas of sovereignty which regard the ruler of a land as the supreme authority, ranking above the law nor being bound in politics by any principles or rules of conscience, have gradually superseded the old one. The modern diplomat is no longer of the Machiavelli type, and the saying of Frederick the Great that the prince of a country is the first servant of the state, puts a new and nobler interpretation upon the old idea of sovereignty which already implies that moral maxims should also be binding for international transactions.

America, though ahead of other nations in a more modern conception of the nature of the state and less hampered by wrong ideas of sovereignty, is in some respects behind the historical development of Europe. Mr. Hill says:

"In nearly all the countries of the world,—except the United States of America,—candidates for the diplomatic service are rigorously examined before they are received, not only in international law and history, but in the laws, languages, and constitutions of other countries, and especially in commercial geography and the statistics of foreign trade. The result is, that the men who serve modern governments as diplomatic representatives are coming to have, in general, a knowledge of what is true, what is just, what is expedient, and what is right in the relations and conduct of foreign states. They constitute a valuable body of peacemakers and public advisers, whose counsel is useful because it is based on knowledge."

Diplomacy is not a new science, but it is of great importance for our international relations. "Beneath the surface of political phenomena, flows a great historical current which deserves the attention of thoughtful men. The expansive instinct of humanity changes its direction of action according to the obstacles it has to overcome. In the era of political inequality, the general aspiration was for liberty, which created in the eighteenth century a struggle for national independence; but in the constitutional era that followed, the larger human relations were revealed, and in the nineteenth century was developed the idea that modern nations are essentially interdependent. The special task of the twentieth century will be to reconcile these two great conceptions, and to unite independent states in bonds of peace, amiety, and fruitful intercourse."

The ideal of international justice has grown slowly. The state, first regarded as an ultimate and absolute authority, is now understood to rest on a moral principle. The sovereignty of its ruler has been limited by a constitution, and the constitution proves that the state itself, in order to fulfill its mission, can no longer be administrated according to the principle of absolutism, formulated by the French kings in the impudent dictum, the ultimate reason of autocracy: *car tel est notre bon plaisir.* Constitutional government has practically abolished the principle of sovereignty; but it does more. In its turn it points to a further progress of mankind implying a demand of the recognition of international morals.

Mr. Hill is not in sympathy with that morbid idealism which proclaims "the dogma that no war is just, that bloodshed is never right, and that all exercise of force is wrong. Such a doctrine owes its very possibility to the protection of institutions that would not exist for a single day, if society had not the force and determination to destroy its enemies."

A weak beginning only has been made to establish international relations upon a basis of justice, viz., the Hague Tribunal, which, however, is still looked upon with suspicion by all those who still cling to the sovereign pretensions of the state.

In the society of nations there is neither legislature, nor judiciary, nor executive, and whether it will be possible to abolish armies and navies and have them replaced by an international police who would insure the peace of the world remains to be seen.

So far the hope of abolishing standing armies and navies is only a Platonic notion, but a great advance is noticeable and the main factor in human progress toward the ideal of international ethics will be the development of an international conscience, represented by a higher respect for international ethics. Mr. Hill says:

"It will be a great advance in education, when our text-books on ethics devote their concluding chapter to international morality; for no ethical sys-

tem can be complete, either in a public or a scientific sense, which does not include in the scope of its theory the moral functions of the State and the ethics of international intercourse. When, in the schools of all civilized countries, the young are taught that moral obligation does not end with national frontiers, that states are moral entities subject to the great principles of ethics, and that treaties once freely accepted are sacred; when national history has learned to be fair and honest in its representation of other nations; a new era of human development will be opened, and diplomacy will enter upon a new period of efficiency."

La psychologie des romanciers russes du xix. siècle. By *Ossip-Lourié*. Paris: Félix Alcan. Pp. xv, 438. Price, 7 fr. 50.

In the introduction to his "Psychology of the Russian Novelists of the Nineteenth Century," Prof. Ossip-Lourié of the New University at Brussels furnishes a compendious review of Russian literature. His account begins with the oral expression of the confused beliefs of semi-barbarous pagans and their earliest epics. It follows the history of letters through the early monkish influences, the rise of intellectual culture with the introduction of printing, and the century and a half of further development which succeeded, until Peter the Great with the importation of Western civilization ushered in a new era. This flourishing epoch was followed by a period of imitators and critics, who gave place about 1830 to a "host of poets, novelists, dramatists, essayists, and philosophers who drew from themselves and their surroundings the fundamental elements of their works." But M. Ossip-Lourié says that in the last century the novel has had the greatest significance in Russian literature. Before Gogol the novel (or rather the story) had kept within the poetic regions of pure imagination, but since his time it has reproduced faithfully actual life with its unattractve features as well as its beauties.

Each of the great Russian novelists has risen from different social surroundings, and gives us in his work, the spirit, ideas, customs, and aspirations of his particular station. The Russian novel is made up of forces issuing from all the classes that constitute the nation, so that, taken as a whole, it gives a faithful likeness of Russian society in the nineteenth century. However, the Russian novelists are not simply portrayers of the customs of their times. They are intellectual creators, introducing into literature a new manner of thinking, and of depicting life and men. Each of them is dominated by a particular type of mind and imagination which governs both his individual and his artistic life. He sees the world through his own emotions, sentiments, and ideas, through that infinite procession of images and conceptions that he was within himself. By understanding his personality we can

better comprehend the characters that he creates, the types that he analyzes, the conditions which he presents.

The object of this present work is to study each of the Russian novelists under the different aspects of his personality and literary talent; to establish the psychological and intellectual state of each writer by the characteristic features of his life; to dissect, analyze, and define the work of each by the internal evidence of that work. After pointing out the importance of psychology in connection with literary criticism, M. Ossip-Lourié studies in turn the life and work of Gogol, Tourguenev, Gontcharov, Dostoievsky, Tolstoy, Gaichine, Tchekov, Korolenko, Maxim Gorki, and several minor writers. While showing forth the immense individual effort of these authors, he admits that no other literature has produced so many cases of pathology of the will as the Russian novel. This phenomenon is accounted for by the distinctive peculiarities of social life in Russia.

In his conclusion M. Ossip-Lourié sketches in bold outlines a psychology of Russian classes. He says that the ruling class has still remained Asiatic at heart under a veneer of civilization. The people have always been sacrificed and kept beneath the yoke of bondage. One might even say that they have been purposely inebriated in order that they might continue resistless and incapable of revolt. There is an intellectual liberal class of which a small minority strive valliantly for liberty; but the greater number have the desire without the will to oppose the elements of despotic force. They love liberty in the abstract, but they believe it is compatible with czarism, and that a social transformation can be brought about by peaceful methods. They are too indolent to do any good, and they do harm in that they prevent the progressives from acting. These last are but a small party with abundant energy and will, but no means to carry out their purposes. Many of them are found among the impetuous undergraduates of the universities.

The book closes by urging the necessity of a frank and loyal union of all the vital forces of Russia, and claims that Europe as a whole ought to consider it a moral duty to come to the aid of the slowly developing civilizing forces there.

ESQUISSE D'UNE HISTOIRE GÉNÉRALE ET COMPARÉE DES PHILOSOPHIES MÉDIÉVALLES. Par *François Picavet*, directeur-adjoint à l'Ecole pratique des Hautes Etudes. Paris: Félix Alcan. 1905. Pp. xxxvii, 366. Price, 7 fr. 50.

It is well known that Leo XIII was a very enthusiastic adherent of St. Thomas, and has done much to restore the influence of Thomism in these latter days. Undoubtedly St. Thomas has been the representative thinker of the church; yet, after all, the man who swayed not only Thomism but the entire Mediæval philosophy, was that ancient mystic, Plotinus. According

to his views, there is a sensible world, and a spiritual world (the latter commonly called *mundus intelligibilis*). This spiritual world is dominated by the principle of perfection, its highest authority being God. The soul is encompassed by the sensible world, but can attain to a union with God in states of ecstasy.

Professor Picavet, one of the most distinguished of French savants, devotes his latest work to an investigation of the Mediæval Philosophy, pointing out the significance of Plotinus. He especially indicates in the portion devoted to synchronic and comparative history, the following phases of philosophic thought pertaining to corresponding periods of time: from the Council of Nice to 529 A. D., the conflict between the neoplatonists and the Christians; from 529 to Charlemagne, the efforts to preserve as much as possible of ancient thought and civilization; from the ninth to the thirteenth centuries, the philosophical works of the Byzantines and Western Christians, the Mussulmans and Jews; from the thirteenth century to the Renaissance and the Reformation, the development of Christian thought in the Occident; from this period to the seventeenth century, the revival of ancient systems, the continued influence or restoration of Christian philosophies, the development of Protestant philosophies, and the appearance of a scientific philosophy, which up to the eighteenth and nineteenth centuries as it increased in importance, stood more and more in opposition to mediæval doctrines.

This work of Professor Picavet helps us to understand better not only the Middle Ages, but the transition from ancient to mediæval civilization, and the nature of modern society and civilization. It permits us too, to form a philosophy of religion by relying on those religions which are best known and have presented the highest and most varied forms. Texts of earlier works have been carefully studied, and the result constitutes a safe guide both for students who wish to pursue their researches further, and for those people who desire to obtain only a general idea of this interesting phase of the history of philosophy.

ZUR EINFÜHRUNG IN DIE PHILOSOPHIE DER GEGENWART. Acht Vorträge von *Alois Riehl.* Second edition. Leipsic: B. G. Teubner. 1904. Pp. 274.

Professor Riehl's "Philosophy of the Present" discusses almost all the questions which have excited popular interest in modern times, and so we need not be astonished that this treatise has reached its second edition in a very short time. His method is that of historic or critical procedure, and all systematic construction has been avoided. The book consists of eight lectures of which five are devoted to the theoretical task of philosophy, elucidating its relation to science in classical antiquity as well as in modern times. They discuss the foundation of critical philosophy, its relation to the exact sciences, the conditions of cognition, together with the most significant problems of

epistemology, monism, and the natural sciences. The last three lectures are devoted to practical questions: the problem of a systematic conception of the world, Schopenhauer and Nietzsche, and finally philosophy at present and in time to come. With special reference to the idea of personality which has been so strongly emphasized of late, Professor Riehl calls attention to Goethe's view on the subject, saying:

"No one has valued the importance of personality more highly than Goethe, who prizes it as the greatest blessing of the human race; but he also recognized and honored the super-personal, the super-human, and respected the limitations of mankind. 'The quintessence of the universe can not be comprehended in a formula; rather is it distinctly and forcibly represented in great personalities.' 'God is constantly acting in higher natures in order to help the lower to advance.' 'It is typical of great personalities to be incorporated into the national life.' And while Goethe thought highly of great personalities, he knew at the same time that even the greatest man is nothing by himself, that he does not live for himself alone. 'Whatever man may undertake and direct, the individual is not sufficient unto himself. For in fact we are all collective beings, no matter what we do. How little we have and are that in the truest sense we can call our own! We must accept and learn from those who were before us as well as from those who are with us. The main thing is for man to have a great purpose, and the determination to carry it out.'"

STUDIES IN THE GOSPEL ACCORDING TO MARK. For the Use of Classes in Secondary Schools and in the Secondary Division of the Sunday School. By *Ernest De Witt Burton,* Professor in the University of Chicago. Chicago: The University Press. 1904. Pp. xxx, 248. Price, $1.00.

The author of this book belongs to that class of theologians who recognise higher criticism. He has pointed out that the title "The Gospel According to Mark" was not written by the original author himself, and that the Appendix, Chapter XVI, Verses 9 to 20, is not really a continuation of this Gospel; but the results of higher criticism are after all withheld, for especially in the latter case the arguments are not mentioned, and no reason is given why the original has been published. Further no mention is made of any criticism that could endanger the traditional conceptions of the divinity of Christ, or the spirit that drives him into the desert, or the nature of the temptation. Buddhist parallels are nowhere mentioned. Thus the book, in spite of its advanced position in certain lines, may be considered as still representing the old conception of Christianity.

The book is attractively made up. The material is conveniently divided into sections. Illustrations help to relieve the monotony of a school book, and

a dictionary of terms is added which contains most important instruction concerning terms and names used in the Gospel; for instance such words as "Golgotha," "Son of Man," "shew bread," "Sanhedrin," "Son of David," etc. However, some very important terms are missing that stand in great need of illustration, for instance "Nazarene." The author apparently assumes that Nazarene is simply the inhabitant of Nazareth, which, according to the traditional interpretation, is identified with el-Nasira.

The seventh volume of *L'année biologique,* covering the year 1902, has just been published under the direction of Yves Delage, Member of the Institute and Professor at the Sorbonne, with the collaboration of a staff of able co-editors. The present annual is a volume of over six hundred pages and covers almost the entire range of biological science. It contains twenty chapters: I. The Cell, its Chemical Structure and its Parts, its Physiology and Functions; II. Sexual Products and Fecundation, the Origin of Embryology, Normal Fecundation, Merogony, Partial Fecundation; III. Parthenogenesis, its Conditions and Experimental Parthenogenesis; IV. Asexual Reproduction, by Division, by Budding, and by Spores; V. Ontogenesis, Tactisms, Tropisms, Functional Excitation, Ontogenetic Adaptation, Bio-mechanics; VI. Teratogenesis, Laws and Causes of the Formation of Monsters; Experimental Teratogenesis and Natural Teratogenesis; VII. Regeneration, Normal as Well as Heteromorphic; VIII. Grafting; IX. Sex and Secondary Sexual Characters; X. Metagenic Polymorphism, Metamorphism and the Alteration of Generation; XI. Latent Characters; XII. Correlations Between Organs and their Functions; XIII. Death, Senility and Immortality of Protists and Germinative Plasm; XIV. Morphology and General Physiology, Chemical Compositions of Organic Substances, Physiology of Nutrition and the Action of the Different Agents; XV. Heredity, Transmission of Characters; XVI. Variation, its Laws, its Forms, and its Causes; XVII. The Origin of Species and their Characters, Fixation of Different Kinds of Variations, New Formations, Divergences, Convergences, Phlsiological Adaptation, Physiological Species, Factors of the Formation of Species and Artificial and Natural Selection, Germinal, Sexual, etc., Segregation and Pan-mixia, Direct Influence of the Mileur, Particular Adaptations, Symbiosis, Parasitism, Mimicry, Phylogeny, the Disappearance of Species; XVIII. The Geographical Distribution of Living Forms; XIX. The Nervous System and Mental Functions, Structure and Functions of the Nerve Cells, Nervous Centers, and Sense Organs; The Nervous Cell, its Physiology and Pathology; Nerve Centers, their Structure; Cerebral Localisations, Sense Organs; Psychical Processes, Sensations, Sentiments, Ideation, Comparative Psychology; XX. General Theories.

Professor Wilhelm Windelband has delivered a memorial lecture in commemoration of the centennial return of Kant's day of death at the University of Heidelberg, and Karl Winters, the University publisher of Heidelberg, has published it in pamphlet form.* Professor Windelband epitomises in it the significance of Kant's life and thought, especially emphasising the moral tenor of his philosophy.

From Italy we have received a number of pamphlets on philosophical subjects; one by Dr. Erminio Troilo† on the doctrine of cognition in Herbert Spencer which is in reality a critical review of the philosophy of agnosticism, especially compared with Kant's critical transcendentalism.

Another pamphlet comes from Florence.‡ It is written by Dr. Guglielmo Salvadori and treats a series of problems of moral philosophy under the title *Moral Sentiment.* It discusses in the first chapter the criterion of the moral value of the ethical sentiment, in the second chapter the classification of the moral sentiment, in the third chapter the development of the moral sentiment. In the conclusion our author descants on the moral sentiment from the empirical, metaphysical, and rational point of view. The standpoint which he takes is a kind of rational eudemonism founded upon the experiences of the utilitarian school.

The third book§ is written by Dr. Roberto Ardigo and published at Turin by Bocca Brothers. It is an historical treatise of about 300 pages on the doctrine of cognition from Descartes to Kant. In the introduction he speaks of modern philosophy and its experimental methods as instanced in Galileo. Chapter I. treats of Bacon and Galileo, Chapter II., of Descartes, Leibnitz, Wolff, and Berkeley, Chapter III., of Locke, Hume, and minor contemporaries of Kant, especially Moses, Mendelssohn, Lambert, Burthogge, closing with an appreciation of the drift of modern philosophy of the character of modern thought, and the death sentence of the old philosophy as enunciated by Kant. Chapter IV. contains the *gnoseo*-logical value of the scientific revolution of modern times.

**Immanual Kant und seine Weltanschauung.*

†*La Dottrina della Conoscenza pi Herbert Spencer.* Bologna: Stab.

‡*Saggio di uno Studio sui Sentimenti Morali.* Firenze: Francesco.

§*La Dottrina della Conoscenza Nei Moderni Precursori di Kant.*

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THE MONIST

ISSUES OF PRAGMATICISM.

PRAGMATICISM was originally enounced[1] in the form of a maxim, as follows: Consider what effects that might *conceivably* have practical bearings you *conceive* the objects of your *conception* to have. Then, your *conception* of those effects is the whole of your *conception* of the object.

I will restate this in other words, since ofttimes one can thus eliminate some unsuspected source of perplexity to the reader. This time it shall be in the indicative mood, as follows: The entire intellectual purport of any symbol consists in the total of all general modes of rational conduct which, conditionally upon all the possible different circumstances and desires, would ensue upon the acceptance of the symbol.

Two doctrines that were defended by the writer about nine years before the formulation of pragmaticism may be treated as consequences of the latter belief. One of these may be called Critical Common-sensism. It is a variety of the Philosophy of Common Sense, but is marked by six distinctive characters, which had better be enumerated at once.

Character I. Critical Common-sensism admits that there not only are indubitable propositions but also that there are indubitable inferences. In one sense, anything evident is indubitable; but the propositions and inferences which Critical Common-Sensism holds to be original, in the sense one cannot "go behind" them (as the

[1] *Popular Science Monthly*, XII, 293; for Jan. 1878. An introductory article opens the volume, in the number for Nov., 1877.

lawyers say) are indubitable in the sense of being acritical. The term "reasoning" ought to be confined to such fixation of one belief by another as is reasonable, deliberate, self-controlled. A reasoning must be conscious; and this consciousness is not mere "immediate consciousness," which (as I argued in 1868, *J. Spec. Phil.*, Vol. II) is simple Feeling viewed from another side, but is in its ultimate nature (meaning in that characteristic element of it that is not reducible to anything simpler), a sense of taking a habit, or disposition to respond to a given kind of stimulus in a given kind of way. As to the nature of that, some *éclaircissements* will appear below and again in my third paper, on the Basis of Pragmaticism. But the secret of rational consciousness is not so much to be sought in the study of this one peculiar nucleolus, as in the review of the process of self-control in its entirety. The machinery of logical self-control works on the same plan as does moral self-control, in multiform detail. The greatest difference, perhaps, is that the latter serves to inhibit mad puttings forth of energy, while the former most characteristically insures us against the quandary of Buridan's ass. The formation of habits under imaginary action (see the paper of Jan., 1878, p. 290 at the top) is one of the most essential ingredients of both; but in the logical process the imagination takes far wider flights, proportioned to the generality of the field of inquiry, being bounded in pure mathematics solely by the limits of its own powers, while in the moral process we consider only situations that may be apprehended or anticipated. For in moral life we are chiefly solicitous about our conduct and its inner springs, and the approval of conscience, while in intellectual life there is a tendency to value existence as the vehicle of forms. Certain obvious features of the phenomena of self-control (and especially of habit), can be expressed compactly and without any hypothetical addition, except what we distinctly rate as imagery, by saying that we have an occult nature of which and of its contents we can only judge by the conduct that it determines, and by phenomena of that conduct. All will assent to that (or all but the extreme nominalist), but anti-synechistic thinkers wind themselves up in a facticious snarl by falsifying the phenomena in representing con-

sciousness to be, as it were, a skin, a separate tissue, overlying an unconscious region of the occult nature, mind, soul, or physiological basis. It appears to me that in the present state of our knowledge a sound methodeutic prescribes that, in adhesion to the appearances, the difference is only relative and the demarcation not precise.

According to the maxim of Pragmaticism, to say that determination affects our occult nature is to say that it is capable of affecting deliberate conduct; and since we are conscious of what we do deliberately, we are conscious *habitualiter* of whatever hides in the depths of our nature; and it is presumable (and *only* presumable,[2] although curious instances are on record), that a sufficiently energetic effort of attention would bring it out. Consequently, to say that an operation of the mind is controlled is to say that it is, in a special sense, a conscious operation; and this no doubt is the consciousness of reasoning. For this theory requires that in reasoning we should be conscious, not only of the conclusion, and of our deliberate approval of it, but also of its being the result of the premiss from which it does result, and furthermore that the inference is one of a possible class of inferences which conform to one guiding principle. Now in fact we find a well-marked class of mental operations, clearly of a different nature from any others which do possess just these properties. They alone deserve to be called *reasonings;* and if the reasoner is conscious, even vaguely, of what his guiding principle is, his reasoning should be called a *logical argumentation.* There are, however, cases in which we are conscious that a belief has been determined by another given belief, but are not conscious that it proceeds on any general principle. Such is St. Augustine's *"cogito, ergo sum."* Such a process should be called, not a reasoning but an *acritical inference.* Again, there are cases in which one belief is determined by another, without our being at all aware of it. These should be called *associational suggestions of belief.*

Now the theory of Pragmaticism was originally based, as anybody will see who examines the papers of Nov. 1877 and Jan. 1878,

[2] But see the experiments of J. Jastrow and me "On Slight Differences of Sensation" in the *Memoirs of the National Academy of Sciences.* Vol. III.

upon a study of that experience of the phenomena of self-control which is common to all grown men and women; and it seems evident that to some extent, at least, it must always be so based. For it is to conceptions of deliberate conduct that Pragmaticism would trace the intellectual purport of symbols; and deliberate conduct is self-controlled conduct. Now control may itself be controlled, criticism itself subjected to criticism; and ideally there is no obvious definite limit to the sequence. But if one seriously inquires whether it is possible that a completed series of actual efforts should have been endless or beginningless, (I will spare the reader the discussion), I think he can only conclude that (with some vagueness as to what constitutes an effort) this must be regarded as impossible. It will be found to follow that there are, besides perceptual judgments, original (i. e. indubitable because uncriticized) beliefs of a general and recurrent kind, as well as indubitable acritical inferences.

It is important for the reader to satisfy himself that genuine doubt always has an external origin, usually from surprise; and that it is as impossible for a man to create in himself a genuine doubt by such an act of the will as would suffice to imagine the condition of a mathematical theorem, as it would be for him to give himself a genuine surprise by a simple act of the will.

I beg my reader also to believe that it would be impossible for me to put into these articles over two per cent. of the pertinent thought which would be necessary in order to present the subject as I have worked it out. I can only make a small selection of what it seems most desirable to submit to his judgment. Not only must all steps be omitted which he can be expected to supply for himself, but unfortunately much more that may cause him difficulty.

Character II. I do not remember that any of the old Scotch philosophers ever undertook to draw up a complete list of the original beliefs, but they certainly thought it a feasible thing, and that the list would hold good for the minds of all men from Adam down. For in those days Adam was an undoubted historical personage. Before any waft of the air of evolution had reached those coasts how could they think otherwise? When I first wrote, we were hardly orientated in the new ideas, and my impression was that the indubitable propo-

sitions changed with a thinking man from year to year. I made some studies preparatory to an investigation of the rapidity of these changes, but the matter was neglected, and it has been only during the last two years that I have completed a provisional inquiry which shows me that the changes are so slight from generation to generation, though not imperceptible even in that short period, that I thought to own my adhesion, under inevitable modification, to the opinion of that subtle but well-balanced intellect, Thomas Reid, in the matter of Common Sense (as well as in regard to immediate perception, along with Kant).[3]

Character III. The Scotch philosophers recognized that the original beliefs, and the same thing is at least equally true of the acritical inferences, were of the general nature of instincts. But little as we know about instincts, even now, we are much better acquainted with them than were the men of the XVIIIth century. We know, for example, that they can be somewhat modified in a very short time. The great facts have always been known; such as that instinct seldom errs, while reason goes wrong nearly half the time, if not more frequently. But one thing the Scotch failed to recognize is that the original beliefs only remain indubitable in their application to affairs that resemble those of a primitive mode of life. It is, for example, quite open to reasonable doubt whether the motions of electrons are confined to three dimensions, although it is good methodeutic to presume that they are until some evidence to the contrary is forthcoming. On the other hand, as soon as we find that a belief shows symptoms of being instinctive, although it may seem to be dubitable, we must suspect that experiment would show that it is not really so; for in our artificial life, especially in that of a student, no mistake is more likely than that of taking a paper-doubt for the genuine metal. Take, for example, the belief in the criminality of incest. Biology will doubtless testify that the practice is unadvisable; but surely nothing that it has to say could

[3] I wish I might hope, after finishing some more difficult work, to be able to resume this study and to go to the bottom of the subject, which needs the qualities of age and does not call upon the powers of youth. A great range of reading is necessary; for it is the belief men *betray* and not that which they *parade* which has to be studied.

warrant the intensity of our sentiment about it. When, however, we consider the thrill of horror which the idea excites in us, we find reason in that to consider it to be an instinct; and from that we may infer that if some rationalistic brother and sister were to marry, they would find that the conviction of horrible guilt could not be shaken off.

In contrast to this may be placed the belief that suicide is to be classed as murder. There are two pretty sure signs that this is not an instinctive belief. One is that it is substantially confined to the Christian world. The other is that when it comes to the point of actual self-debate, this belief seems to be completely expunged and ex-sponged from the mind. In reply to these powerful arguments, the main points urged are the authority of the fathers of the church and the undoubtedly intense instinctive clinging to life. The latter phenomenon is, however, entirely irrelevant. For though it is a wrench to part with life, which has its charms at the very worst, just as it is to part with a tooth, yet there is no *moral* element in it whatever. As to the Christian tradition, it may be explained by the circumstances of the early Church. For Christianity, the most terribly earnest and most intolerant of religions,—[See *The Book of Revelations of St. John the Divine,*]—and it remained so until diluted with civilization,—recognized no morality as worthy of an instant's consideration except Christian morality. Now the early Church had need of martyrs, i. e., witnesses, and if any man had done with life, it was abominable infidelity to leave it otherwise than as a witness to its power. This belief, then, should be set down as dubitable; and it will no sooner have been pronounced dubitable, than Reason will stamp it as false.

The Scotch School appear to have no such distinction, concerning the limitations of indubitability and the consequent limitations of the jurisdiction of original belief.

Character IV. By all odds, the most distinctive character of the Critical Common-sensist, in contrast to the old Scotch philosopher, lies in his insistence that the acritically indubitable is invariably vague.

Logicians have been at fault in giving Vagueness the go-by,

so far as not even to analyze it. The present writer has done his best to work out the Stechiology (or Stoicheiology), Critic, and Methodeutic of the subject, but can here only give a definition or two with some proposals respecting terminology.

Accurate writers have apparently made a distinction between the *definite* and the *determinate*. A subject is *determinate* in respect to any character which inheres in it or is (universally and affirmatively) predicated of it, as well as in respect to the negative of such character, these being the very same respect. In all other respects it is *indeterminate*. The *definite* shall be defined presently. A sign (under which designation I place every kind of thought, and not alone external signs,) that is in any respect objectively indeterminate (i. e. whose object is undetermined by the sign itself) is objectively *general* in so far as it extends to the interpreter the privilege of carrying its determination further.[4] *Example*: "Man is mortal." To the question, What man? the reply is that the proposition explicitly leaves it to you to apply its assertion to what man or men you will. A sign that is objectively indeterminate in any respect is objectively *vague* in so far as it reserves further determination to be made in some other conceivable sign, or at least does not appoint the interpreter as its deputy in this office. *Example*: "A man whom I could mention seems to be a little conceited." The *suggestion* here is that the man in view is the person addressed; but the utterer does not authorize such an interpretation or *any* other application of what she says. She can still say, if she likes, that she does *not* mean the person addressed. Every utterance naturally leaves the right of further exposition in the utterer; and

[4] Hamilton and a few other logicians understood the subject of a universal proposition in the collective sense; but every person who is well-read in logic is familiar with many passages in which the leading logicians explain with an iteration that would be superfluous if all readers were intelligent, that such a subject is distributively not collectively general. A term denoting a collection is singular, and such a term is an "abstraction" or product of the operation of hypostatic abstraction as truly as is the name of the essence. "Mankind" is quite as much an abstraction and *ens rationis* as is "humanity." Indeed, every object of a conception is either a signate individual or some kind of indeterminate individual. Nouns in the plural are usually distributive and general; common nouns in the singular are usually indefinite.

therefore, in so far as a sign is indeterminate, it is vague, unless it is expressly or by a well-understood convention rendered general. Usually, an affirmative predication covers *generally* every essential character of the predicate, while a negative predication *vaguely* denies some essential character. In another sense, honest people, when not joking, intend to make the meaning of their words determinate, so that there shall be no latitude of interpretation at all. That is to say, the character of their meaning consists in the implications and non-implications of their words; and they intend to fix what is implied and what is not implied. They believe that they succeed in doing so, and if their chat is about the theory of numbers, perhaps they may. But the further their topics are from such presciss, or "abstract," subjects, the less possibility is there of such precision of speech. In so far as the implication is not determinate, it is usually left vague; but there are cases where an unwillingness to dwell on disagreeable subjects causes the utterer to leave the determination of the implication to the interpreter; as if one says, "That creature is filthy, in every sense of the term."

Perhaps a more scientific pair of definitions would be that anything is *general* in so far as the principle of excluded middle does not apply to it and is *vague* in so far as the principle of contradiction does not apply to it. Thus, although it is true that "Any proposition you please, *once you have determined its identity*, is either true or false"; yet *so long as it remains indeterminate and so without identity*, it need neither be true that any proposition you please is true, nor that any proposition you please is false. So likewise, while it is false that "A proposition *whose identity I have determined* is both true and false," yet until it is determinate, it may be true that a proposition is true and that a propostion is false.

In those respects in which a sign is not vague, it is said to be *definite,* and also with a slightly different mode of application, to be *precise,* a meaning probably due to *præcisus* having been applied to curt denials and refusals. It has been the well-established, ordinary sense of *precise* since the Plantagenets; and it were much to be desired that this word, with its derivatives *precision, precisive,* etc., should, in the dialect of philosophy, be restricted to this sense.

To express the act of *rendering precise* (though usually only in reference to numbers, dates, and the like,) the French have the verb *préciser,* which, after the analogy of *décider,* should have been *précider.* Would it not be a useful addition to our English terminology of logic, to adopt the verb *to precide,* to express the general sense, to render precise? Our older logicians with salutary boldness seem to have created for their service the verb *to prescind,* the corresponding Latin word meaning only to "cut off at the end," while the English word means to suppose without supposing some more or less determinately indicated accompaniment. In geometry, for example, we "prescind" shape from color, which is precisely the same thing as to "abstract" color from shape, although very many writers employ the verb "to abstract" so as to make it the equivalent of "prescind." But whether it was the invention or the courage of our philosophical ancestors which exhausted itself in the manufacture of the verb "prescind," the curious fact is that instead of forming from it the noun *prescission,* they took pattern from the French logicians in putting the word *precision* to this second use. About the same time[5] [See Watts. *Logick,* 1725, I, vi, 9 *ad fin.*] the adjective *precisive* was introduced to signify what *prescissive* would have more unmistakably conveyed. If we desire to rescue the good ship Philosophy for the service of Science from the hands of lawless rovers of the sea of literature, we shall do well to keep prescind, presciss, prescission, and prescissive on the one hand, to refer to dissection in hypothesis, while precide, precise, precision, and precisive are used so as to refer exclusively to an expression of determination which is made either full or free for the interpreter. We shall thus do much to relieve the stem "abstract" from staggering under the double burden of conveying the idea of prescission as well as the unrelated and very important idea of the creation of *ens rationis* out of an ἔπος πτερόεν,—to filch the phrase to furnish a name for an expression of non-substantive thought,—an opera-

[5] But unfortunately it has not been in the writer's power to consult the *Oxford Dictionary* concerning these words; so that probably some of the statements in the text might be corrected with the aid of that work.

tion that has been treated as a subject of ridicule,—this hypostatic abstraction,—but which gives mathematics half its power.

The purely formal conception that the three affections of terms, *determination, generality,* and *vagueness* form a group dividing a category of what Kant calls "functions of judgment" will be passed by as unimportant by those who have yet to learn how important a part purely formal conceptions may play in philosophy. Without stopping to discuss this, it may be pointed out that the "quantity" of propositions in logic, that is, the distribution of the *first* subject[6], is either *singular* (that is, determinate, which renders it substantially negligible in formal logic), or *universal* (that is, general), or *particular* (as the mediæval logicians say, that is, vague or *indefinite*). It is a curious fact that in the logic of relations it is the first and last quantifiers of a proposition that are of chief importance. To affirm of anything that it is a horse is to yield to it *every* essential character of a horse: to deny of anything that it is a horse is vaguely to refuse to it *some* one or more of those essential characters of the horse. There are, however, predicates that are unanalyzable in a given state of intelligence and experience. These are, therefore, determinately affirmed or denied. Thus, this same group of concepts reappears. Affirmation and denial are in themselves unaffected by these concepts, but it is to be remarked that there are cases in which we can have an apparently definite idea of a border line between affirmation and negation. Thus, a point of a surface may be in a region of that surface, or out of it, or on its boundary. This gives us an indirect and vague conception of an intermediary between affirmation and denial in general, and consequently of an intermediate, or nascent state, between determination and indetermination. There must be a similar intermediacy between generality and vagueness. Indeed, in an article in the seventh volume of

[6] Thus returning to the writer's original nomenclature, in despite of *Monist* VII, 209, where an obviously defective argument was regarded as sufficient to determine a mere matter of terminology. But the Quality of propositions is there regarded from a point of view which seems extrinsic. I have not had time, however, to re-explore all the ramifications of this difficult question by the aid of existential graphs, and the statement in the text about the last quantifier may need modification.

The Monist, pp. 205-217, there lies just beneath the surface of what is explicitly said, the idea of an endless series of such *intermediacies.* We shall find below some application for these reflections.

Character V. The Critical Common-sensist will be further distinguished from the old Scotch philosopher by the great value he attaches to doubt, provided only that it be the weighty and noble metal itself, and no counterfeit nor paper substitute. He is not content to ask himself whether he does doubt, but he invents a plan for attaining to doubt, elaborates it in detail, and then puts it into practice, although this may involve a solid month of hard work; and it is only after having gone through such an examination that he will pronounce a belief to be indubitable. Moreover, he fully acknowledges that even then it may be that some of his indubitable beliefs may be proved false.

The Critical Common-sensist holds that there is less danger to heuretic science in believing too little than in believing too much. Yet for all that, the consequences to heuretics of believing too little may be no less than disaster.

Character VI. Critical Common-sensism may fairly lay claim to this title for two sorts of reasons; namely, that on the one hand it subjects four opinions to rigid criticism: its own; that of the Scotch school; that of those who would base logic or metaphysics on psychology or any other special science, the least tenable of all the philosophical opinions that have any vogue; and that of Kant; while on the other hand it has besides some claim to be called Critical from the fact that it is but a modification of Kantism. The present writer was a pure Kantist until he was forced by successive steps into Pragmaticism. The Kantist has only to abjure from the bottom of his heart the proposition that a thing-in- itself can, however indirectly, be conceived; and then correct the details of Kant's doctrine accordingly, and he will find himself to have become a Critical Common-sensist.

Another doctrine which is involved in Pragmaticism as an essential consequence of it, but which the writer defended (*J. Spec. Phil.,* Vol. II, p. 155 *ad fin.* 1868, and *N. Am. Rev.,* Vol. CXIII, pp. 449-472, 1871), before he had formulated, even in his own

mind, the principle of pragmaticism, is the scholastic doctrine of realism. This is usually defined as the opinion that there are real objects that are general, among the number being the modes of determination of existent singulars, if, indeed, these be not the only such objects. But the belief in this can hardly escape being accompanied by the acknowledgment that there are, besides, real *vagues*, and especially real possibilities. For possibility being the denial of a necessity, which is a kind of generality, is vague like any other contradiction of a general. Indeed, it is the reality of some possibilities that pragmaticism is most concerned to insist upon. The article of Jan. 1878 endeavored to gloze over this point as unsuited to the exoteric public addressed; or perhaps the writer wavered in his own mind. He said that if a diamond were to be formed in a bed of cotton-wool, and were to be consumed there without ever having been pressed upon by any hard edge or point, it would be merely a question of nomenclature whether that diamond should be said to have been hard or not. No doubt, this is true, except for the abominable falsehood in the word MERELY, implying that symbols are unreal. Nomenclature involves classification; and classification is true or false, and the generals to which it refers are either reals in the one case, or figments in the other. For if the reader will turn to the original maxim of pragmaticism at the beginning of this article, he will see that the question is, not what *did* happen, but whether it would have been well to engage in any line of conduct whose successful issue depended upon whether that diamond *would* resist an attempt to scratch it, or whether all other logical means of determining how it ought to be classed *would* lead to the conclusion which, to quote the very words of that article, would be "the belief which alone could be the result of investigation carried *sufficiently far.*" Pragmaticism makes the ultimate intellectual purport of what you please to consist in conceived conditional resolutions, or their substance; and therefore, the conditional propositions, with their hypothetical antecedents, in which such resolutions consist, being of the ultimate nature of meaning, must be capable of being true, that is, of expressing whatever there be which is such as the proposition expresses, independently of being

thought to be so in any judgment, or being represented to be so in any other symbol of any man or men. But that amounts to saying that possibility is sometimes of a real kind.

Fully to understand this, it will be needful to analyze modality, and ascertain in what it consists. In the simplest case, the most subjective meaning, if a person does not know that a proposition is false, he calls it *possible.* If, however, he knows that it is *true,* it is much more than possible. Restricting the word to its characteristic applicability, a state of things has the Modality of the possible, —that is, of the merely possible,—only in case the contradictory state of things is likewise possible, which proves possibility to be the vague modality. One who knows that Harvard University has an office in State Street, Boston, and has impression that it is at No. 30, but yet suspects that 50 is the number, would say "I think it is at No. 30, but it *may be* at No. 50," or "it *is possibly* at No. 50." Thereupon, another, who does not doubt his recollection, might chime in, "It *actually is* at No. 50," or simply "it *is* at No. 50," or " it *is* at No. 50, *de inesse.*" Thereupon, the person who had first asked, what the number was might say, "Since you are so positive, it *must be* at No. 50," for "I know the first figure is 5. So, since you are both certain the second is a 0, why 50 it *necessarily is.*" That is to say, in this most subjective kind of Modality, that which is known by direct recollection is in the Mode of *Actuality,* the determinate mode. But when knowledge is indeterminate among alternatives, either there is one state of things which alone accords with them all, when this is in the Mode of *Necessity,* or there is more than one state of things that no knowledge excludes, when each of these is in the Mode of *Possibility.*

Other kinds of subjective Modality refer to a Sign or Representamen which is assumed to be true, but which does not include the Utterer's (i. e. the speaker's, writer's, thinker's or other symbolizer's) total knowledge, the different Modes being distinguished very much as above. There are other cases, however, in which, justifiably or not, we certainly think of Modality as objective. A man says, "I *can* go to the seashore if I like." Here is implied, to be sure, his ignorance of how he will decide to act. But this is not

the point of the assertion. It is that the complete determination of conduct in the *act* not yet having taken place, the further determination of it belongs to the subject of the action regardless of external circumstances. If he had said, "I *must* go where my employers may send me," it would imply that the function of such further determination lay elsewhere. In "You *may* do so and so," and "You *must* do so," the "may" has the same force as "can," except that in the one case freedom from particular circumstances is in question, and in the other freedom from a law or edict. Hence the phrase, "You *may* if you *can*." I must say that it is difficult for me to preserve my respect for the competence of a philosopher whose dull logic, not penetrating beneath the surface, leaves him to regard such phrases as misrepresentations of the truth. So an act of hypostatic abstraction which in itself is no violation of logic, however it may lend itself to a dress of superstition, may regard the collective tendencies to variableness in the world, under the name of Chance, as at one time having their way, and at another time overcome by the element of order; so that, for example, a superstitious cashier, impressed by a bad dream, may say to himself of a Monday morning, "*May be,* the bank has been robbed." No doubt, he recognizes his total ignorance in the matter. But besides that, he has in mind the absence of any particular cause which should protect his bank more than others that are robbed from time to time. He thinks of the variety in the universe as vaguely analogous to the indecision of a person, and borrows from that analogy the garb of his thought. At the other extreme stand those who declare as inspired, (for they have no rational proof of what they allege), that an actuary's advice to an insurance company is based on nothing at all but ignorance.

There is another example of objective possibility: "A pair of intersecting rays, i. e., unlimited straight lines conceived as movable objects, *can* (or *may*) move, without ceasing to intersect, so that one and the same hyperboloid shall be completely covered by the track of each of them." How shall we interpret this, remembering that the object spoken of, the pair of rays, is a pure creation of the Utterer's imagination, although it is required (and, indeed, forced)

to conform to the laws of space? Some minds will be better satisfied with a more subjective, or nominalistic, others with a more objective, realistic interpretation. But it must be confessed on all hands that whatever degree or kind of reality belongs to pure space belongs to the substance of that proposition, which merely expresses a property of space.

Let us now take up the case of that diamond which, having been crystallized upon a cushion of jeweler's cotton, was accidentally consumed by fire before the crystal of corundum that had been sent for had had time to arrive, and indeed without being subjected to any other pressure than that of the atmosphere and its own weight. The question is, was that diamond *really* hard? It is certain that no discernible *actual* fact determined it to be so. But is its hardness not, nevertheless, a *real* fact? To say, as the article of Jan. 1878 seems to intend, that it is just as an arbitrary "usage of speech" chooses to arrange its thoughts, is as much as to decide against the reality of the property, since the real is that which is such as it is regardless of how it is, at any time, thought to be. Remember that this diamond's condition is not an isolated fact. There is no such thing; and an isolated fact could hardly be real. It is an unsevered, though presciss part of the unitary fact of nature. Being a diamond, it was a mass of pure carbon, in the form of a more or less transparent crystal, (brittle, and of facile octahedral cleavage, unless it was of an unheard of variety), which, if not trimmed after one of the fashions in which diamonds may be trimmed, took the shape of an octahedron, apparently regular (I need not go into minutiæ), with grooved edges, and probably with some curved faces. Without being subjected to any considerable pressure, it could be found to be insoluble, very highly refractive, showing under radium rays (and perhaps under "dark light" and X-rays) a peculiar bluish phosphorescence, having as high a specific gravity as realgar or orpiment, and giving off during its combustion less heat than any other form of carbon would have done. From some of these properties hardness is believed to be inseparable. For like it they bespeak the high polemerization of the molecule. But however this may be, how can the hardness of all other diamonds fail

to bespeak *some* real relation among the diamonds without which a piece of carbon would not be a diamond? Is it not a monstrous perversion of the word and concept *real* to say that the accident of the non-arrival of the corundum prevented the hardness of the diamond from having the *reality* which it otherwise, with little doubt, would have had?

At the same time, we must dismiss the idea that the occult state of things (be it a relation among atoms or something else), which constitutes the reality of a diamond's hardness can possibly consist in anything but in the truth of a general conditional proposition. For to what else does the entire teaching of chemistry relate except to the "behavior" of different possible kinds of material substance? And in what does that behavior consist except that if a substance of a certain kind should be exposed to an agency of a certain kind, a certain kind of sensible result *would* ensue, according to our experiences hitherto. As for the pragmaticist, it is precisely his position that nothing else than this can be so much as *meant* by saying that an object possesses a character. He is therefore obliged to subscribe to the doctrine of a real Modality, including real Necessity and real Possibility.

A good question, for the purpose of illustrating the nature of Pragmaticism, is, What is Time? It is not proposed to attack those most difficult problems connected with the psychology, the epistemology, or the metaphysics of Time, although it will be taken for granted, as it must be according to what has been said, that Time is real. The reader is only invited to the humbler question of what we mean by Time, and not of every kind of meaning attached to Past, Present, and Future either. Certain peculiar feelings are associated with the three general determinations of Time; but those are to be sedulously put out of view. That the reference of events to Time is irresistible will be recognized; but as to how it may differ from other kinds of irresistibility is a question not here to be considered. The question to be considered is simply, What is the intellectual purport of the Past, Present, and Future? It can only be treated with the utmost brevity.

That Time is a particular variety of objective Modality is too

obvious for argumentation. The Past consists of the sum of *faits accomplis,* and this Accomplishment is the Existential Mode of Time. For the Past really acts upon us, and *that* it does, not at all in the way in which a Law or Principle influences us, but precisely as an Existent object acts. For instance, when a *Nova Stella* bursts out in the heavens, it acts upon one's eyes just as a light struck in the dark by one's own hands would; and yet it is an event which happened before the Pyramids were built. A neophyte may remark that its reaching the eyes, which is all we know, happens but a fraction of a second before we know it. But a moment's consideration will show him that he is losing sight of the question, which is not whether the distant Past can act upon us *immediately,* but whether it acts upon us just as any Existent does. The instance adduced (certainly a commonplace enough fact), proves conclusively that the mode of the Past is that of Actuality. Nothing of the sort is true of the Future, to compass the understanding of which it is indispensable that the reader should divest himself of his Necessitarianism,—at best, but a scientific theory,—and return to the Common-sense State of Nature. Do you never say to yourself, "I *can* do this or that as well to-morrow as to-day"? Your Necessitarianism is a theoretical pseudo-belief,—a make-believe belief,—that such a sentence does not express the real truth. That is only to stick to proclaiming the unreality of that Time, of which you are invited, be it reality or figment, to consider the meaning. You need not fear to compromise your darling theory by looking out at its windows. Be it true in theory or not, the unsophisticated conception is that everything in the Future is either *destined,* i. e. necessitated already, or is *undecided,* the contingent future of Aristotle. In other words, it is not Actual, since it does not act except through the idea of it, that is, as a law acts; but is either Necessary or Possible, which are of the same mode since (as remarked above) Negation being outside the category of modality cannot produce a variation in Modality. As for the Present instant, it is so inscrutable that I wonder whether no sceptic has ever attacked its reality. I can fancy one of them dipping his pen in his blackest ink to commence the assault, and then suddenly reflecting that his entire life

is in the Present,—the "living present," as we say, this instant when all hopes and fears concerning it come to their end, this Living Death in which we are born anew. It is plainly that Nascent State between the Determinate and the Indeterminate that was noticed above.

Pragmaticism consists in holding that the purport of any concept is its conceived bearing upon our conduct. How, then, does the Past bear upon conduct? The answer is self-evident: whenever we set out to do anything, we "go upon," we base our conduct on facts already known, and for these we can only draw upon our memory. It is true that we may institute a new investigation for the purpose; but its discoveries will only become applicable to conduct after they have been made and reduced to a memorial maxim. In short, the Past is the store-house of all our knowledge.

When we say that we know that some state of things exists, we mean that it used to exist, whether just long enough for the news to reach the brain and be retransmitted to tongue or pen, or longer ago. Thus, from whatever point of view we contemplate the Past, it appears as the Existential Mode of Time.

How does the Future bear upon conduct? The answer is that future facts are the only facts that we can, in a measure, control; and whatever there may be in the Future that is not amenable to control are the things that we *shall* be able to infer, or *should* be able to infer under favorable circumstances. There may be questions concerning which the pedulum of opinion never would cease to oscillate, however favorable circumstances may be. But if so, those questions are *ipso facto* not *real* questions, that is to say, are questions to which there is no true answer to be given. It is natural to use the future tense (and the conditional mood is but a mollified future) in drawing a conclusion or in stating a consequence. "If two unlimited straight lines in one plane and crossed by a third making the sum ... then these straight lines *will* meet on the side, etc." It cannot be denied that acritical inferences may refer to the Past in its capacity as past; but according to Pragmaticism, the conclusion of a Reasoning power must refer to the Future. For its meaning refers to conduct, and since it is a reasoned conclusion

must refer to deliberate conduct, which is controllable conduct. But the only controllable conduct is Future conduct. As for that part of the Past that lies beyond memory, the Pragmaticist doctrine is that the meaning of its being believed to be in connection with the Past consists in the acceptance as truth of the conception that we ought to conduct ourselves according to it (like the meaning of any other belief). Thus, a belief that Christopher Columbus discovered America really refers to the future. It is more difficult, it must be confessed, to account for beliefs that rest upon the double evidence of feeble but direct memory and upon rational inference. The difficulty does not seem insuperable; but it must be passed by.

What is the bearing of the Present instant upon conduct?

Introspection is wholly a matter of inference. One is immediately conscious of his Feelings, no doubt; but not that they are feelings of an *ego*. The *self* is only inferred. There is no time in the Present for any inference at all, least of all for inference concerning that very instant. Consequently the present object must be an external object, if there be any objective reference in it. The attitude of the Present is either conative or perceptive. Supposing it to be perceptive, the perception must be immediately known as external,—not indeed in the sense in which a hallucination is *not* external, but in the sense of being present regardless of the perceiver's will or wish. Now this kind of externality is conative externality. Consequently, the attitude of the present instant (according to the testimony of Common Sense, which is plainly adopted throughout) can only be a Conative attitude. The consciousness of the present is then that of a struggle over what shall be; and thus we emerge from the study with a confirmed belief that it is the Nascent State of the Actual.

But how is Temporal Modality distinguished from other Objective Modality? Not by any general character since Time is unique and *sui generis*. In other words there is only one Time. Sufficient attention has hardly been called to the surpassing truth of this for Time as compared with its truth for Space. Time, therefore, can only be identified by brute compulsion. But we must not go further.

MILFORD, PA. CHARLES S. PEIRCE.

CHINESE OCCULTISM.

BELIEF in mysterious agencies characterises a certain period in the religious development of every nation. Even the Jews, distinguished among the Semites by their soberness, consulted Yahveh through the Urim and Thummim, an oracle the nature of which is no longer definitely known. Kindred institutions among most nations are based upon primitive animism, or a belief in spirits, but in China we have a very peculiar mixture of logical clearness with fanciful superstitions. Chinese occultism is based upon a rational, nay a philosophical, or even mathematical, conception of existence. An original rationalism has here engendered a most luxurious growth of mysticism, and so the influence of occultism upon the people of the Middle Kingdom has been prolonged beyond measure.

THE YIH SYSTEM.

Among the ancient traditions of China there is a unique system of symbols called the *yih* (易), i. e., "permutations" or "changes,"

THE TWO PRIMARY FORMS* (LIANG I).

	THE YANG	THE YIH
Old form	○	●
Modern form	———	— —

* It is difficult to translate the term *Liang I*. One might call the two *I* "elements," if that word were not used in another sense. The two *I* are commonly referred to as "Elementary Forms" or "Primary Forms." De Groot speaks of them as "Regulators."

which consists of all possible combinations of two elements, called *liang i* (兩 儀), i. e., the two elementary forms, which are the negative principle, *yin* (陰), and the positive principle, *yang* (陽). The four possible configurations of yang and yin in groups of two are called *ssu shiang* (四 象), i. e., "the four [secondary] figures"; all further combinations of the elementary forms into groups of three or more are called *kwa* (卦). In English, groups of three elementary forms are commonly called trigrams, and groups of six, hexagrams.

The book in which the permutations of yang and yin are recorded, was raised in ancient times to the dignity of a canonical writing, a class of literature briefly called *king* in Chinese. Hence the book is known under the title of *Yih King*.

The *Yih King* is one of the most ancient, most curious, and most mysterious documents in the world. It is more mysterious than the pyramids of Egypt, more ancient than the Vedas of India, more curious than the cuneiform inscriptions of Babylon.

In the earliest writings, the yang is generally represented as a white disk and the yin as a black one; but later on the former is replaced by one long dash denoting strength, the latter by two short dashes considered as a broken line to represent weakness. Disks are still used for diagrams, as in the Map of Ho and the Table of Loh, but the later method was usually employed, even before Confucius, for picturing kwa combinations.

The trigrams are endowed with symbolical meaning according to the way in which yin and yang lines are combined. They apply to all possible relations of life and so their significance varies.

Since olden times, the yih system has been considered a philosophical and religious panacea; it is believed to solve all problems, to answer all questions, to heal all ills. He who understands the yih is supposed to possess the key to the riddle of the universe.

The yih is capable of representing all combinations of existence. The elements of the yih, yang the positive principle and yin the negative principle, stand for the elements of being. Yang means "bright," and yin, "dark." Yang is the principle of heaven; yin, the principle of the earth. Yang is the sun, yin is the moon. Yang is masculine and active; yin is feminine and passive. The

THE FOUR FIGURES (SSU SHIANG).

SYMBOL	NAME	SIGNIFICANCE						
⚌	Yang Major	Sun	Heat	Mentality (or leadership)	Unity (or origin)	The nature of things (essence)	Eyes	Great Monarch[3]
⚍	Yang Minor	Fixed Stars	Daylight	Corporality (bodily organism)	Rotation	Compound things[1]	Nose	Prince
⚎	Yin Minor	Planets	Night	Materiality (inertia; bodily substance)	Succession	Multiplicity[2]	Mouth	Duke
⚏	Yin Major	Moon	Cold	Sensuality; passion	Quality	Attributes of things	Ears	Emperor

[1] Unity in multiplicity, i. e., the Yang dominating over the Yin.
[2] Multiplicity in unity, i. e., the Yin dominating over the Yang.
[3] While the Yin major denotes dominion in the concrete world of material existence, the Yang major symbolises the superhuman and supernatural, the divine, the extraordinary, such as would be a genius on a throne, a great man in the highest sense of the word.

former is motion; the latter is rest. Yang is strong, rigid, lordlike; yin is mild, pliable, submissive, wifelike. The struggle between, and the different mixture of, these two elementary contrasts, condition all the differences that prevail, the state of the elements, the nature of things, and also the character of the various personalities as well as the destinies of human beings.

The *Yih King* (易 經) is very old, for we find it mentioned as early as the year 1122 B. C., in the official records of the Chou dynasty, where we read that three different recensions of the work

THE EIGHT KWA FIGURES AND THE BINARY SYSTEM.

NAME	TRANSCRIPTION	MEANINGS OF THE CHINESE WORD*	KWA	BINARY SYSTEM	ARABIC NUMERALS
乾	ch'ien	to come out; to rise, sunrise; vigorous; (present meaning) dry.	☰	111	7
兌	tui	to weigh; to barter; permeable.	☱	110	6
離	li	to separate.	☲	101	5
震	chan	to quake; to thunder.	☳	100	4
巽	sun	peaceful; a stand or pedestal.	☴	011	3
坎	k'an	a pit; to dig a pit.	☵	010	2
艮	kan	a limit; to stop; perverse.	☶	001	1
坤	kw'un	earth; to nourish; yielding.	☷	000	0

*A native student of the Yih system does not connect the usual meaning of the word with the names of the eight Kwas, and we insert here a translation of the character only for the sake of completeness.

were extant, the *Lien Shan,* the *Kwei Ts'ang* and the *Yih of Chou,*[1] of which, however, the last one alone has been preserved.

This *Yih of Chou,* our present *Yih King,* exhibits two arrangements of the kwa figures, of which one is attributed to their origi-

[1] Lien Shan means "mountain range" and by some is supposed to be a *nom de plume* of Shen Nung (i. e. "divine husbandman"), the mythical ruler of ancient China (2737-2697 B. C.), successor to Fuh-Hi. Others identify Lien Shan with Fuh-Hi. Kwei Ts'ang means "reverted hoard" and may have been simply an inversion of the Lien Shan arrangement. Its invention is assigned to the reign of Hwang Ti, "the Yellow Emperor," the third of the three rulers, (2697-2597 B. C.), a kind of a Chinese Numa Pompilius. The Chou redaction of the *Yih,* which is the latest one, is named after the Chou dynasty.

nator, the legendary Fuh-Hi,[2] the other to Wen Wang.[3] Fuh-Hi is also called Feng,[4] "wind," and Tai Ho,[5] "the great celestial," and he lived, according to Chinese records, from 2852 to 2738 B. C.

It speaks well for the mathematical genius of the ancient founders of Chinese civilisation that the original order of the yih, attributed to Fuh-Hi, corresponds closely to Leibnitz' Binary System of arithmetic. If we let the yin represent 0 and the yang, 1, it appears that the eight trigrams signify the first eight figures from 0-7, arranged in their proper arithmetical order, and read from below upward. Leibnitz knew the yih and speaks of it in terms of high

FUH-HI.

appreciation. Indeed it is not impossible that it suggested to him his idea of a binary system.

While Fuh-Hi's system exhibits a mathematical order, Wen Wang's is based upon considerations of occultism. It stands to reason that Fuh-Hi (by which name we understand that school, or founder of a school, that invented the yih) may not have grasped the full significance of his symbols in the line of abstract thought and especially in mathematics, but we must grant that he was a

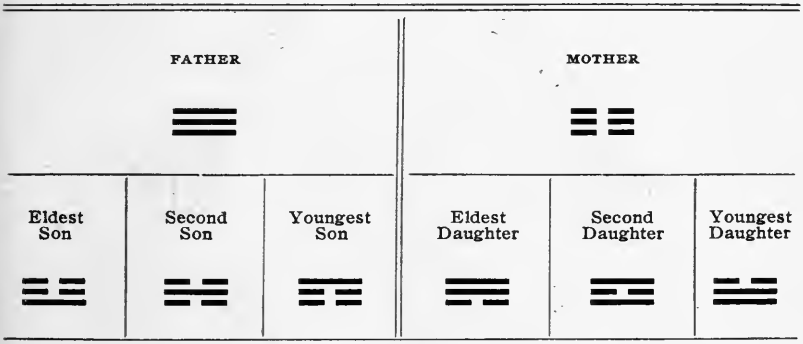
[2]伏羲 [3]文王 [4]風 [5]太昊

mathematical genius, if not in fact, certainly potentially. As to further details our information is limited to legends.

The case is different with Wen Wang, for his life is inscribed on the pages of Chinese history and his character is well known.

The personal name of Wen Wang (i. e., the "scholar-king") is Hsi-Peh, which means "Western Chief." He was the Duke of Chou, one of the great vassals of the empire, and lived from 1231 to 1135 B. C. In his time the emperor was Chou-Sin, a degenerate debauché and a tyrant, the last of the Yin dynasty, who oppressed the people by reckless imposition and provoked a just rebellion. Wen Wang offended him and was long kept in prison, but his son

THE TRIGRAMS AS FAMILY RELATIONS.



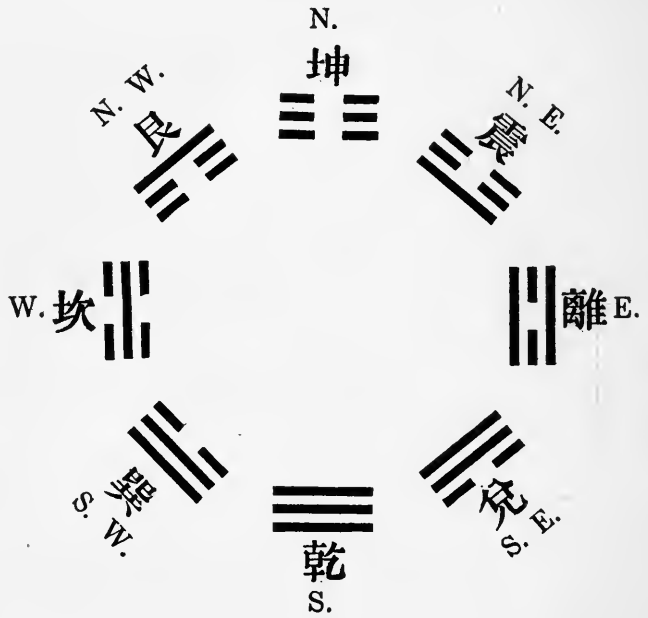
Fa, surnamed Wu Wang, being forced into a conflict with Chou-Sin, overthrew the imperial forces. The tyrant died in the flames of his palace which had been ignited by his own hands. Wu Wang[6] assumed the government and became the founder of the Chou dynasty which reigned from 1122 until 225 B. C.

Wen Wang was a man of earnest moral intentions, but with a hankering after occultism. During his imprisonment he occupied himself in his enforced leisure with the symbols of the yih, and found much comfort in the divinations which he believed to discover in them. When he saw better days he considered that the

[6] Wu Wang was born 1169 B. C.; he became emperor in 1122 B. C. and died 1116 B. C.

prophecies were fulfilled, and his faith in their occult meaning became more and more firmly established.[7]

The eight permutations of the trigrams apparently form the oldest part of the *Yih King*. They have been an object of contemplation since time immemorial and their significance is set forth in various ways. The trigrams consisting of three yang lines are called the unalloyed yang, and of three yin lines, the unalloyed yin. In the mixed groups the place of honor is at the bottom, and if they are conceived as family relations, the unalloyed yang represents



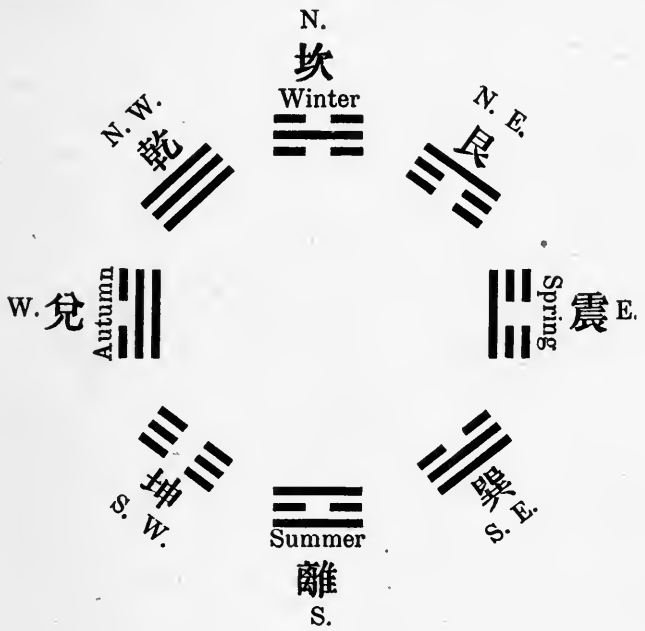
ARRANGEMENT OF TRIGRAMS ACCORDING TO FUH-HI.

the father and the unalloyed yin, the mother. The three sons are represented by the trigrams containing only one yang; the eldest son having yang in the lowest place, the second in the middle, and the third on top. The corresponding trigrams with only one yin line represent in the same way the three daughters.

The trigrams are also arranged both by Fuh-Hi and Wen Wang in the form of a mariner's compass. In the system of Fuh-Hi the

[7] Mayers, *Chinese Reader's Manual*, p. 177.

unalloyed yin stands at the north, the unalloyed yang at the south. The others are so arranged that those which correspond to 1, 2, 3, of Leibnitz' Binary System proceed from north through west to south in regular order, while 4, 5, 6, start from south taking the corresponding places in the east. In this mathematical arrangement we always have the opposed configurations in opposite quarters, so as to have for each place in every opposite kwa a yang line correspond with a yin line and *vice versa;* while if they are expressed



ARRANGEMENT OF TRIGRAMS ACCORDING TO WEN WANG.

in numbers of the binary system, their sums are always equal to seven.

Wen Wang rearranged the trigrams and abandoned entirely the mathematical order attributed to Fuh-Hi. The following quotation from the *Yih King* evinces the occultism which influenced his thoughts:

"All things endowed with life have their origin in chan, as chan corresponds to the east. They are in harmonious existence in siuen because siuen corresponds to the southeast. Li is brightness and renders all things visible

to one another, being the kwa which represents the south. Kw'un is the earth from which all things endowed with life receive food. Tui corresponds to mid-autumn. Ch'ien is the kwa of the northwest. K'an is water, the kwa of of the exact north representing distress, and unto it everything endowed with life reverts. Kan is the kwa of the northeast where living things both rise and terminate."

Since this new arrangement is absolutely dependent on occult considerations, the grouping must appear quite arbitrary from the standpoint of pure mathematics. It is natural that with the growth of mysticism this arbitrariness increases and the original system is lost sight of.

The yin and yang elements are supposed to be the product of a differentiation from the *t'ai chih,* "the grand limit," i. e., the absolute or ultimate reality of all existence, which, containing both yang and yin in potential efficiency, existed in the beginning. The grand limit evolved the pure yang as ether or air, which precipitated the Milky Way, shaping the visible heaven or firmament; while the yin coagulated and sank down to form the earth. But the earth contained enough of the yang to produce heat and life. Some unalloyed yang particles rose to form the sun, while correspondingly other unalloyed yin particles produced the moon, the two great luminaries, which in their turn begot the fixed stars.

THE TABLET OF DESTINY.

At the beginning of Chinese history stands a tablet which in some mysterious way is supposed to be connected with an explanation of the universe. It has been reconstructed by later Chinese thinkers and is pictured in the hands of Fuh-Hi as an arrangement of the kwa figures preserved in the *Yih King.* Considering the several traces of Babylonian traditions in ancient Chinese literature and folklore, would it not be justifiable to identify the tablet of Fuh-Hi with the ancient Babylonian "Tablet of Destiny" mentioned in the Enmeduranki Text, a copy of which was discovered in the archives of Asurbanipal[20] and is supposed to contain the "Mystery of Heaven and Earth?"

[20] K2486 and K4364; cf. Zimmern, KAT[2] 533.

Enmedurankl, king of Sippar, is the seventh of the aboriginal kings, and he declares that he received the divine tablet "from Anu, [Bel, and Ea]."[21]

Chinese sages have their own interpretation of the phrase "the mystery of heaven and earth." They would at once associate the words "heaven" and "earth" with the two opposing principles yang and yin, and the question is whether among the ancient Sumerians there was not a similar tendency prevalent. It seems to be not impossible that the Chinese tablet in the hands of Fuh-Hi is the same as the "Tablet of Destiny" of the Sumerians, and when some Assyriologist has informed himself of the primitive Chinese conception of this mysterious tablet, he may be able to throw some additional light on the subject.

DIVINATION.

An explanation of the universe which derives all distinctions between things, conditions, relations, etc., from differences of mixture, must have appeared very plausible to the ancient sages of China, and we appreciate their acumen when we consider that even to-day advanced Western scientists of reputation attempt to explain the universe as a congeries of force-centers, acting either by attraction or repulsion in analogy to positive and negative electricity. On the ground of this fact the educated Chinese insist with more than a mere semblance of truth, that the underlying idea of the Chinese world-conception is fully borne out and justified by the results of Western science.

While it is obvious that the leading idea of the yih is quite scientific, we observe that as soon as the Chinese thinkers tried to apply it *a priori* without a proper investigation of cause and effect, they abandoned more and more the abstract (and we may say, the purely mathematical) conception of the yang and yin, fell victims to occultism, and used the yih for divination purposes. When we compare the vagaries of the occultism of the yih with the accom-

[21] Anu, Bel, and Ea are the Sumerian trinity. The words Bel and Ea are illegible on the tablet and have been restored by an unequivocal emendation. A doubtful word of the tablet has been translated by "omen" which presupposes that the translator regards the tablet as a means of divination.

plishments of Western science, we may feel very wise and superior, but we should not forget that it was the same fallacious argument of wrong analogy which produced in China the many superstitious practices of the yih, and in the history of our civilisation, astrology, alchemy, and magic. These pseudo-sciences were taken seriously in the world of thought throughout the Middle Ages and began to be abolished only after the Reformation with the rise of genuine astronomy, genuine chemistry, and genuine nature science. If the

A DIVINATION OUTFIT.

Chinese are wrong we must remember that there was a time when we made the same mistake.

The Chinese outfit for divination consists of fifty stalks called "divining-sticks" and six small oblong blocks to represent the hexagrams. These blocks are not unlike children's building-blocks, but they bear on two adjoining sides incisions dividing the oblong faces into equal sections, so as to give the surface the appearance of a yin figure. The sticks are made of stalks of the milfoil plant (*ptarmica sibirica*) which is cultivated on the tomb of Confucius and regarded as sacred.

Pious people consult the oracle on all important occasions. They are first careful to make themselves clean, and then assume a calm and reverential attitude of mind. The diviner then takes out one stick and places it in a holder on the center of the table. This single stalk is called "the grand limit" (*t'ai chih*), the ultimate cause of existence. He next lifts the forty-nine remaining sticks above his forehead with his right hand, and divides them at random into two parts, at the same time holding his breath and concentrating his thoughts on the question to be answered. The sticks in the right hand are then placed on the table, and one is taken out from them and placed between the fourth and fifth fingers of the left hand. The three groups are now called heaven, earth and man. The left-hand group is then counted with the right hand in cycles of eight, and the number of the last group yields the lower trigram of the answer, called the inner complement. This number is counted after the oldest order of the eight trigrams, viz., that of Fuh-Hi corresponding to the inverted binary arrangement. The upper trigram, called the outer complement, is determined in the same way.

After the hexagram is determined, one special line is selected by the aid of the divining-sticks in the same way as before, except that instead of counting in cycles of eight, the diviner now counts in cycles of six. Having thus established the hexagram and a special line in it, he next consults the *Yih King* which contains a definite meaning for each hexagram as a whole, and also for each single line; and this meaning is made the basis of the divine answer.

It is obvious that this complicated process presupposes a simpler one which, however, must have been in use in pre-historic times, for as far as Chinese history dates back the divining stalks and the kwa system are referred to in the oldest documents.

URIM AND THUMMIM.

The Chinese method of divination may help us to understand the Urim and Thummim of the Hebrews which are so ancient that details of their method are practically forgotten.

We notice first that the Urim and Thummim are two sets of symbols apparently forming a contrast similar to that of yin and

yang. It is not probable that they were a set of twelve gems representing the twelve tribes of Israel. Secondly, like the yin and yang, the two sets must have been a plurality of elements and not only two symbols as is sometimes assumed; and thirdly, they served the purpose of divination, for they are referred to in connection with the ephod which must have had something to do with the determining oracle.

The Urim and Thummim* are translated in the Septuagint† by "manifestation and truth," or, as it has been rendered in English, "light and perfection." It appears that the vowel in the first word is wrong, and we ought to read *Orim,* which is the plural form of *Or,* "light," and might be translated by "the shining things." If Thummim is to be derived from the root THAMAM, its vocalisation ought to be *thamim* (not *thummim*) and would mean "the completed things."

We cannot doubt that the Urim and Thummim form a contrast, and if the Urim represent "light" or yang, the Thummim would represent "darkness" or yin, the former being compared to the rise of the sun, the latter to the consummation of the day.

Sometimes the answer of the Urim and Thummim is between two alternatives (as in 1 Sam. xiv. 36 ff), some times a definite reply is given which would presuppose a more or less complicated system similar to the answers recorded in the *Yih King.* In the history of Saul (1Sam. x. 22) the answer comes out, "Behold, he hath hid hmself among the stuff," and in the time of the Judges (Judges xx. 28) the question is asked about the advisability of a raid against the tribe of Benjamin, and the oracle declares, "Go up; for to-morrow I will deliver them into thine hand." On other occasions the oracle does not answer at all,‡ and its silence is interpreted as due to the wrath of God.

The answer received by consulting the Urim and Thummim was regarded as the decision of God, and was actually called the voice of God. This view seems to have led in later times, when the process of divination was no longer understood, to the assump-

*הָאוּרִים וְהַתֻּמִּים † δήλωσις καὶ ἀλήθεια.

‡ See Sam. xiv. 37 and xxviii. 6.

tion that Yahveh's voice could be heard in the Holy of Holies, a misinterpretation which is plainly recognisable in the story of the high priest Eleazar (Num. vii. 89).

The Urim and Thummim are frequently mentioned in close connection with the ephod which has been the subject of much discussion. It is commonly assumed that the word is used in two senses, first as an article of apparel and secondly as a receptacle for Urim and Thummim. Unless we can find an interpretation which shows a connection between the two, we can be sure not to have rightly understood the original significance of this mysterious article. The description of the ephod in Exodus ii. 28, (an unquestionably postexilic passage) is irreconcilable with the appearance, use or function which this curious object must have possessed according to our historical sources, and the latter alone can be regarded as reliable. After considering all the passages in which the ephod is mentioned we have come to the conclusion that it was a pouch worn by the diviner who hung it around his loins using the string as a girdle.

The original meaning of *ephod* is "girdle" and the verb *aphad* means "to put on, to gird." David, a strong believer in the Urim and Thummim, danced before the Lord "girded with an ephod," and we must assume that according to the primitive fashion the diviner was otherwise naked. Hence he incurred the contempt of his wife Michal whose piety did not go so far as the king's in worshiping Yahveh in this antiquated manner.

The main significance of the ephod in connection with the Urim and Thummim was to serve as a receptacle for the lots, and so it may very well have become customary to make it of a more costly and enduring material in the form of a vase. This will explain those passages in which the ephod is spoken of as being made of gold and standing on the altar, as where we are informed that the sword of Goliath had been deposited as a trophy wrapped in a mantle "behind the ephod."

There are other passages in which "ephod" seems to be identical with an idol, but if our interpretation be accepted there is no

difficulty in this, for the receptacle of the Urim and Thummim may very well have come to be regarded as an object of worship.

It is difficult to say whether the ephod is identical with the *khoshen,* the breastplate of the high priest, which in later postexilic usage was ornamented with twelve precious stones representing the twelve tribes of Israel. It is sure, however, that the Urim and Thummim cannot be identified with the twelve jewels, and the Hebrew words plainly indicate that they were placed inside as into a pouch. In Lev. xiii. 8 the verb *nathan el,* "to put into," is used and not *nathan 'al,* "to put upon."

The breastplate of the high priest seems to be the same as what is called in Babylonian history the "tables of judgment," which also were worn on the breast. But the identification does not seem convincing. We would have to assume that the ephod was first worn around the loins after the fashion of a loin cloth and that later in a more civilised age when the priests were dressed in sacerdotal robes, it was suspended from the shoulders and hung upon the breast.

After Solomon's time there is no longer any historical record of the use of the Urim and Thummim. It seems certain that in the post-exilic age the rabbis knew no more about it than we do to-day and regretted the loss of this special evidence of grace. They supposed their high priests must be no longer fit to consult the oracle (Esdras ii. 63; Neh. vii. 65) and Josephus states (*Antiq.* iii. 8-9) that two hundred years before his time, it had ceased. According to common tradition, however, it was never reintroduced into the temple service after the exile.

While Josephus identified the Urim and Thummim with the twelve jewels in the breastplate of the high priest, Philo* claims that they were pictures exhibited in the embroidery of the breastplate representing the symbols of light and truth. His conception is untenable, but it is noteworthy because his view seems to be influenced by his knowledge of the sacerdotal vestments of Egypt. We are told that the high priest in his capacity as judge used to wear a breastplate bearing the image of truth or justice. One such

* *De vita Mosis,* p. 670 C; 671, D. E.; *De Monarchia,* p. 824, A.

shield has been found, upon which were two figures recognisable by the emblems on their heads: one with a solar disk as Ra, the sun-god or light, the other with a feather, as Maat or truth. If the Urim and Thummim were not plural and were not contrasts, and if we did not know too well that they were placed in an ephod, Philo's interpretation would have much to recommend itself. Perhaps he and also the Septuagint were under Egyptian influence.

While we do not believe that the Urim and Thummim were exactly like the yang and yin we are fully convinced that the Chinese method of divination throws some light upon the analogous Hebrew practice and will help us to understand the meaning of the terms. If the two systems are historically connected, which is not quite impossible, we must assume that they were differentiated while yet in their most primitive forms.

P'AN-KU.

The basic idea of the yih philosophy was so convincing that it almost obliterated the Taoist cosmogony of P'an-Ku who is said to have chiseled the world out of the rocks of eternity. Though the legend is not held in high honor by the *literati,* it contains some features of interest which have not as yet been pointed out and deserve at least an incidental comment.

P'an-Ku is written in two ways: one[8] means in literal translations, "basin ancient," the other "basin solid."[9] Both are homophones, i. e., they are pronounced the same way; and the former may be preferred as the original and correct spelling. Obviously the name means "aboriginal abyss," or in the terser German, *Urgrund,* and we have reason to believe it to be a translation of the Babylonian *Tiamat,* "the Deep."

The Chinese legend tells us that P'an-Ku's bones changed to rocks; his flesh to earth; his marrow, teeth and nails to metals; his hair to herbs and trees; his veins to rivers; his breath to wind; and his four limbs became pillars marking the four corners of the world, —which is a Chinese version not only of the Norse myth of the Giant Ymir, but also of the Babylonian story of Tiamat.

[8] 盤古 [9] 圓

Illustrations of P'an-Ku represent him in the company of supernatural animals that symbolise old age or immortality, viz., the tortoise and the crane; sometimes also the dragon, the emblem of power, and the phenix, the emblem of bliss.

* * *

When the earth had thus been shaped from the body of P'an-Ku, we are told that three great rulers successively governed the world: first the celestial, then the terrestrial, and finally the human sovereign. They were followed by Yung-Ch'eng and Sui-Jen (i. e., fire-man) the latter being the Chinese Prometheus, who brought the fire down from heaven and taught man its various uses.

The Prometheus myth is not indigenous to Greece, where it received the artistically classical form under which it is best known to us. The name, which by an ingenious afterthought is explained as "the fore thinker," is originally the Sanskrit *pramantha*[10] and means "twirler" or "fire-stick," being the rod of hard wood which produced fire by rapid rotation in a piece of soft wood.

We cannot deny that the myth must have been known also in Mesopotamia, the main center of civilisation between India and Greece, and it becomes probable that the figure Sui-Jen has been derived from the same prototype as the Greek Prometheus.

THE FIVE ELEMENTS.

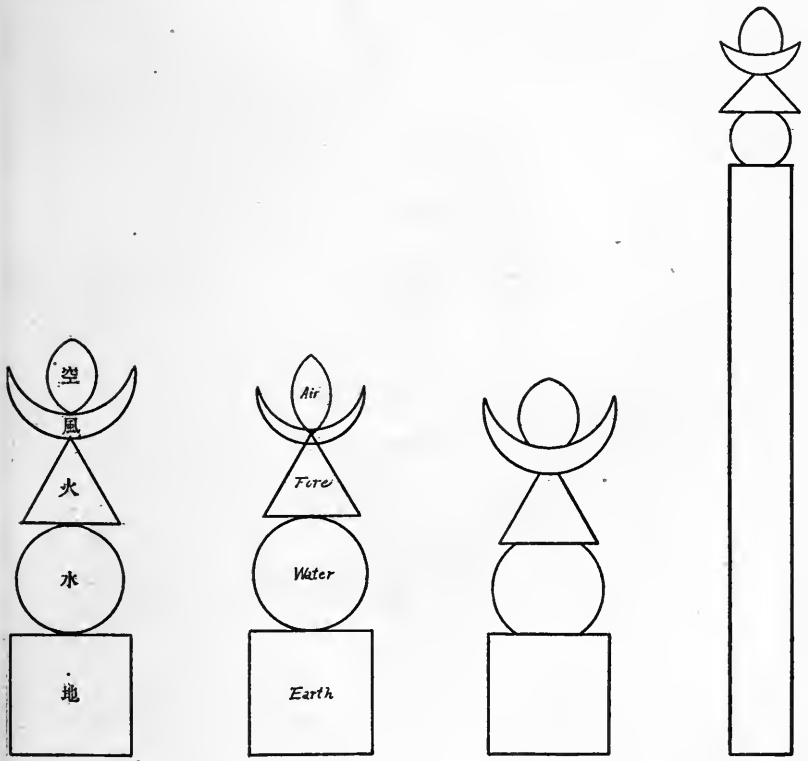
Occultism dominated the development of thought during the Middle Ages of China not less than in Europe, and here again in the conception of the elements we find traces of a common origin in both the East and West.

The Chinese speak of five elements: water, fire, wood, metal, and earth; while, according to the ancient sages of Hellas and India, there are but four: water, fire, earth, and air. This latter view also

[10] See Steinthal's "The original Form of the Legend of Prometheus" which forms and appendix to Goldziher's *Mythology Among the Hebrews,* translated by Russell Martineau, London. 1877.

Mantha is derived from the same root as the German word *mangeln,* "to torture," and one who forces (viz. Agni, the god of fire) is called *pramathyu-s* "the fire-robber." The Sanskrit name in its Greek form is Prometheus, whose nature of fire-god is still recognisable in the legend.

(although in a later age) has migrated to China, where it is commonly accepted among the Buddhists, but has been modified in so far as ether has been superadded so as to make the elements of the Buddhist-Chinese conception equal in number to the older enumeration which we may call the Taoist view.



DIFFERENT REPRESENTATIONS OF THE ELEMENTS.

[The proportions of the several heights are deemed important, and are as follows: the square, 10; the circle, 9; the triangle, 7; the crescent, 2; the gem, 6. When built in the form of a *stupa,* the square changes into a cube, the circle into a globe, the triangle into a four-sided pyramid, and the crescent and gem also into solid bodies. The globe retains its proper dimensions but is, as it were, pressed into the cube and the pyramid; the pyramid is frequently changed into an artistically carved roof. The Mediæval European conception is obviously not original.

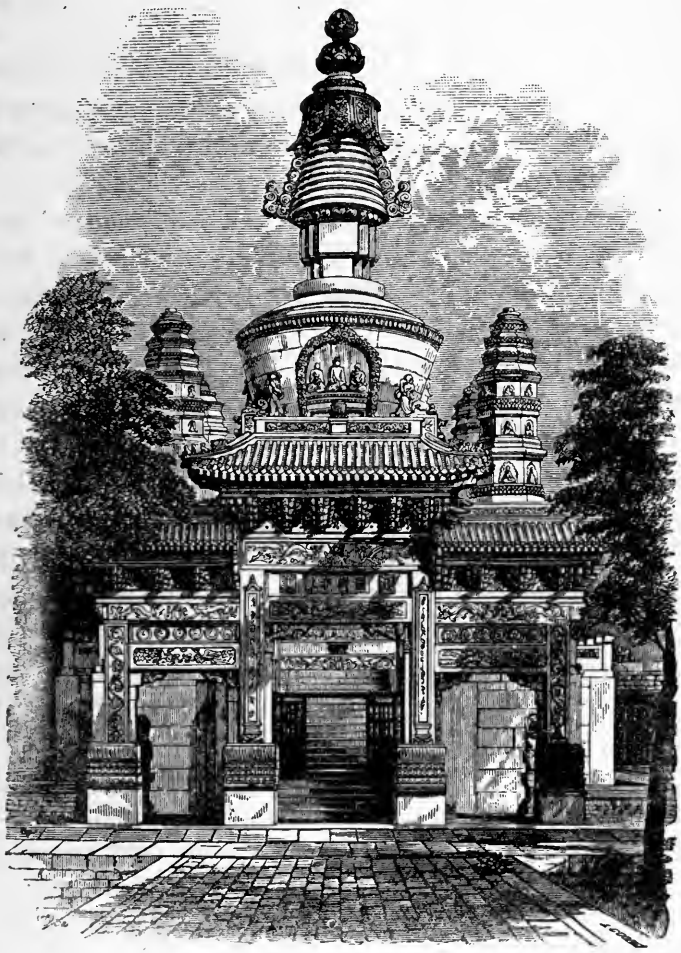
That the Buddhist conception of the five elements has been imported to China from India, is proved beyond question by the fact

TIBETAN STUPA.

[This illustration is reproduced from the current number of the *East of Asia,* an illustrated magazine printed in Shanghai, China.

The monument represents the five elements, but its shape is no longer exact. The upper part of the cube shows a formation of steps, not unlike the Babylonian zikkurat or staged tower. The globe is no longer a true sphere, and the pyramid has been changed into a pointed cone, so slender as to be almost a pole. The monument is probably used as a mausoleum.]

that the Chinese diagrams are frequently marked with their Sanskrit terms. It is strange that the symbolic diagrams are more nearly identical than their interpretations. Earth is represented by a square, water by a sphere, fire by a triangle, air by a crescent,



GATEWAY TO BUDDHIST MONASTERY, PEKIN.

A further development of the Stupa of the five elements.

[The cube has been changed into a roofed house; the sphere has assumed the shape of a Chinese cap, the pyramid is adorned with a peculiar ornament imitative of a cover, and the crescent has been changed into a flower-like knob, as has also the gem which surmounts the whole.]

and ether by a gem surmounting the whole. The two upper symbols are conceived as one in the treatises of the mediæval alchemy of Europe, and serve there as the common symbol of air. The symbol ether is commonly called by its Sanskrit term *mani,* which literally means "gem," and in popular imagination is endowed with magic power.

The five elements are also represented by memorial poles which on the Chinese All Souls' Day are erected at the tombs of the dead, on which occasion the grave is ornamented with lanterns, and a torch is lit at evening.

All over the interior of Asia so far as it is dominated by Chinese civilisation, we find *stupas* built in the shape of the symbols of the five elements, and their meaning is interpreted in the sense that the body of the dead has been reduced to its original elements. We must not, however, interpret this idea in a materialistic sense, for it is meant to denote an absorption into the All and a return to the origin and source of life.

It is noticeable that this reverence of the elements as divine is a well-known feature of ancient Mazdaism, the faith of the Persians, and is frequently alluded to by Herodotus in his description of Persian customs. The desire not to desecrate the elements causes the Persians to regard burial and cremation as offensive. They deposit their dead in the Tower of Silence, leaving them there to the vultures, whereby the pollution by the corpse either of earth or of fire is avoided.

The Taoist view of the elements is different from the Buddhist conception, and we may regard it as originally and typically Chinese. At any rate it is full of occultism and constitutes an important chapter in the mystic lore of China. According to this view, the five elements are water, fire, wood, metal, and earth.* The knowledge of these elements, legend tells us, is somehow connected with the marks on the shell of the sacred tortoise which, having risen from the river Loh, appeared to Ts'ang-Hieh (Mayers, *Ch. R. M.,* I, 756). Tsou-Yen, a philosopher who lived in the fourth century B. C.,

*水 火 木 金 土

wrote a treatise on cosmogony in which the five elements play an important part (Mayers, *Ch. R. M.*, I, 746).

The five elements also figure prominently in "The Great Plan,"[11] which is an ancient imperial manifesto on the art of good government. There it is stated that like everything else they are produced by the yang and yin, being the natural results of that twofold breath which will operate favorably or unfavorably upon the living or the dead according to the combination in which they are mixed. All misfortunes are said to arise from a disturbance of the five elements in a given situation, and thus the Chinese are very careful not to interfere with nature or cause any disturbance of natural conditions. We are told in "The Great Plan"[12] that "in olden times K'wan dammed up the inundating waters and so disarranged the five elements. The Emperor of Heaven was aroused to anger and would not give him the nine divisions of the Great Plan. In this way the several relations of society were disturbed, and [for punishment] he was kept in prison until he died." K'wan's misfortune has remained a warning example to the Chinese. In their anxiety not to disturb the proper mixture in which the five elements should be combined they pay great attention to those pseudo-scientific professors who determine the prevalence of the several elements, not by studying facts but by interpreting some of the most unessential features, for instance, the external shape of rocks and plants. Pointed crags mean "fire"; gently rounded mountains, "metal"; cones and sugar-loaf rocks represent trees, and mean "wood"; and square plateaus denote "earth"; but if the plateau be irregular in shape so as to remind one of the outlines of a lake, it stands for "water." It would lead us too far to enter into further details; at the same time it would be difficult to lay down definite rules, as there is much scope left to the play of the imagination, and it is certain that, while doctors may disagree in the Western world, the geomancers of China have still more opportunity for a great divergence of opinion.

The elements are supposed to conquer one another according

[11] A chapter in the *Shu King*, translated into English by James Legge. *S. B. E.*, vol. III, 137.

[12] See *S. B. E.*, III, 139.

to a definite law. We are told that wood conquers earth, earth conquers water, water conquers fire, fire conquers metal, and metal conquers wood. This rule which is preserved by Liu An of the second century B. C. is justified by Pan Ku, a historian of the second century A. D.,compiler of the books of the era of the Han dynasty, as follows:

"By wood can be produced fire, by fire can be produced earth [in other words, wood through fire is changed to ashes]; from earth can be produced metal [i. e., by mining]; from metal can be produced water [they can be changed through heat to a liquid state]; from water can be produced wood [plants]. When fire heats metal, it makes it liquid [i. e., it changes it into

THE FIVE ELEMENTS AND THEIR INTERRELATION.

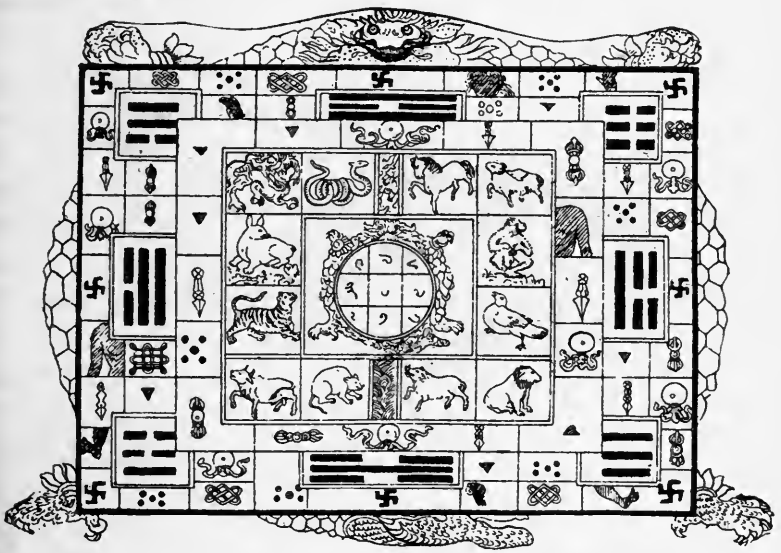
ELEMENTS	PARENT	CHILD	ENEMY	FRIEND	PLANET
water's	metal	wood	earth	fire	Mercury
fire's	wood	earth	water	metal	Mars
wood's	water	fire	metal	earth	Jupiter
metal's	earth	water	fire	wood	Venus
earth's	fire	metal	wood	water	Saturn

the state of the element water]. When water destroys fire it operates adversely upon the very element by which it is produced. Fire produces earth, yet earth counteracts water. No one can do anything against these phenomena, for the power which causes the five elements to counteract each other is according to the natural dispensation of heaven and earth. Large quantities prevail over small quantities, hence water conquers fire. Spirituality prevails over materiality, the non-substance over substance, thus fire conquers metal; hardness conquers softness, hence metal conquers wood; density is superior to incoherence, therefore, wood conquers earth; solidity conquers insolidity, therefore earth conquers water."

Besides being interrelated as parent and offspring, or as friend and enemy, the five elements are represented by the five planets, so that water corresponds to Mercury, fire to Mars, wood to Jupiter, metal to Venus, and earth to Saturn.

The yih system being cosmic in its nature, has been used by the Chinese sages to represent the universe. The first attempt in this direction is Fuh-Hi's diagram in compass form representing the four quarters and four intermediary directions.

The system was changed by Wen Wang who rearranged the eight trigrams but retained the fundamental idea. It was supposed to have been revealed to Fuh-Hi on the back of a tortoise, but later sages superadded to the fundamental idea further characteristics of the universe, according to their more complicated knowledge of science and occultism.



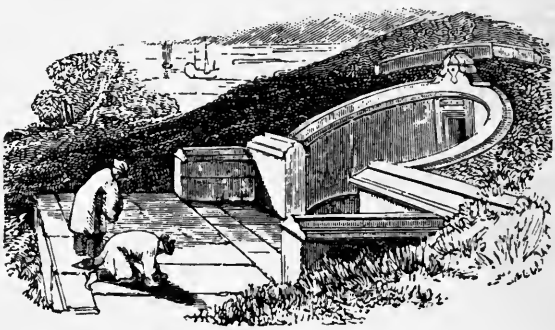
THE MYSTIC TABLET.[14]

We reproduce here a mystic tablet of Tibetan workmanship, which, however, reflects the notions prevailing over the whole Chinese empire. The kwa tablet lies on the back of the tortoise, presumably the same as was supposed to have been present when P'an-Ku chiseled the world from out of the rocks of eternity — and certainly the same tortoise which made its appearance in the Loh river to reveal the secret of the kwa to Fuh-Hi.

In the center of our kwa tablet is the magic square written in Tibetan characters, which is the same as that represented in dots

in the so-called "Writing of Loh."[13] It is also depicted as resting in its turn on the carapace of a smaller tortoise.

This magic square is surrounded by the twelve animals of the duodenary cycle, representing both the twelve double-hours of the day, and the twelve months of the year. In the left lower center is represented the rat which, in passing around to the left, is followed in order by the ox, tiger, hare, dragon, serpent, horse, goat, monkey, cock, dog, and boar. The symbols of the days are: a sun for Sunday, a crescent for Monday; a red eye for Tuesday (red light of the planet Mars); a hand holding a coin for Wednesday (indicating the function of the god Mercury); a thunderbolt for Thursday



A TYPICAL CHINESE GRAVE.

[The dead are protected against the evil influence of unfavorably mixed elements in the surroundings of the grave by a horseshoe-shaped wall. Cf. pp. 531-2.]

(sacred to Marduk, Jupiter, Thor, the thunder-god); a buckle for Friday (day of Frigga or Venus); and a bundle for Saturday.

The duodenary cycle of animals is surrounded by various emblems indicating lucky and unlucky days. Among these we can discover gems, buckles, thunderbolts, various limbs of the body, triangles, five-spots, links of a chain, luck symbols, and swastikas.

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[13] See the author's pamphlet, *Chinese Philosophy*, p. 19.

[14] The table has been reproduced from Waddell's *Buddhism of Tibet*, p. 453. Students who take the trouble to enter into further details are warned that in Waddell's table, by some strange mistake, the position of the trigrams *tui* and *chan*, in the east and in the west, has been reversed, a mistake which we have corrected in our reproduction.

They surround the eight trigrams which are placed according to the arrangement of Wen Wang. The kwa in the lower part represents north and winter; in the upper part, the south and summer; toward the right, west and autumn; and toward the left, east and spring. The kwa in the lower right hand corner represents heaven; in the lower left, mountain; the upper left, air or wind; and in the right upper corner, earth.

SYSTEMS OF ENUMERATION.

The twelve animals which are pictured on our Tibetan tablet are a curious relic of prehistoric civilisation. They represent at once the twelve months, the twelve divisions of the zodiac, and the twelve double hours of the day. Kindred systems of designating duodecimal divisions of the cosmos, both in time and space, by a cycle of animals can be traced in Babylon, Egypt, primitive America, and modern Europe, where to the present day the constellations along the ecliptic are divided into twelve groups, called the Zodiac, or *Thierkreis,* i. e., the animal cycle.

The duodenary cycle is an ancient method of counting, expressed by animal names, a custom which has only been abolished in Japan since the Great Reform under the influence of Western civilisation. Up to that time people spoke there of "the rat hour," "the ox hour," "the tiger hour," etc., and these terms had no other significance than in Western countries, one o'clock, two o'clock, or three o'clock.

The twelve animals are affiliated with the twelve branches, so-called, which practically possess the same significance, being also a duodenary cycle. The twelve branches may be summarily characterised as the twelve months, beginning with the eleventh in which the yang principle begins to prepare for its appearance in the new year, and ending in the tenth month of the ensuing year. The twelve branches are correlated not only to the twelve animals, but also to the five elements as indicated in our diagram. The fifth element "earth" is missing because it represents the center around which the twelve branches are grouped.

THE DUODENARY CYCLE.

THE TWELVE BRANCHES							THE TWELVE ANIMALS	
NO.	NAME	TRANSCRIPTION	USUAL MEANING	SIGNIFICANCE IN THE DUODENARY CYCLE	SYMBOL	ELEMENT TO WHICH RELATED	NAME	MEANING
1	子	tze	child	Regeneration of vegetation	Yang stirring underground	water	鼠	rat
2	丑	chu	cord	Relaxation; untying a knot	Hand half-opened		牛	ox
3	寅	yin	to revere	Awakening of life.	Wriggling earthworm	wood	虎	tiger
4	卯	mao	a period of time	Plants breaking through the soil	Opening a gate		兎	hare
5	辰	chen	vibration	First vegetation; seed-time	Thunderstorm		龍	dragon
6	巳	ssu	end	Supremacy of Yang	Snake	fire	蛇	serpent
7	午	wu	to oppose	Yin reasserting itself	Female principle in hidden growth		馬	horse
8	未	wei	not yet	Taste of fruit	Tree in full bloom		羊	goat
9	申	shen	to expand	Yin growing strong	Clasped hands	metal	猴	monkey
10	酉	yu	ripe	Completion	Cider or wine-press		雞	cock
11	戌	shu	guard	Exhaustion	Yang withdrawing underground		犬	dog
12	亥	hai	[Kernel]*	Kernel or root	Yang in touch with Yin	water	猪	boar

*This character has now no meaning except in its relation to the duodenary cycle. Formerly it denoted kernel, but now the character for tree is added to give that meaning.

There is another system of counting, which however is decimal, and is called "the ten stems"; and it appears that it is simply an older method of counting the months of the year. In their original here also the explanation of the several symbols has reference to the progress of the year.

It is not impossible that the decimal system was the original and indigenous Chinese method of counting, while the duodecimal system

THE TEN STEMS.

NO.	NAME	TRANSCRIPTION	SIGNIFICANCE	ELEMENT TO WHICH RELATED	
1	甲	chia	Yang moving in the East sprouting.	fir tree	wood
2	乙	yi	Plant growing in a crooked way; tendril; twig.	bamboo	
3	丙	ping	Growth in southern heat; bloom.	torch-flame	fire
4	丁	ting	Vegetation in warm season; summer.	lamp-light	
5	戊	wu	Exuberance; surcease of life.	mountains	earth
6	己	ki	Wintry sleep; hibernation.	level ground	
7	庚	keng	Fullness of crops; the West; autumn fruit.	weapon	metal
8	辛	sin	Ripened fruit and its flavor; supposed to be metallic.	cauldron	
9	壬	jen	Yin at the height of its function; pregnancy.	billow	water
10	癸	kwei	Water absorbed by earth; Yang preparing for spring.	unruffled stream	

was imported at a very early date from Accad or Sumer, the country of the founders of Babylonian civilisation.

The existence of these two systems suggests the occurrence of a calendar reform such as was introduced in Rome under Numa Pompilius, and we are confronted with the strange coincidence that in China as well as in Rome the two additional months (January

and February) were inserted at the beginning as a result of which we call even to-day the last month of the year December, i. e., "the tenth." We must leave the question as to the plausibility of a historical connection to specialists familiar with the influence of Babylonian thought on the rest of the world. It is not impossible that a Babylonian (perhaps Sumerian) calendar reform traveled in both directions, rapidly toward the more civilised East, and very slowly toward the West. producing in these remote countries and at different times this startling coincidence of a similar calendar reform.

We might parenthetically state that the original meaning of the ten stems and twelve branches has practically been lost sight of, and both systems have become simply series of figures, the former from one to ten, the latter from one to twelve; while their symbolical relations, the former with the elements, the latter with the twelve animals, are of importance merely to occultists.

The ten stems are also called "the ten mothers," and the twelve branches, "the twelve children." That the former is the older arrangement appears from another name which is "the ten hoary characters.

By a combination of the ten stems with the twelve branches in groups of two in which the former are repeated six times and the latter five times, a series of sixty is produced which is commonly called by sinologists the sexagenary cycle, and is used for naming years as well as days. The invention of the sexagenary cycle and its application to the calendar is attributed to Nao the Great, one of the prime ministers of Hwang Ti, the Yellow Emperor,[15] who had solicited this work in the sixtieth year of his reign. Nao the Great, having accomplished the task, set the beginning of the new era in the succeeding year, 2637 B. C. Accordingly we live now in the seventy-sixth cycle which began in 1863 and will end in 1922.

A convenient method of translating the properly Chinese names of the sexagenary cycle would be to render the two characters by their equivalent relations to the twelve animals and the five elements,

[15] According to traditional chronology, Hwang Ti reigned from 2697 to 2597 B. C.

THE SEXAGENARY CYCLE.

甲	子	1 *chia tzu* 1864	甲	申	21 *chia shên* 1884	甲	辰	41 *chia chên* 1904
乙	丑	2 *yi ch'ou* 1865	乙	酉	22 *yi yu* 1885	乙	巳	42 *yi ssu* 1905
丙	寅	3 *ping yin* 1866	丙	戌	23 *ping shu* 1886	丙	午	43 *ping wu* 1906
丁	卯	4 *ting mao* 1867	丁	亥	24 *ting hai* 1887	丁	未	44 *ting wei* 1907
戊	辰	5 *mou chên* 1868	戊	子	25 *mou tzu* 1888	戊	申	45 *mou shên* 1908
己	巳	6 *chi ssu* 1869	己	丑	26 *chi ch'ou* 1889	己	酉	46 *chi yu* 1909
庚	午	7 *kêng wu* 1870	庚	寅	27 *kêng yin* 1890	庚	戌	47 *kêng shu* 1910
辛	未	8 *hsin wei* 1871	辛	卯	28 *hsin mao* 1891	辛	亥	48 *hsin hai* 1911
壬	申	9 *jên shen* 1872	壬	辰	29 *jên shên* 1892	壬	子	49 *jên tzu* 1912
癸	酉	10 *kwei yu* 1873	癸	巳	30 *kwei ssu* 1893	癸	丑	50 *kwei ch'ou* 1913
甲	戌	11 *chia shu* 1874	甲	午	31 *chia wu* 1894	甲	寅	51 *chia yin* 1914
乙	亥	12 *yi hai* 1875	乙	未	32 *yi wei* 1895	乙	卯	52 *yi mao* 1915
丙	子	13 *ping tzu* 1876	丙	申	33 *ping shên* 1896	丙	辰	53 *ping chên* 1916
丁	丑	14 *ting ch'ou* 1877	丁	酉	34 *ting yu* 1897	丁	巳	54 *ting ssu* 1917
戊	寅	15 *mou yin* 1878	戊	戌	35 *mou shu* 1898	戊	午	55 *mou wu* 1918
己	卯	16 *chi mao* 1879	己	亥	36 *chi hai* 1899	己	未	56 *chi wei* 1919
庚	辰	17 *kêng chên* 1880	庚	子	37 *kêng tzu* 1900	庚	申	57 *kêng shên* 1920
辛	巳	18 *hsin ssu* 1881	辛	丑	38 *hsin ch'ou* 1901	辛	酉	58 *hsin wu* 1921
壬	午	19 *jên wu* 1882	壬	寅	39 *jên yin* 1902	壬	戌	59 *jên shu* 1922
癸	未	20 *kwei wei* 1883	癸	卯	40 *kwei mao* 1903	癸	亥	60 *kwei hai* 1923

so as to speak of the "fir-rat" year, the "bamboo-ox" year, the "torch-tiger" year, etc.

FENG-SHUI.*

Chinese occultism has been reduced to a system in an occult science (or better, pseudo-science) called *feng-shui* which, literally translated, means "wind and water," and the two words combined denote atmospheric influence, or climate. As a science feng-shui means a study of conditions, spiritual as well as physical, and the average Chinese is very anxious to locate the site of graves, temples, public and private edifices so as to insure the auspicious influence of their surroundings. Belief in the efficiency of feng-shui is very strong, and consequently its scholars play an important part in public and private life.

The science of feng-shui is fantastical, but its advocates claim the authority of the ancient *Yih King,* which in chapter XIII, 1 to 12, reads as follows:

> "By looking up in order to contemplate the heavenly bodies, and by looking down to examine into the natural influences of the earth, man may acquire a knowledge of the cause of darkness and light."

Feng-shui is also called *ti-li*† and *k'an-yü.*‡ *Ti-li* may fitly be translated by "geomancy." *Li,* frequently translated by "reason" or "rational principle," means a system of the dominant maxims which govern nature. *Ti* means "the earth" and so the two together signify "the divining art as to terrestrial conditions." *K'an-yü,* translated literally, means "canopy chariot," but *k'an* (canopy) refers to the sky and *yü* (chariot) refers to the earth as the vehicle in which all living beings are carried. The term "canopy chariot" then means the art which is occupied with the conditions of man's habitation.

The professional diviners who use the net tablet are called *sien-sheng,*§ "the elder born," which is a title of respect and has been translated by "professor." They are called either *feng-shui sien-sheng,* "professors of divination," or *ti-li sien-sheng,* "geomancers," or *k'an-yü sien-sheng,* "masters of the canopied chariot."

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*風水 †地理 ‡堪輿 §先生

The application of the feng-shui is naturally very loose, and two different professors may easily come to opposite results according to their individual interpretation of the correct balance of the mixture of the elements and the several spiritual influences that may be discovered in the indications of the geomancer's compass. Prof. J. J. M. De Groot[16] explains the application of the lo-pan as follows:

"The chief use of the geomantic compass is to find the line in which, according to the almanac, a grave ought to be made, or a house or temple built. Indeed, in this most useful of all books it is every year decided between which two points of the compass the lucky line for that year lies, and which point is absolutely inauspicious. This circumstance not only entails a postponement of many burials, seeing it is not always possible to find a grave, answering to all the geomantic requirements, in the lucky line of the year; but it regularly compels the owners of houses and temples to postpone repairs or the rebuilding of the same until a year in which the line wherein their properties are situate is declared to be lucky. Many buildings for this reason alone are allowed to fall to ruin for years, and it is no rare thing to see whole streets simultaneously demolished and rebuilt in years auspicious to the direction in which they were placed."

Considering the sacrifices which are expected of a good son in the selection of the site and the general equipment of the parental graves, we can easily understand that the burden of ancestral worship is very heavy. While we must admire the filial piety of the Chinese, we regret to see the uselessness of their devotion and the waste to which it leads. It is refreshing, however, to observe that the general rule is not without exceptions and we find that there are sensible men who raise their voices in protest.

Ts'ui Yuen of the second century, a mandarin of high position, died at Loh-Yang, the imperial metropolis. According to the customary ritual, his son should have transported his remains to his place of birth for burial in the family cemetery, but Ts'ui Yuen left these instructions with his son Shih, which we quote from De Groot (*loc. cit.*, pp. 837-8):

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[16] In his voluminous work *The Religious System of China,* Vol. III, Bk. 1. "Disposal of the Dead." Part 3. "The Grave," p. 974.

"Human beings borrow from heaven and earth the breath upon which they live, and at the end of their terrestrial career they restitute the etherial parts of that breath to heaven, giving their bones back to earth; consequently, what part of the earth can be unsuitable for concealing their skeletons? You must not take me back to my place of birth, nor may you accept any funeral presents, neither offerings of mutton or pork."

The Chinese authority from which Professor De Groot quotes, adds:[17]

"Respectfully receiving these his last orders, Shih kept the corpse in Loh-Yang and there buried it."

The spirit of Ts'ui Yuen has not died out, as is attested by a satirical poem which is current to-day, and which humorously points out the inconsistency of those mantics or soothsayers who know all the conditions of the four quarters and promise their patrons to show them (for a due consideration) a spot so auspicious for a grave that the spirit of their ancestor will bestow upon members of the family the dignity of kings. If that were true, why have they not buried their own parents there? The poem in the original Chinese is as follows:

地理先生慣說謊、
指南指北指西東、
山中若有王侯地、
何不尋來葬乃翁.

ti li hsien sheng kwan shuo huang
chih nan chih pei chih hsi tung
shan chung je yu wang hou ti
he pu hsin lai tsang nai weng.[18]

This translation imitates the original as closely as possible in metre and meaning:

Trash these mantics manifest,
Point out south, north, east and west;
Know graves royalty bestowing
Yet their own sires there not rest.

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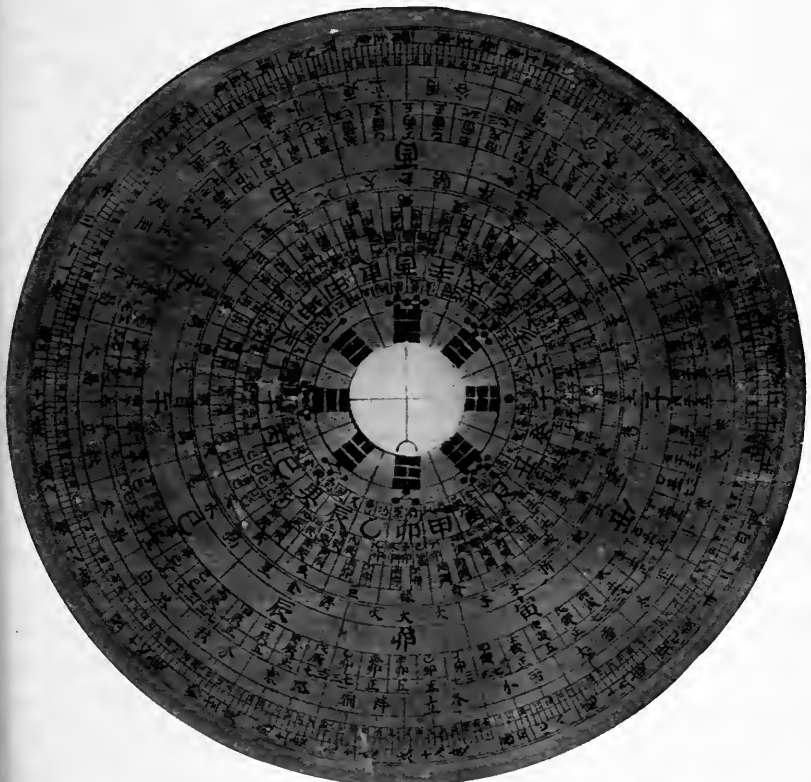
[17] *Books of the Later Han Dynasty,* Chap. 82 line 15.

[18] In the early Chinese form, the final words of the first, second, and fourth lines were all pronounced as if ending in *ong.* Consequently, although the individual words have changed their form, the series is considered as containing one rhyme and, according to Chinese rules of rhyming, is still so used in verse.

LO-PAN.

Collectors of curios may have seen in Chinese stores the instrument called *lo-pan** (net-tablet), or *lo-king*† (net-standard), or *pan-shih*‡ (disk-norm). This is the geomancer's compass which incorpo-



LO-PAN OR NET TABLET.

[The original is in the possession of Prof. Friedrich Hirth.]

rates the sum-total of feng-shui. The Chinese salesman who showed the instrument at my request, a man who must have lived half his life or more in the United States, expressed great respect for it and tried to impress me with the fact that it contained the deepest wisdom of the ages.

The lo-pan is a disk of lacquered wood, mostly of yellow color,

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* 羅盤　　† 羅經　　‡ 盤式

carrying in its center under glass, a small mariner's compass. Some of the characters written in the surrounding circles are red, and some are black. Different copies differ in details, but all are practically the same in their general and most characteristic features. The concentric circles of the net tablet are called *ts'eng*,* i. e., "tiers," "stories," or "strata."

The mariner's compass in the center represents *t'ai chih*,† "the great origin." The first circle contains the eight trigrams in the arrangement of Fuh-Hi, which denote the eight directions of the compass and the virtues and properties attributed to them.

The second circles contains the numerals from one to nine in the arrangement of the magic square, the five being omitted as it belongs in the center. Accordingly the sum of each two opposite figures always makes ten.

The third row represents twenty-four celestial constellations, each expressed in two characters, so that three names are registered in each octant.

The fourth circle represents in occult terms twenty-four divisions of the compass. Southeast, southwest, northeast, and northwest are written in their kwa names, while the rest are designated alternately by the ten stems and twelve branches; two of the stems are omitted, however, because referring to the element earth, they are supposed to belong in the center. If we write the ten stems as numerals from one to ten, the twelve branches in italic letters from *a* to *m*, and the four kwa names in Roman capitals A to D, we have the following arrangement, beginning in the southeast: A *f* 3 *g* 4 *h* B *i* 7 *k* 8 *l* C *m* 9 *a* 10 *b* D *c* 1 *d* 2 *e*. This arrangement is ancient for it is quoted as an established part of the divining method by Sze-Ma Ch'ien in the twenty-fifth chapter of his *Historical Records*, which is devoted to the art of divination.

The fifth circle is divided into seventy-two parts each containing two characters of the sexagenary cycle, written one above the other, and arranged in groups of five divided by blank spaces. If we again express the ten stems in figures and the twelve branches

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*層 †太極

in italics, the scheme (starting with the first branch *a* standing in the north) reads as follows:

1 3 5 7 9	2 4 6 8 10	3 5 7 9 1	4 6 8 10 2	5 7 9 1 3	6 8 10 2 4
a a a a a	*b b b b b*	*c c c c c*	*d d d d d*	*e e e e e*	*f f f f f*
7 9 1 3 5	8 10 2 4 6	9 1 3 5 7	10 2 4 6 8	1 3 5 7 9	2 4 6 8 10
g g g g g	*h h h h h*	*i i i i i*	*k k k k k*	*l l l l l*	*m m m m m*

In the sixth row each octant is divided into three sections, each having five compartments in the second and fourth of which appear two characters of the sexagenary cycle. Accordingly they are arranged in the following order, the blanks being expressed by zeros:

0 3 0 7 0	0 3 0 7 0	0 4 0 8 0	0 4 0 8 0	0 3 0 7 0	0 3 0 7 0
0 *a* 0 *a* 0	0 *a* 0 *a* 0	0 *b* 0 *b* 0	0 *b* 0 *b* 0	0 *c* 0 *c* 0	0 *c* 0 *c* 0
0 4 0 8 0	0 4 0 8 0	0 3 0 7 0	0 3 0 7 0	0 4 0 8 0	0 4 0 8 0
0 *d* 0 *d* 0	0 *d* 0 *d* 0	0 *e* 0 *e* 0	0 *e* 0 *e* 0	0 *f* 0 *f* 0	0 *f* 0 *f* 0
0 3 0 7 0	0 3 0 7 0	0 4 0 8 0	0 4 0 8 0	0 3 0 7 0	0 3 0 7 0
0 *g* 0 *g* 0	0 *g* 0 *g* 0	0 *h* 0 *h* 0	0 *h* 0 *h* 0	0 *i* 0 *i* 0	0 *i* 0 *i* 0
0 4 0 8 0	0 4 0 8 0	0 3 0 7 0	0 3 0 7 0	0 4 0 8 0	0 4 0 8 0
0 *k* 0 *k* 0	0 *k* 0 *k* 0	0 *l* 0 *l* 0	0 *l* 0 *l* 0	0 *m* 0 *m* 0	0 *m* 0 *m* 0

The third and fourth stems refer to fire and the seventh and eighth to metal.

The seventh row is devoted to the eight stars of the Dipper, which in Chinese folklore is regarded with much awe, because this most conspicuous constellation revolves around the polar star and seems to resemble the hand of a watch on the great celestial dial of the universe. We must remember that the seventh star is double, its luminous satellite being visible even without the assistance of a telescope. If we represent the names of the eight stars by numbers from one to eight, their arrangement beginning with the southwest is as follows: 1 8 5 7 4 4 6 2 3 1 5 7 8 1 3 2 6 6 4 7 5 8 3 2.

Beyond the seventh circle we have a double line which divides the seven inner rows from the nine outer ones. The first of these, the eighth circle, is divided into twelve sections each having three characters, the central ones written in red being the sun and moon

together with the five elements twice repeated. Beginning in the south with the character sun, and turning toward the left, they read as follows: sun, moon, water, metal, fire, wood, earth, earth, wood, fire, metal, water.

The ninth row, consisting of twelve sections, represents the twelve branches in regular succession, beginning in the north with the first and turning toward the right. They coincide in position with the twelve branches as they appear in the fourth row.

The tenth row is a repetition of the fifth, with the exception that here the characters are distributed evenly over the whole circle.

The eleventh row consists of numerals only. The circle is divided into twelve sections, each being subdivided into five compartments which contain the following scheme repeated twelve times: | 3 7 | 1 | 5 | 1 | 7 3 |.

The twelfth row is inscribed with the names of the sub-divisions of the four seasons, beginning with early spring above the unalloyed yin and turning toward the right.

SPRING.

立春 Beginning of Spring.
雨水 Rain Water.
驚蟄 Resurrection of hibernating Insects.
春分 Vernal Equinox.
清明 Pure Brightness.
穀雨 Rains over the Grain.

AUTUMN.

立秋 Beginning of Autumn.
處暑 Limit of Heat.
白露 White Dew.
秋分 Autumnal Equinox.
寒露 Cold Dew.
霜降 Descent of Hoar Frost.

SUMMER.

立夏 Beginning of Summer.
小滿 Grain filling a little.
芒種 Grain in Ear.
夏至 Summer Solstice.
小暑 Slight Heat.
大暑 Great Heat.

WINTER.

立冬 Beginning of Winter.
小雪 Little Snow.
大雪 Heavy Snow.
冬至 Winter Solstice.
小寒 Little Cold.
大寒 Severe Cold.

The thirteenth row is divided into seventy-two equal parts, which are left blank.

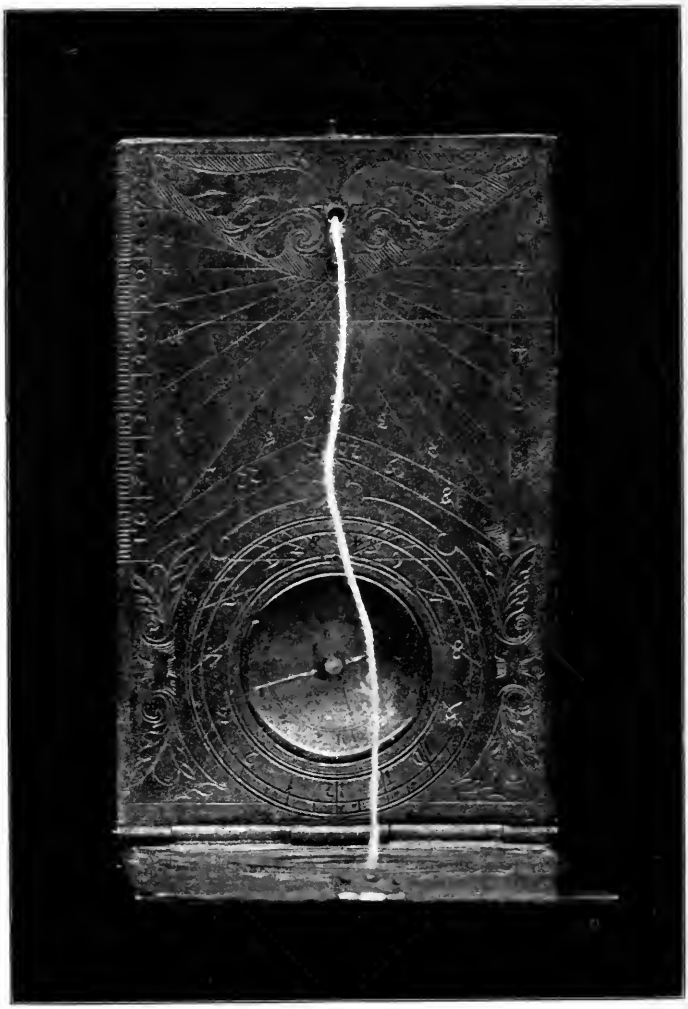
The fifteenth row is divided into three hundred and sixty equal blanks representing the degrees of a circle which method of division the Chinese as well as we of the Occident have inherited from the Babylonians.

The sixteenth row contains the names of the twenty-eight constellations together with the number of degrees which each covers. These degrees are specifically marked in the fourteenth circle in which the odd numbers only are expressed. The series starting in the southeast and turning toward the right, is as follows:

1. The horn, 11°; in Virgo.
2. The neck, 11°; in Virgo.
3. The bottom, 18°; in Libra.
4. The room, 5°; in Scorpio.
5. The heart, 8°; in Scorpio.
6. The tail, 15°; in Scorpio.
7. The sieve, 9°; in Sagittarius.
8. The measure, 24°; in Sagittarius.
9. The ox, 8°; in Aries and Sagittarius.
10. The damsel, 11°; in Aquarius.
11. The void, 10°; in Aquarius and Equuleus.
12. Danger, 20°; in Aquarius and Pegasus.
13. The house, 16°; in Pegasus.
14. The wall, 13°; in Pegasus and Andromeda.
15. Astride, 11°; in Andromeda and Pisces.
16. The hump, 13°; in Aries.
17. The stomach, 12°; in Musca Borealis.
18. The Pleiades, 9°. (In Chinese *mao.*)[19]
19. The end, 15°; in Hyades and Taurus.
20. The bill or beak, 1°; in Orion.
21. Crossing, or mixture, 11°; in Orion.
22. The well or pond, 31°; in Gemini.
23. The ghost, 5°; in Cancer.
24. The willow, 17°; in Hydra.

[19] The Chinese term *mao* does not possess any other significance except the name of this constellation. This character is unfortunately misprinted in Mayers, *Chinese Reader's Manual.* It is correct in the enumeration of Professor De Groot, *loc. cit.*, p. 972.

25. The star, 8°; in Hydra.
26. The drawn bow, 18°; in Hydra.
27. The wing, 17°; in Crater and Hydra.
28. The back of a carriage seat, 13°; in Corvus.

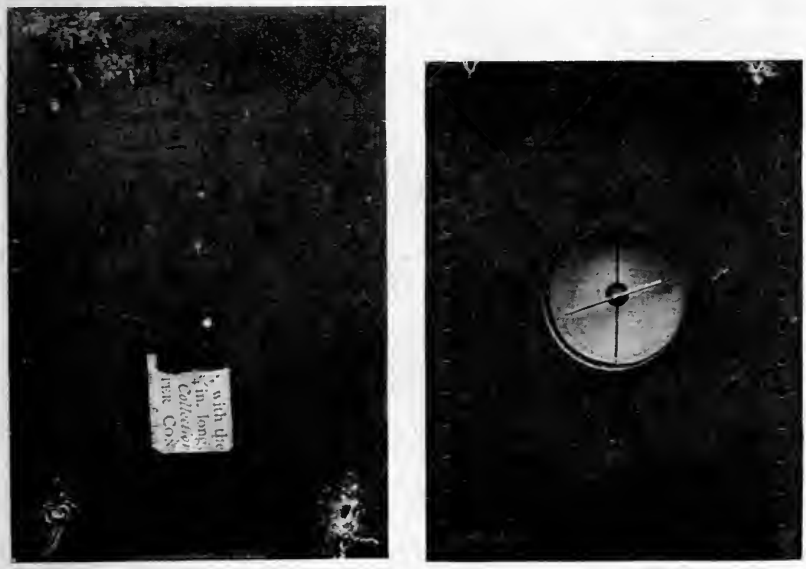


CHINESE POCKET COMPASS.

The two plates are hinged together and fold upon one another in the same way as the European compasses shown in the following pages.

THE MARINER'S COMPASS A CHINESE INVENTION.

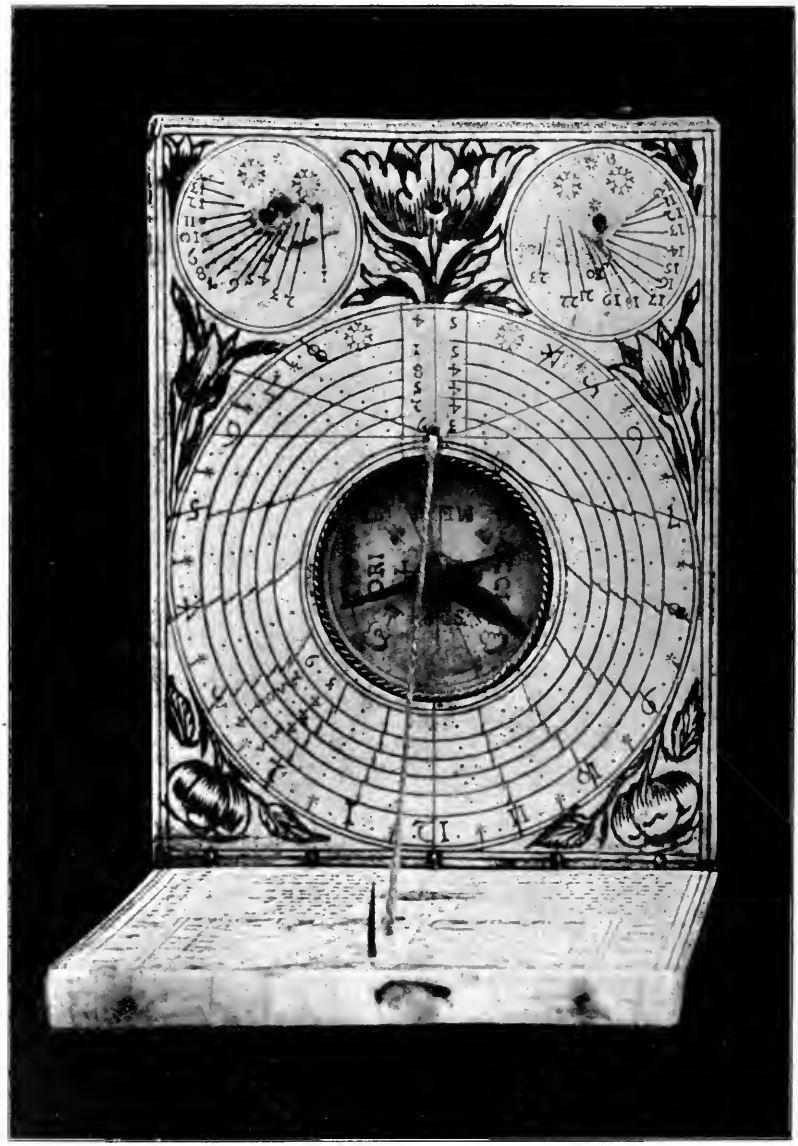
The lo-pan or net tablet unquestionably serves superstitious purposes, but we must bear in mind that much genuine science is incorporated in many of its details, and the latter no doubt has given countenance to the former. This again is according to the general law of the evolution of mankind and finds its parallel in the history of European civilisation. We must bear in mind that the great occultists of the Middle Ages, Paracelsus, Albertus Magnus, and



EUROPEAN COMPASS.
(Presumably Italian.)

men like them down to Agrippa of Nettesheim, were the most powerful intellects of their day; and though they were deeply entangled in mysticism, much of their life's work was devoted to the furtherance of genuine scientific enquiry.

In the Chinese Middle Ages the leading thinkers were of the same stamp, and so it is natural that much of genuine astronomy and the results of accurate observation of the stars are incorporated in the lo-pan. The most obvious part of it which must have ap-



EUROPEAN COMPASS.
(Presumably Nuremberg.)

peared extremely mystifying in former centuries was, as the Chinese call it, the south-pointing needle—the mariner's compass—situated in the center of the lo-pan.

The south-pointing needle is an ancient Chinese invention which for some time seems to have been forgotten. Professor Friedrich Hirth of Columbia University has privately communicated to me facts which prove that it was employed in ancient times by travelers through the desert, that the invention was lost and had to be rediscovered. We would add, too, that the Chinese invention became known in Europe after the time of Marco Polo where it was soon used as a mariner's compass. The incident is well known and can easily be established on the testimony of literary sources, but while sauntering through the National Museum at Washington, the writer discovered a palpable evidence in the show cases there exhibited, which displayed the Chinese pocket instruments containing south-pointing needles presumably a few centuries old, side by side with European compasses. They are of the same oblong shape and consist of two tablets hinged in the same manner. The European instruments have sun-dials in addition and are decidedly more serviceable for practical use but we can not doubt that for the original idea our ancestors are indebted to our Mongol fellow-men.*

THE PERSONIFICATION OF STARS.

To the Chinese (as also in some respects to the Babylonians) the stars are actual presences who sway the destinies of mankind, and we reproduce here a series of illustrations from a Buddhist picture-book printed in Japan. They are based upon ancient traditions ultimately derived from Sumer and Accad, but we have at present no means to determine the question of their history, especially as to their fate in China. One thing, however, may be regarded as certain, viz., that their traditional forms are prior to the calendar reform of the Jesuits. Hence we must assume that they have been imported by the way on

* We wish to express here our indebtedness to the National Museum and its officers, and especially to Prof. Otis T. Mason and Mr. George C. Maynard. for the reproduction of characteristic specimens of this interesting collection.

land either by the Buddhists from India, or through some earlier civilising influences perhaps from ancient Babylon, or may be in later times from Greece by way of Bactria and Tibet. An historical

connection of some kind or other with Western astronomy which also derives its origin from ancient Babylon, can scarcely be doubted; for the general similarities are too pronounced, and the more par-

ticular ones serve as obvious evidences which cannot be rejected, while the differences afford suggestions in regard to their development and fate.

According to the Chinese and Japanese custom, the series begins in the right upper corners and the order proceeds downwards and to the left.

The first figure represents the sun; the second, the moon. In

the next row we see the polar star seated (like Buddha) on a lotus and holding in his hands a wheel to indicate that he is the hub of the heavens. As Buddha in the spiritual world, so the polar star

among the constellations is alone at rest while all other things in the universe whirl round in unceasing rotation. In the same column is the star of twilight-brightness, which may be either the morning or evening star.

The third row of the same page begins the series of stars that constitute Ursa Major, popularly called "the dipper" in America and known in China as "the bushel."

The satellite of the seventh star in Ursa Major is pictured as a smaller companion in the right hand corner in the field of his bigger brother. Since he stands at the very point of the constella-

tion, his significance is in inverse proportion to his size, in a similar way as Tom Thumb always takes the initiative in all deeds and proves to be the saviour of his seven brothers.

The seven planets are here increased after the precedence of Hindu astrology by two three-headed figures called *Rahu* and *Ketu*, the former being conceived as the head, and the latter as the tail of

the monster who is supposed to be responsible for solar and lunar eclipses.

Next in order on our tables beginning with the second column

of their fourth page, are the twenty-eight constellations mentioned above which play an important part in Chinese occultism. The approximate outline of the constellation is indicated in each case above

the picture, and we see, for instance, why the fifteenth constellation is called "astride," and the twenty-sixth, a "drawn bow."

The stars corresponding to our signs of the zodiac are named

differently in Chinese. The characters on the lo-pan are presumably the older and the originally Chinese way of naming the constellations of the ecliptic, while our Buddhist picture-book incorporates a later view, and we are inclined to regard it as imported by Bud-

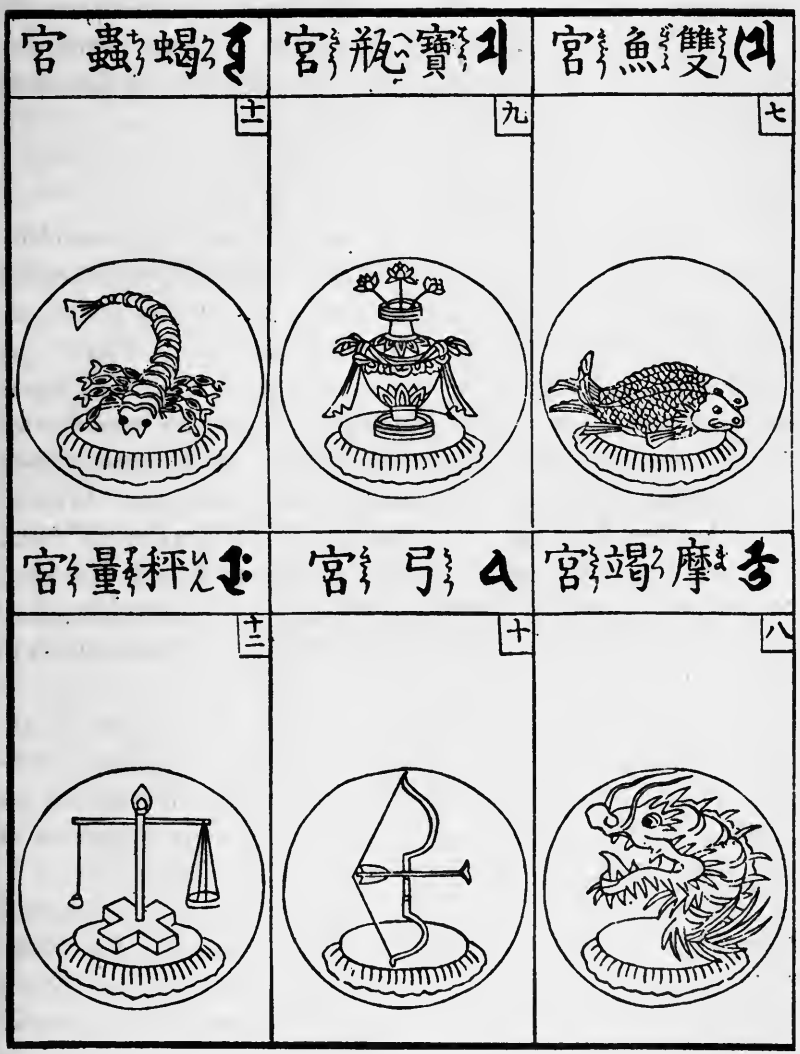
dhist missionaries from India. Nine names among the twelve correspond very closely to ours, but the order in which they occur is different.

In our researches we have never entered deeply into comparative astronomy, but judging from suggestions of scholars who have made a specialty of this interesting branch of human lore, we can say positively that the Babylonian origin of the division and names

of the zodiac has been firmly established. Prof. Franz Boll has collected all pertinent material of Greek texts and also illustrations of several ancient representations of the starry heavens in his book,

Sphaera, neue griechische Texte und Untersuchungen zur Geschichte der Sternbilder (Leipsic, Teubner, 1903). He also refers to the method prevalent in Eastern Asia, of counting hours, months, and

years by the duodenary system of animals and points out its similarities to the Babylonian system (pp. 326 ff.). The facts presented here in our article can only corroborate Professor Boll's theory.



In addition to Professor Boll's work, the writer has had the advantage of consulting some manuscript notes of an American sinologue, Mr. Richard H. Geoghegan of Seattle, Washington, who compares the calendar system of China to that of the Maya in

Central America, and arrives at the conclusion that the latter must have derived the inspiration of its origin from the former.

In consideration of the fact that the calendar systems of prehistoric peoples in Asia and America exhibit similarities which are still traceable in our nomenclature of the zodiac, we come to the conclusion that the interrelations of primitive mankind must have been much closer than is commonly assumed.*

PREHISTORIC CONNECTIONS.

The evidences that indicate a Western origin of Chinese civilisation are very strong, and it seems that the first Chinese settlers must have come in prehistoric times from a country that was closely connected with the founders of Babylonian culture. There is an unmistakable resemblance between cuneiform writing and Chinese script, so as to make it quite probable that they have been derived from a common source. We have, further, the sexagenary cycle corresponding to the use of the number sixty in Babylonia. We ourselves have retained some of the names for the signs of the zodiac that were used in Babylon, and the Chinese have done the same. Moreover, the Chinese divide the circle into three hundred and sixty degrees as did the Babylonians, a system which has been adhered to in the West down to modern times.

The Prometheus legend seems to come from the same source (presumably Accad) as the story of the Chinese "Fire Man," Sui-Jen. The Babylonian story of Tiamat as to the formation of the world is repeated in the legend of P'an-Ku, the personification of the ancient abyss.

Finally the yih system of the yang and the yin is paralleled in at least one Semitic tribe by the similar divining method of the Urim and Thummim. Though in the latter case the loss of details prevents us from having any evidence of a historical connection, the similarity of the purpose, as well as the duality of the elements of the oracle cannot be denied.

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* As soon as we see our way in overcoming the difficulties of reproducing the Chinese characters and the Mayan symbols, we will proceed to publish Mr. Geoghegan's article in the the columns of *The Monist*.

If none of these indications is conclusive when considered separately, we can not disregard them when all are taken together.

Further bearing in mind that there is an ancient tradition in China of a settlement having been made by a tribe coming from the Far West, we may very well assume the ancestors of the Chinese to be a detachment of the founders of the Babylonian civilisation, either Sumerians or Accadians, and that they left their home in prehistoric times presumably even before the first Semitic invasion or soon afterwards. They were perhaps that portion of the people who would not submit to the new condition of things and preferred exile to absorption by a victorious enemy.

CONCLUSION.

Chinese occultism has its great faults, yet it is based upon a world conception which is not only rational but even in close agreement with some leading principles of Western science; and there is scarcely a superstition in Cathay which has not at one time or another prevailed in European countries, if not in the same, at least in an analogous form. We, too, had the measles in our childhood; so we have no reason to ridicule the Chinese because they (or at least large classes of the population) have them still.

From the standpoint of comparative ethnology and especially ethnic psychology, a knowledge of the Chinese mode of thinking is of great importance; for the Chinese are so different from all other existing nations in their world conception, and in their ways of arguing, as well as living, that they seem to have developed a type of humanity of their own. Yet the differences are only in externals and their main logical as well as moral notions are practically the same as those which prevail among the nations of Europe. Those traits, however, which are different are deeply rooted in the aboriginal character of the Chinese nation and pervade their entire history. These strange people have developed on different lines, and though they started with great promise, having made rapid strides at the very beginning of their civilisation, they exhibited a most devout reverence toward the past which resulted in an un-

paralleled conservatism in their national institutions that worked as a brake upon progress, and rendered their further evolution almost stagnant. Because of this they have been easily overtaken by the younger nations of the West who were still barbarians, nay, savages, when China had attained a high grade of civilisation. We should not forget that we owe to China all the inventions which in their entirety produced the latest phase of our civilisation, viz., the invention of printing, the manufacture of paper, the use of the mariner's compass, and last but not least, the invention of gunpowder. Reports of these inventions, not to mention others of less significance, such as the manufacture of porcelain, silk culture, etc., had reached Europe through travelers who at first were scarcely believed, but the result was a rediscovery of these ancient Chinese inventions and their more systematic application in practical life. While the Chinese, almost since the days of Confucius, have made little advance in the arts and sciences, Europe grew rapidly in knowledge, wealth, and power, having now reached a stage which might be called "the age of science."

It is difficult for us to-day to understand how the Chinese can be so impervious to progress, how they can be so proud of their own civilisation, the imperfections of which appear obvious to us. We find an answer to these problems when we become acquainted with the Chinese mode of speaking, writing, and thinking. If we want to comprehend their errors we must know that these are but the reverse aspect of their proficiencies, and their faults are frequently misapplied virtues. We shall be better able to deal with the Chinese when we study their character as a whole by contemplating the dark aspects of the picture as the shades that are produced by the light that falls upon things. In this sense and for the purpose of furnishing the necessary material for a psychological appreciation of the Chinese nationality, we have sketched here and in some previous articles, in bare outlines, the main characteristic features of the Chinese world-conception. We hope that we have helped thereby to contribute a little toward the realisation of the great ideal of peace on earth and good will among men.

EDITOR.

MAGIC SQUARES.

[CONCLUSION.]

EVEN MAGIC SQUARES.

THE writer believes that the method of constructing even magic squares by a predetermined geometrical arrangement of numbers is new and original. It will be noted that the foregoing dia-

1	195	3	193	5	191	190	7	188	10	186	12	184	14
182	16	180	18	178	20	176	175	23	173	25	171	27	15
168	167	31	165	33	163	35	36	160	38	158	40	30	155
48	153	152	46	150	48	148	147	51	145	53	45	142	56
140	58	138	137	61	135	63	64	132	66	60	129	69	127
71	125	73	123	122	76	120	119	79	75	116	82	114	84
112	86	110	88	108	107	91	92	90	103	95	101	97	99
98	100	96	102	89	93	105	106	104	94	109	87	111	85
113	83	115	74	80	118	78	77	121	117	81	124	72	126
70	128	69	67	131	65	133	134	62	136	130	68	139	57
141	44	54	144	52	146	50	49	149	47	151	143	55	154
20	41	157	39	159	37	161	162	34	164	32	166	156	42
28	170	26	172	24	174	21	22	177	19	179	17	181	169
183	13	185	11	187	6	8	189	9	192	4	194	2	196

Fig. 66.

grams illustrate in a graphic manner the interesting results attained by the harmonious association of figures, and they also clearly demonstrate the almost infinite variety of possible combinations.

THE CONSTRUCTION OF EVEN MAGIC SQUARES BY DE LA HIRE'S METHOD.

A perfect magic square of 4×4 may be constructed as follows:

1. Fill the corner diagonal columns of a 4×4 square with the numbers 1 to 4 in arithmetical sequence, starting from the upper and lower left hand corners (Fig. 67).
2. Fill the remaining empty cells with the missing numbers of the series 1 to 4 so that the sum of every perpendicular and horizontal column equals 10 (Fig. 68).

1			4
	2	3	
	2	3	
1			4

Fig. 67.

1	3	2	4
4	2	3	1
4	2	3	1
1	3	2	4

Fig. 68.

1	4	4	1
3	2	2	3
2	3	3	2
4	1	1	4

Fig. 69.

3. Construct another 4×4 square, having all numbers in the same positions relatively to each other as in the last square, but reversing the direction of all horizontal and perpendicular columns (Fig. 69).
4. Form the key square Fig. 70 from Fig. 69 by substituting key numbers for prime numbers, and then add the numbers in this key square to similarly located numbers in the primary square Fig. 68. The result will be the perfect square of 4×4 shown in Fig. 72.

By making the key square Fig. 71 from the primary square Fig. 68 and adding the numbers therein to similarly located numbers in the primary square Fig. 69, the same magic square of 4×4 will be produced, but with all horizontal and perpendicular columns reversed in direction as shown in Fig. 73.

The magic square of 6×6 shown in Figure 46 and also a large number of variations of same may be readily constructed by

the De la Hire method, and the easiest way to explain the process will be to analyze the above mentioned square into the necessary primary and key squares, using the prime numbers 1 to 6 with their respective key numbers as follows:

Prime numbers 1, 2, 3, 4, 5, 6.
Key numbers 0, 6, 12, 18, 24, 30.

The cells of two 6×6 squares may be respectively filled with prime and key numbers by analyzing the contents of each cell in Fig. 46. Commencing at the left hand cell in the upper row, we note that this cell contains 1. In order to produce this number by the addition of a prime number to a key number it is evident that

PRIME NUMBERS	KEY NUMRERS
1	0
2	4
3	8
4	12

0	12	12	0
8	4	4	8
4	8	8	4
12	0	0	12

Fig. 70.

0	8	4	12
12	4	8	0
12	4	8	0
0	8	4	12

Fig. 71.

1	15	14	4
12	6	7	9
8	10	11	5
13	3	2	16

Fig. 72.

1	12	8	13
15	6	10	3
14	7	11	2
4	9	5	16

Fig. 73.

0 and 1 must be selected and written into their respective cells. The second number in the top row of Fig. 46 being 35, the key number 30 must be written in the second cell of the key square and the prime number 5 in the second cell of the prime square, and so on throughout all the cells, the finished squares being shown in Figs. 74 and 75.

Another prime square may now be derived from the key square Fig. 74 by writing into the various cells of the former the prime numbers that correspond to the key numbers of the latter. This second primary square is shown in Fig. 76. It will be seen that the numbers in Fig. 76 occupy the same relative positions to each other

as the numbers of the first primary square (Fig. 75), but the direction of all columns is changed from horizontal to perpendicular, and vice versa.

To distinguish and identify the two primary squares which are used in these operations, the first one (in this case Fig. 75) will in future be termed the A primary square, and the second one (in this case Fig. 76) the B primary square.

1	35	34	3	32	6
30	8	28	27	11	7
24	23	15	16	14	19
13	17	21	22	20	18
12	26	9	10	29	25
31	2	4	33	5	36

Fig. 46 (Dup.)

0	30	30	0	30	0
24	6	24	24	6	6
18	18	12	12	12	18
12	12	18	18	18	12
6	24	6	6	24	24
30	0	0	30	0	30

Fig. 74.

It is evident that the magic square of 6×6 shown in Fig. 46 may now be reconstructed by adding the cell numbers in Fig. 74

1	5	4	3	2	6
6	2	4	3	5	1
6	5	3	4	2	1
1	5	3	4	2	6
6	2	3	4	5	1
1	2	4	3	5	6

Fig. 75.

1	6	6	1	6	1
5	2	5	5	2	2
4	4	3	3	3	4
3	3	4	4	4	3
2	5	2	2	5	5
6	1	1	6	1	6

Fig. 76.

to the similarly placed cell numbers in Fig. 75. Having thus inversely traced the development of the magic square from its A and B primary and key squares, it will be useful to note some of the general characteristics of even primary squares, and also to study the rules which govern their construction, as these rules will be found instructive in assisting the student to work out an almost endless variety of even magic squares of all dimensions.

1. Referring to the 6×6 A primary square shown in Fig. 75, it will be noted that the two corner diagonal columns contain the numbers 1 to 6 in arithmetical order, starting respectively from the upper and lower left hand corner cells, and that the diagonal columns of the B primary square in Fig. 76 also contain the same numbers in arithmetical order but starting from the two upper corner cells. The numbers in the two corner diagonal columns are subject to many arrangements which differ from the above but it will be unnecessary to consider them in the present article.
2. The numbers in the A primary square Fig. 75 have the same relative arrangement as those in the B primary square Fig. 76, but the horizontal columns in one square form the perpendicular columns in the other and vice versa. This is a general but not a universal relationship between A and B primary squares.
3. The sum of the series 1 to 6 is 21 and the sum of every column in both A and B 6×6 primary squares must also be 21.
4. The sum of every column in a 6×6 key square must be 90, and under these conditions it follows that the sum of every column of a 6×6 magic square which is formed by the combination of a primary square with a key square must be 111 $(21 + 90 = 111)$.
5. With the necessary changes in numbers the above rules hold good for all sizes of A and B primary squares and key squares.

We may now proceed to show how a variety of 6×6 magic squares can be produced by different combinations of numbers in primary and key squares. The six horizontal columns in Fig. 75 show some of the combinations of numbers from 1 to 6 that can be used in 6×6 A primary squares, and the positions of these columns or rows of figures relatively to each other may be changed so as to produce a vast variety of squares which will naturally lead to the development of a corresponding number of 6×6 magic squares.

In order to illustrate this in a systematic manner the different rows of figures in Fig. 75 may be rearranged and identified by letters as given in Fig. 77.

a	1	2	4	3	5	6
b	1	5	4	3	2	6
c	1	5	3	4	2	6
d	6	5	3	4	2	1
e	6	2	3	4	5	1
f	6	2	4	3	5	1

Fig. 77.

Fig. 78 shows the sequence of numbers in the diagonal columns of these 6×6 A primary squares, and as this arrangement cannot

1st line	1					6	*a*, *b*, or *c*.
2nd "		2			5		*a*, *e*, or *f*.
3rd "			3	4			*c*, *d*, or *e*.
4th "			3	4			*c*, *d*, or *e*.
5th "		2			5		*a*, *e*, or *f*.
6th "	1					6	*a*, *b*, or *c*.

Fig. 78.

be changed in this series, the various horizontal columns or rows in Fig. 77 must be selected accordingly. The small letters at the right

No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
a	*a*	*b*	*b*	*c*	*c*
f	*e*	*f*	*e*	*a*	*f*
c	*d*	*c*	*d*	*d*	*e*
d	*c*	*d*	*c*	*e*	*d*
e	*f*	*e*	*f*	*f*	*a*
b	*b*	*a*	*a*	*b*	*b*

Fig. 79.

of Fig. 78 indicate the different horizontal columns that may be used for the respective lines in the square; thus either *a*, *b*, or *c* column

in Fig. 77 may be used for the first and sixth lines, *a*, *e*, or *f* for the second and fifth, and *c*, *d*, or *e* for the third and fourth lines, but neither *b*, *c*, or *d* can be used in the second or fifth lines, and so forth.

Six different combinations of columns are given in Fig, 79, from which twelve different 6×6 magic squares may be constructed. Taking column No. 1 as an example, Fig. 80 shows an

a	1	2	4	3	5	6
f	6	2	4	3	5	1
c	1	5	3	4	2	6
d	6	5	3	4	2	1
e	6	2	3	4	5	1
b	1	5	4	3	2	6

Fig. 80.

1	6	1	6	6	1
2	2	5	5	2	5
4	4	3	3	3	4
3	3	4	4	4	3
5	5	2	2	5	2
6	1	6	1	1	6

Fig. 81.

A primary square made from the combination *a*, *f*, *c*, *d*, *e*, *b*, and Fig. 81 is the B primary square formed by reversing the direction of the horizontal and perpendicular columns of Fig. 80. The key square Fig. 82 is then made from Fig. 81 and the 6×6 magic

0	30	0	30	30	0
6	6	24	24	6	24
18	18	12	12	12	18
12	12	18	18	18	12
24	24	6	6	24	6
30	0	30	0	0	30

Fig. 82.

0	30	30	0	30	0
24	6	24	24	6	6
18	12	12	12	18	18
12	18	18	18	12	12
6	24	6	6	24	24
30	0	0	30	0	30

Fig. 83.

square in Fig. 84 is the result of adding the cell numbers of Fig. 82 to the corresponding cell numbers in Fig. 80.

The above operation may be varied by reversing the horizontal columns of the key square Fig. 82 right and left as shown in Fig. 83 and then forming the magic square given in Fig. 85. In this way two different magic squares may be derived from each combination.

It will be noted that all the 6×6 magic squares that are constructed by these rules are similar in their general characteristics to the 6×6 squares which are built up by the diagrammatic system.

Perfect 8×8 magic squares may be constructed in great variety by the method now under consideration, and the different com-

1	32	4	33	35	6
12	8	28	27	11	25
19	23	15	16	14	24
18	17	21	22	20	13
30	26	9	10	29	7
31	5	34	3	2	36

Fig. 84.

1	32	34	3	35	6
30	8	28	27	11	7
19	17	15	16	20	24
18	23	21	22	14	13
12	26	9	10	29	25
31	5	4	33	2	36

Fig. 85.

binations of numbers from 1 to 8 given in Fig. 86 will be found useful by laying out a large number of A primary squares.

1	7	6	4	5	3	2	8	*a*
1	2	6	4	5	3	7	8	*b*
1	2	6	5	4	3	7	8	*c*
1	7	3	4	5	6	2	8	*d*
1	7	3	5	4	6	2	8	*e*
8	2	3	5	4	6	7	1	*aa*
8	7	3	5	4	6	2	1	*bb*
8	7	3	4	5	6	2	1	*cc*
8	2	6	5	4	3	7	1	*dd*
8	2	6	4	5	3	7	1	*ee*

Fig. 86.

Fig. 87 shows the fixed numbers in the diagonal columns of these 8×8 A primary squares, and also designates by letters the specific rows of figures which may be used for the different horizontal columns. Thus the row marked *a* in Fig. 86 may be used for the first, fourth, fifth, and eighth horizontal columns but cannot

be employed for the second, third, sixth or seventh columns, and so forth.

Fig. 88 suggests half a dozen combinations which will form as many primary squares, and it is evident that the number of possible variations is very large. It will suffice to develop the first and third of the series in Fig. 88 as examples.

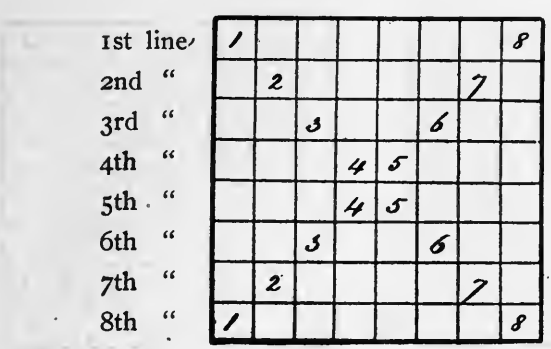


Fig. 87.

Fig. 89 is the A primary square developed from column No. 1 in Fig. 88, and Fig. 90 is the B primary square made by reversing

No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
a	*b*	*c*	*d*	*e*	*a*
aa	*b*	*c*	*dd*	*ee*	*b*
aa	*d*	*cc*	*e*	*e*	*e*
a	*b*	*cc*	*d*	*ee*	*d*
a	*b*	*cc*	*d*	*ee*	*d*
aa	*d*	*cc*	*e*	*e*	*e*
aa	*b*	*c*	*dd*	*ee*	*b*
a	*b*	*c*	*d*	*e*	*a*

Fig. 88.

the direction of all horizontal and perpendicular columns of Fig. 89. Substituting key numbers for the prime numbers in Fig. 90, and adding these key numbers to the prime numbers in Fig. 89 gives the perfect magic square of 8×8 shown in Fig. 91. The latter will be found identical with the square which may be written out directly from diagrams in Fig. 52.

Fig. 92 shows an A primary square produced from column No. 3 in Fig. 88. The B primary square Fig. 93 being made in the regular way by reversing the direction of the columns in Fig. 92.

Prime numbers 1, 2, 3, 4, 5, 6, 7, 8.
Key numbers 0, 8, 16, 24, 32, 40, 48, 56.

1	7	6	4	5	3	2	8	a
8	2	3	5	4	6	7	1	aa
8	2	3	5	4	6	7	1	aa
1	7	6	4	5	3	2	8	a
1	7	6	4	5	3	2	8	a
8	2	3	5	4	6	7	1	aa
8	2	3	5	4	6	7	1	aa
1	7	6	4	5	3	2	8	a

Fig. 89.

1	8	8	1	1	8	8	1
7	2	2	7	7	2	2	7
6	3	3	6	6	3	3	6
4	5	5	4	4	5	5	4
5	4	4	5	5	4	4	5
3	6	6	3	3	6	6	3
2	7	7	2	2	7	7	2
8	1	1	8	8	1	1	8

Fig. 90.

The perfect magic square of 8×8 in Fig. 94 is developed from these two primary squares as in the last example, and it will be

1	63	62	4	5	59	58	8
56	10	11	53	52	14	15	49
48	18	19	45	44	22	23	41
25	39	38	28	29	35	34	32
33	31	30	36	37	27	26	40
24	42	43	21	20	46	47	17
16	50	51	13	12	54	55	9
57	7	6	60	61	3	2	64

Totals = 260.

Fig. 91.

found similar to the square which may be formed directly from diagram No. 2 in Fig. 54.

Fig. 95 shows another 8×8 magic square which is constructed by combining the A primary square in Fig. 89 with the B primary square in Fig. 93 after changing the latter to a key square in the

manner before described. This magic square may also be directly constructed from diagram No. 4 in Fig. 54.

It is evident that an almost unlimited number of different 8×8 magic squares may be made by the foregoing methods, and

1	2	6	5	4	3	7	8	c
1	2	6	5	4	3	7	8	c
8	7	3	4	5	6	2	1	cc
8	7	3	4	5	6	2	1	cc
8	7	3	4	5	6	2	1	cc
8	7	3	4	5	6	2	1	cc
1	2	6	5	4	3	7	8	c
1	2	6	5	4	3	7	8	c

Fig. 92.

1	1	8	8	8	8	1	1
2	2	7	7	7	7	2	2
6	6	3	3	3	3	6	6
5	5	4	4	4	4	5	5
4	4	5	5	5	5	4	4
3	3	6	6	6	6	3	3
7	7	2	2	2	2	7	7
8	8	1	1	1	1	8	8

Fig. 93.

their application to the formation of other and larger squares is so obvious that it will be unnecessary to present any further examples.

1	2	62	61	60	59	7	8
9	10	54	53	52	51	15	16
48	47	19	20	21	22	42	41
40	39	27	28	29	30	34	33
32	31	35	36	37	38	26	25
24	23	43	44	45	46	18	17
49	50	14	13	12	11	55	56
57	58	6	5	4	3	63	64

Fig. 94.

1	7	62	60	61	59	2	8
16	10	51	53	52	54	15	9
48	42	19	21	20	22	47	41
33	39	30	28	29	27	24	40
25	31	38	36	37	35	26	32
24	18	43	45	44	46	23	17
56	50	11	13	12	14	55	49
57	63	6	4	5	3	58	64

Fig. 95.

COMPOUND MAGIC SQUARES.

The writer believes that these highly ingenious combinations were first devised by Prof. Hermann Schubert.

They may be described as a series of small magic squares arranged quadratically in magic square order.

The 9×9 square shown in Fig. 96 is the smallest of this class that can be constructed and it consists of nine 3×3 sub-squares arranged in the same order as the numerals 1 to 9 inclusive in the 3×3 square shown in Fig. 1. The first sub-square occupies the

71	64	69	8	1	6	53	46	51
66	68	70	3	5	7	48	50	52
67	72	65	4	9	2	49	54	47
26	19	24	44	37	42	62	55	60
21	23	25	39	41	43	57	59	61
22	27	20	40	45	38	58	63	56
35	28	33	80	73	78	17	10	15
30	32	34	75	77	79	12	14	16
31	36	29	76	81	74	13	18	11

Totals = 369.

Fig. 96.

middle section of the first horizontal row of sub-squares, and it contains the numbers 1 to 9 inclusive arranged in regular magic

47	58	69	80	1	12	23	34	45
57	68	79	9	11	22	33	44	46
67	78	8	10	21	32	43	54	56
77	7	18	20	31	42	53	55	66
6	17	19	30	41	52	63	65	76
16	27	29	40	51	62	64	75	5
26	28	39	50	61	72	74	4	15
36	38	49	60	71	73	3	14	25
37	48	59	70	81	2	13	24	35

Totals = 369.

Fig. 97.

square order being a duplicate of Fig. 1. The second sub-square is located in the right hand lower corner of the third horizontal row of sub-squares and it contains the numbers 10 to 18 inclusive arranged in magic square order, and so on to the last sub-square

which occupies the middle section of the third horizontal row of sub-squares, and which contains the numbers 73 to 81 inclusive.

This peculiar arrangement of the numbers 1 to 81 inclusive forms a magic square in which the characteristics of the ordinary 9×9 square are multiplied to a remarkable extent, for whereas in the latter square (Fig. 97) there are only twenty columns which sum up to 369, in the compound square of 9×9 there are an immense number of combination columns which yield this amount. This is evident from the fact that there are eight columns in the first sub-square which yield the number 15; also eight columns in

113	127	126	116	1	15	14	4	81	95	94	84
124	118	119	121	12	6	7	9	92	86	87	89
120	122	123	117	8	10	11	5	88	90	91	85
125	115	114	128	13	3	2	16	93	83	82	96
33	47	46	36	65	79	78	68	97	111	110	100
44	38	39	41	76	70	71	73	108	102	103	105
40	42	43	37	72	74	75	69	104	106	107	101
45	35	34	48	77	67	66	80	109	99	98	112
49	63	62	52	129	143	142	132	17	31	30	20
60	54	55	57	140	134	135	137	28	22	23	25
56	58	59	53	136	138	139	133	24	26	27	21
61	51	50	64	141	131	130	144	29	19	18	32

Totals = 870.

Fig. 98.

the middle sub-square which yield the number 123—and eight columns in the last sub-square which sum up to the number 231—and $15 + 123 + 231 = 369$.

The next compound square is that of 12×12 which may be built with sixteen sub-squares of 3×3 or with nine sub-squares of 4×4 the latter arrangement being shown in Fig. 98.

The next larger square of this class is that of 16×16 which can only be built with sixteen sub-squares of 4×4. Next comes the 18×18 compound square which may be constructed with

thirty-six sub-squares of 3×3 or with nine sub-squares of 6×6, and so on indefinitely with larger and larger compound squares.

CONCENTRIC MAGIC SQUARES.

Beginning with a small central magic square it is possible to arrange one or more panels of numbers concentrically around it so that after the addition of each panel, the enlarged square will still retain magic qualifications.

Either a 3×3 or a 4×4 magic square may be used as a

23	1	2	20	19
22	16	9	14	4
5	11	13	15	21
8	12	17	10	18
7	25	24	6	3

Fig. 99.

23	1	2	20	19
22	12	11	16	4
5	17	13	9	21
8	10	15	14	18
7	25	24	6	3

Fig. 102.

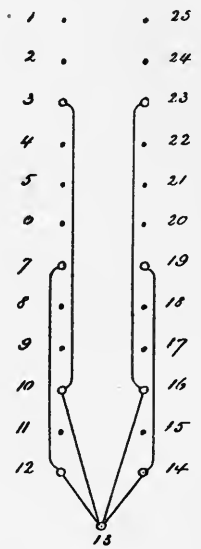


Fig. 100.

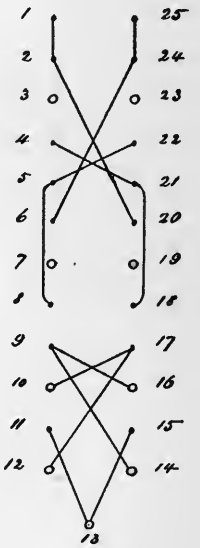


Fig. 101.

Totals of 3×3 squares $= 39$.
Totals of 5×5 squares $= 65$.

nucleus, and the square will obviously remain either odd or even, according to its beginning, irrespective of the number of panels which may be successively added to it. The center square will naturally be perfect, but after one or more panels have been added the enlarged square will no longer retain perfect characteristics, because the peculiar features of its construction will not permit the sum of every pair of geometrically opposite numbers to equal the

sum of the first and last numbers of the series used. The sum of every horizontal and perpendicular column and of the two corner diagonal columns will, however, be the same amount.

The smallest concentric square that can be constructed is that of 5×5, an example of which is illustrated in Fig. 99.

The center square of 3×3 begins with 9 and continues, with increments of 1, up to 17, the center number being 13 in accordance with the general rule for a 5×5 square made with the series of

19	2	20	1	23
4	16	9	14	22
18	11	13	15	8
21	12	17	10	5
3	24	6	25	7

Fig. 103.

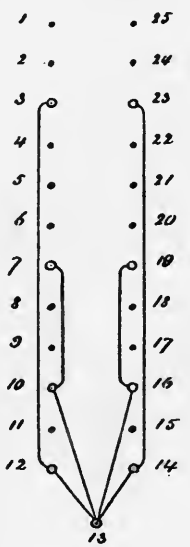


Fig. 104.

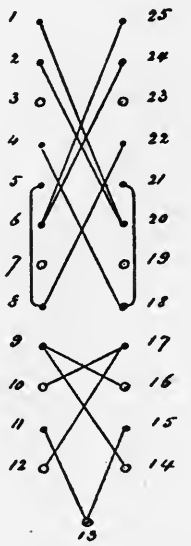


Fig. 105.

Totals of 3×3 square $= 39$.
Totals of 5×5 square $= 65$.

numbers 1 to 25. The development of the two corner diagonal columns is given in diagram Fig. 100, the numbers for these columns being indicated by small circles. The proper sequence of the other twelve numbers in the panels is shown in Fig. 101. The relative positions of the nine numbers in the central 3×3 square cannot be changed, but the entire square may be inverted or turned one quarter, one half, or three quarters around, so as to vary the position of the numbers in it relatively to the surrounding panel

numbers. Fig. 102 shows a 5×5 concentric square in which the panel numbers occupy the same cells as in Fig. 99, but the central 3×3 square is turned around one quarter of a revolution to the right.

Several variations may also be made in the location of the panel numbers, an example being given in Figs. 103, 104, and 105. Many

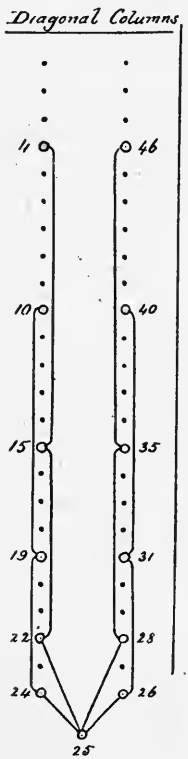


Fig. 106.

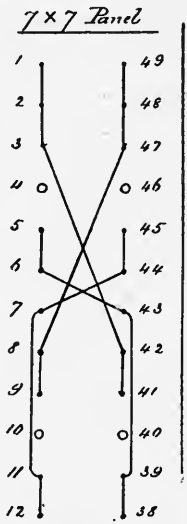


Fig 107.

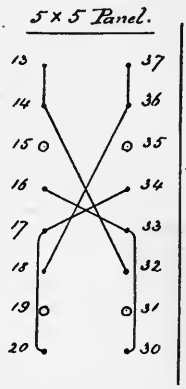


Fig. 108.

Fig. 109.

46	1	2	3	42	41	40
45	35	13	14	32	31	5
44	34	28	21	26	16	6
7	17	23	25	27	33	43
11	20	24	29	22	30	39
12	19	37	36	18	15	38
10	49	48	47	8	9	4

Fig. 110.

Totals of 3×3 square = 75
Totals of 5×5 square = 125
Totals of 7×7 square = 175

other changes in the relative positions of the panel numbers are selfevident.

One of many variations of the 7×7 concentric magic square

is shown in Fig. 110. The 3×3 central square in this example is started with 21 and finished with 29 in order to comply with the general rule that 25 must occupy the center cell in a 7×7 square

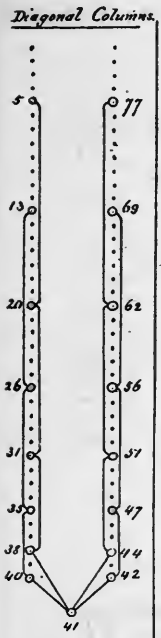


Fig. 111.

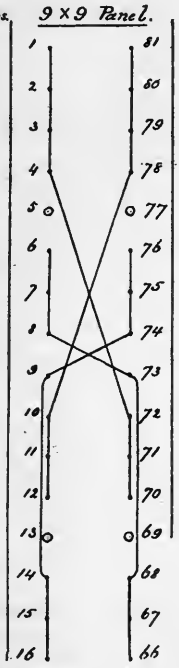


Fig. 112.

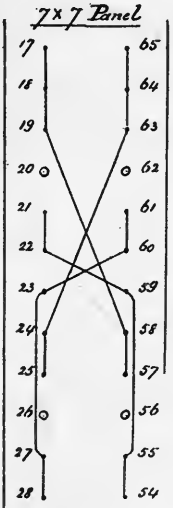


Fig. 113.

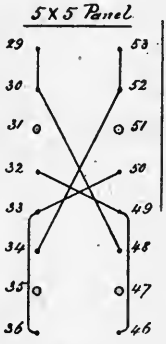


Fig. 114.

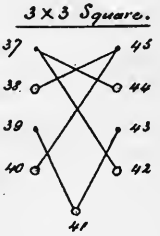


Fig. 115.

TOTALS:

3×3 square 123,
5×5 square 205,
7×7 square 287,
9×9 square 369.

77	1	2	3	4	72	71	70	69
76	62	17	18	19	58	57	56	6
75	61	51	29	30	48	47	21	7
74	60	50	44	37	42	32	22	8
9	23	33	39	41	43	49	59	73
14	27	36	40	45	38	46	55	68
15	28	35	53	52	34	31	54	67
16	26	65	64	63	24	25	20	66
13	81	80	79	78	10	11	12	5

Fig. 116.

that includes the series of numbers 1 to 49. The numbers for the two corner diagonal columns are indicated in their proper order by small circles in Fig. 106, and the arrangement of the panel numbers is given in Figs. 107, 108, and 109. As a final example of an

odd concentric square Fig. 116 shows one of 9×9, its development being given in Figs. 111, 112, 113, 114, and 115.

All these diagrams are simple and obvious expansions of those shown in Figs. 100 and 101 in connection with the 5×5 concentric square, and they and their numerous variations may be expanded

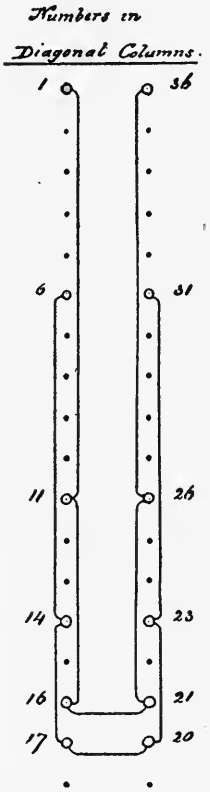


Fig. 117.

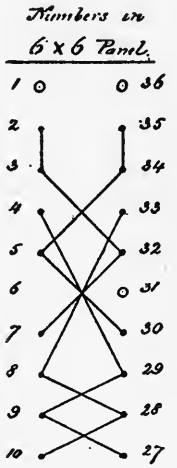


Fig. 118.

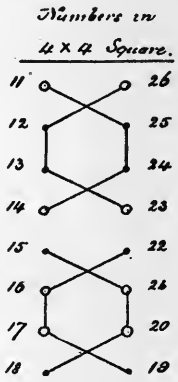


Fig. 119.

1	35	34	5	30	6
33	11	25	24	14	4
8	22	16	17	19	29
28	18	20	21	15	9
10	23	13	12	26	27
31	2	3	32	7	36

Fig. 120.

Totals of 4×4 square $= 74$.
Totals of 6×6 square $= 111$.

indefinitely and used for the construction of larger odd magic squares of this class.

The smallest even concentric magic square is that of 6×6, of which Fig. 120 is an example. The development of this square

may be traced in the diagrams given in Figs. 117, 118, and 119. The center square of 4×4 is perfect, but after the panel is added the enlarged square becomes imperfect as already noted. Figs. 121, 122, 123, and 124 illustrate another example of this square with diagrams of development.

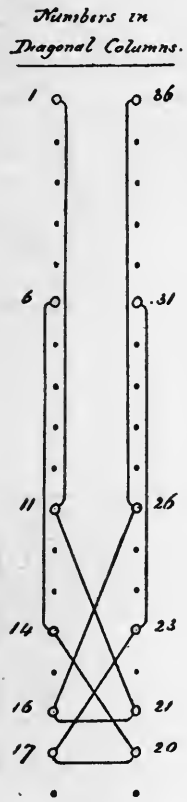


Fig. 121.

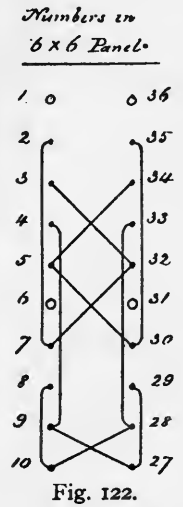


Fig. 122.

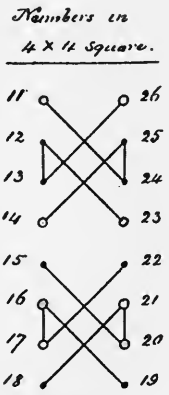


Fig. 123.

1	35	30	5	34	6
33	11	24	25	14	4
28	18	21	20	15	9
10	22	17	16	19	27
8	23	12	13	26	29
31	2	7	32	3	36

Fig. 124.

Totals of 4×4 square = 74.
Totals of 6×6 square = 111.

A concentric square of 8×8 with diagrams are given in Figs. 125, 126, 127, 128, and 129, and one of 10×10 in Figs. 130, 131, 132, 133, 134, and 135. It will be seen that all these larger squares have been developed in a very easy manner from successive expan-

sions of the diagrams used for the 6 × 6 square in Figs. 117, 118, and 119.

The rules governing the formation of concentric magic squares

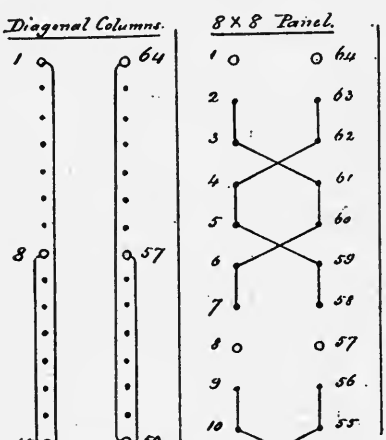


Fig. 126.

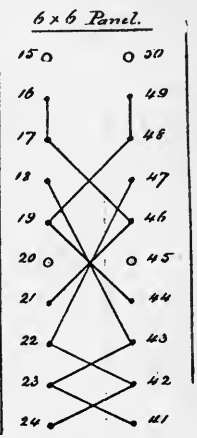


Fig. 127.

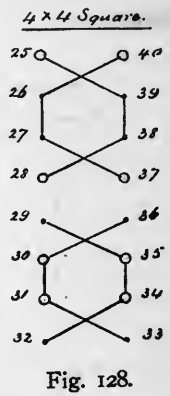


Fig. 128.

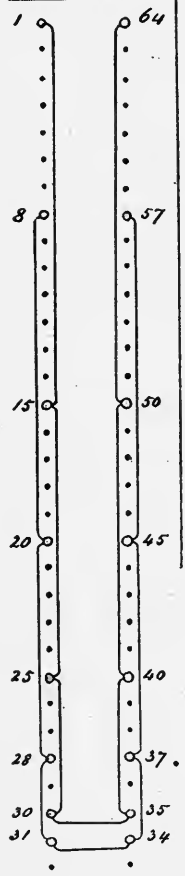


Fig. 125.

1	63	62	4	5	59	58	8
56	15	49	48	19	44	20	9
55	47	25	39	38	28	18	10
11	22	36	30	31	33	43	54
53	42	32	34	35	29	23	12
13	24	37	27	26	40	41	52
14	45	16	17	46	21	50	51
57	2	3	61	60	6	7	64

Fig. 129.

Totals of 4 × 4 square = 130.
Totals of 6 × 6 square = 195.
Totals of 8 × 8 square = 260.

have been hitherto considered somewhat difficult, but by the aid of diagrams as devised by the writer, their construction in great variety

and of any size has been reduced to an operation of extreme simplicity, involving only the necessary patience to construct the diagrams and copy the numbers.

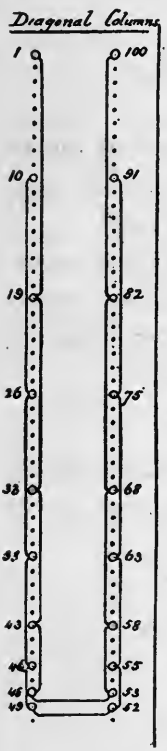


Fig. 130.

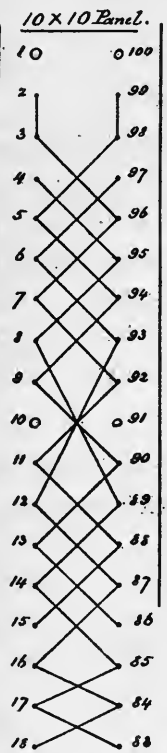


Fig. 131.

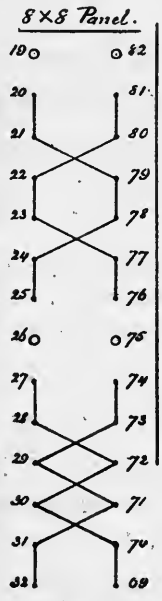


Fig. 132.

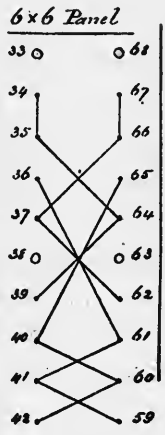


Fig. 133.

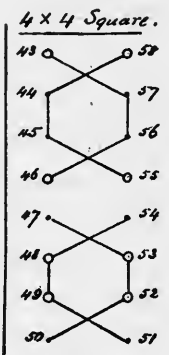


Fig. 134.

TOTALS:

4 × 4 square = 202
6 × 6 square = 303
8 × 8 square = 404
10 × 10 square = 505

1	99	98	5	94	9	90	13	86	10
97	19	81	80	22	23	77	76	26	4
6	74	33	67	66	37	62	38	27	95
93	73	65	43	57	56	46	36	28	8
12	29	40	54	48	49	51	61	72	89
87	71	60	50	52	53	47	41	30	14
16	31	42	55	45	44	58	59	70	85
84	32	63	34	35	64	39	68	69	17
18	75	20	21	79	78	24	23	82	83
91	2	3	96	7	92	11	88	15	100

Fig. 135.

GENERAL NOTES ON THE CONSTRUCTION OF MAGIC SQUARES.

There are two variables which govern the summations of all magic squares, viz.:

1. The Initial, or starting number.
2. The Increment, or increasing number.

When these two numbers are known, the summations can be easily determined, or when either of these variables and the summation are known, the other variable can be readily derived.

The most interesting problem in this connection is the construction of squares with predetermined summations, and this subject will therefore be first considered, assuming that the reader is familiar with the usual methods of building odd and even squares.

* * *

If a square of 3×3 is constructed in the usual manner, that is, beginning with unity and proceeding with regular increments of 1, the total of each column will be 15.

8	1	6
3	5	7
4	9	2

Totals = 15.

Fig. 136.

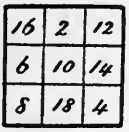
If 2 is used as the initial number instead of 1 and the square is again constructed with regular increments of 1, the total of each column will be 18 instead of 15.

9	2	7
4	6	8
5	10	3

Totals = 18.

Fig. 137.

If 2 is still used as the initial number and the square is once more constructed with regular increments of 2 instead of 1, the total of each column will be 30 instead of 18.



Totals = 30.

Fig. 138.

It therefore follows that there must be initial numbers, the use of which with given increments will entail summations of any predetermined amount, and there must also be increments, the use of which with given initial numbers, will likewise produce predetermined summations.

These initial numbers and increments may readily be determined by a simple form of equation which will establish a connection between them and the summation numbers.

Let:

a = initial or starting number.

b = increment.

c = number of cells in one side of square.

d = summation number when square is started with unity and built up with increments of 1.

e = desired summation number.

Then:

$$(a \times c) + [(d - c) \times b] = e.$$

It will be found convenient to substitute a constant for $(d - c)$ in the foregoing equation and for this purpose a table of these constants is given below for all squares from 3×3 to 12×12.

Squares:	$(d - c)$ = Const. = K
3×3	12
4×4	30
5×5	60
6×6	105
7×7	168
8×8	252
9×9	360
10×10	495
11×11	660
12×12	858

When using the above constants the equation will be:

$$(a \times c) + (K \times b) = e.$$

EXAMPLES.

What initial number is required for the square of 3×3, with 1 as the increment, to produce 1903 as the summation?

Transposing the last equation:

$$\frac{e - (K \times b)}{c} = a,$$

or

$$\frac{1903 - (12 \times 1)}{3} = 630\tfrac{1}{3} = \text{Initial No.}$$

$637\frac{1}{3}$	$630\frac{1}{3}$	$635\frac{1}{3}$
$632\frac{1}{3}$	$634\frac{1}{3}$	$636\frac{1}{3}$
$633\frac{1}{3}$	$638\frac{1}{3}$	$631\frac{1}{3}$

Totals = 1903.

Fig. 139.

We will now apply the same example to a square of 4×4, in which case:

$$\frac{1903 - (30 \times 1)}{4} = 468\tfrac{1}{4} = \text{Initial No.}$$

$468\frac{1}{4}$	$482\frac{1}{4}$	$481\frac{1}{4}$	$471\frac{1}{4}$
$479\frac{1}{4}$	$473\frac{1}{4}$	$474\frac{1}{4}$	$476\frac{1}{4}$
$475\frac{1}{4}$	$477\frac{1}{4}$	$478\frac{1}{4}$	$472\frac{1}{4}$
$480\frac{1}{4}$	$470\frac{1}{4}$	$469\frac{1}{4}$	$483\frac{1}{4}$

Totals = 1903.

Fig. 140.

Also to a square of 5×5.

$$\frac{1903 - (60 \times 1)}{5} = 368.6 = \text{Initial No.}$$

384.6	391.6	368.6	375.6	352.6
390.6	372.6	374.6	381.6	383.6
371.6	373.6	380.6	387.6	389.6
377.6	379.6	386.6	388.6	370.6
378.6	385.6	392.6	369.6	376.6

Totals = 1903.

Fig. 141.

And for a square of 6×6.

$$\frac{1903 - (105 \times 1)}{6} = 299^2/_3 = \text{Initial No.}$$

$299\frac{2}{3}$	$333\frac{2}{3}$	$332\frac{2}{3}$	$301\frac{2}{3}$	$330\frac{2}{3}$	$304\frac{2}{3}$
$328\frac{2}{3}$	$306\frac{2}{3}$	$326\frac{2}{3}$	$325\frac{2}{3}$	$309\frac{2}{3}$	$305\frac{2}{3}$
$322\frac{2}{3}$	$321\frac{2}{3}$	$313\frac{2}{3}$	$314\frac{2}{3}$	$312\frac{2}{3}$	$317\frac{2}{3}$
$311\frac{2}{3}$	$315\frac{2}{3}$	$319\frac{2}{3}$	$320\frac{2}{3}$	$318\frac{2}{3}$	$316\frac{2}{3}$
$310\frac{2}{3}$	$324\frac{2}{3}$	$307\frac{2}{3}$	$308\frac{2}{3}$	$327\frac{2}{3}$	$323\frac{2}{3}$
$329\frac{2}{3}$	$300\frac{2}{3}$	$302\frac{2}{3}$	$331\frac{2}{3}$	$303\frac{2}{3}$	$334\frac{2}{3}$

Totals = 1903.

Fig. 142.

Squares built up with progressive increments of 1, have only thus far been considered. As before stated, this method can be varied by using increments greater or less than unity, but the same increment number must be used continuously throughout the construction of any given square.

EXAMPLES.

What initial number must be used in a square of 3×3, with increments of 3, to produce a summation of 1903?

Applying the equation given on page 578, but making $b = 3$ instead of 1, we have:

$$\frac{1903 - (12 \times 3)}{3} = 622^1/_3.$$

$622^1/_3$ is therefore the initial number and by using this in a 3×3 square with progressive increments of 3, the desired results are obtained.

$643\frac{1}{3}$	$622\frac{1}{3}$	$637\frac{1}{3}$
$628\frac{1}{3}$	$634\frac{1}{3}$	$640\frac{1}{3}$
$631\frac{1}{3}$	$646\frac{1}{3}$	$625\frac{1}{3}$

Totals = 1903.

Fig. 143.

To find the initial number with increments of 10.

$$\frac{1903 - (12 \times 10)}{3} = 594^1/_3 = \text{Initial No.}$$

664⅓	594⅓	644⅓
614⅓	634⅓	654⅓
624⅓	674⅓	604⅓

Totals = 1903.

Fig. 144.

Or to find the initial number with increments of $^1/_3$.

$$\frac{1903 - (12 \times {}^1/_3)}{3} = 633 = \text{Initial No.}$$

635⅓	633	634⅔
633⅔	634⅓	635
634	635⅔	633⅓

Totals = 1903.

Fig. 145.

These examples being sufficient to illustrate the rule, we will pass on another step and show how to build squares with predetermined summations, using any desired initial numbers, with a proper increment.

EXAMPLES.

What increment number must be used in a square of 3×3, wherein 1 is the initial number and 1903 the desired summation?

Referring to equation on page 578 and transposing, we have:

$$\frac{e - (a \times c)}{K} = b = \text{Increment.}$$

or

$$\frac{1903 - (1 \times 3)}{12} = 158^1/_3 = \text{Increment.}$$

Starting therefore with unity and building up the square with successive increments of $158^1/_3$, we obtain the desired result.

1109⅓	1	792⅔
317⅔	634⅓	951
476	1267⅔	159⅓

Totals = 1903.

Fig. 146.

When it is desired to start with any number larger or smaller

than unity, the numbers in the equation can be modified accordingly. Thus if 4 is selected as an initial number, the equation will be:

$$\frac{1903 - (4 \times 3)}{12} = 157^{7}/_{12} = \text{Increment.}$$

$1107\frac{4}{12}$	4	$791\frac{11}{12}$
$319\frac{7}{12}$	$634\frac{11}{12}$	$949\frac{6}{12}$
$476\frac{9}{12}$	$1264\frac{5}{12}$	$161\frac{7}{12}$

Totals = 1903.

Fig. 147.

or with an initial number of 5.

$$\frac{1903 - (5 \times 3)}{12} = 157^{1}/_{3} = \text{Increment.}$$

$1106\frac{1}{3}$	5	$791\frac{1}{3}$
$319\frac{1}{3}$	$634\frac{1}{3}$	949
477	$1263\frac{1}{3}$	$162\frac{1}{3}$

Totals = 1903.

Fig. 148.

With an initial number of 500.

$$\frac{1903 - (500 \times 3)}{12} = 33^{7}/_{12} = \text{Increment.}$$

$735\frac{1}{12}$	500	$677\frac{11}{12}$
$567\frac{7}{12}$	$634\frac{11}{12}$	$701\frac{6}{12}$
$600\frac{9}{12}$	$768\frac{5}{12}$	$533\frac{7}{12}$

Totals = 1903.

Fig. 149.

With an initial number of $^{1}/_{3}$.

$$\frac{1903 - (^{1}/_{3} \times 3)}{12} = 158\frac{1}{2} = \text{Increment.}$$

$1109\frac{11}{12}$	$\frac{4}{12}$	$792\frac{11}{12}$
$317\frac{11}{12}$	$634\frac{11}{12}$	$951\frac{11}{12}$
$475\frac{11}{12}$	$1268\frac{11}{12}$	$158\frac{11}{12}$

Totals = 1903.

Fig. 150.

It is thus demonstrated that any initial number may be used

providing (in a square of 3×3) it is less than one-third of the summation. In a square of 4×4 it must be less than one-fourth of the summation, and so on.

To illustrate an extreme case, we will select 634 as an initial number in a 3×3 square and find the increment which will result in a summation of 1903.

$$\frac{1903 - (634 \times 3)}{12} = {}^{1}/_{12} \text{ Increment.}$$

$634\frac{2}{12}$	634	$634\frac{5}{12}$
$634\frac{3}{12}$	$634\frac{4}{12}$	$634\frac{6}{12}$
$634\frac{1}{12}$	$634\frac{8}{12}$	$634\frac{7}{12}$

Totals = 1903.

Fig. 151.

In the case of a square of 4×4, using 1 as a starting number and 1903 as a summation:

$$\frac{1903 - (1 \times 4)}{30} = 63.3 = \text{Increment.}$$

1	887.2	823.9	190.9
697.3	317.5	380.8	507.4
444.1	570.7	634	254.2
760.6	127.6	64.3	950.5

Totals = 1903.

Fig. 152.

As a final example of this rule we will select 475 as a starting number for a 4×4 square, the summation to be 1903.

$$\frac{1903 - (475 \times 4)}{30} = .1 = \text{Increment.}$$

475	476.4	476.3	475.3
476.1	475.5	475.6	475.8
475.7	475.9	476	475.4
476.2	475.2	475.1	476.5

Totals = 1903.

Fig. 153.

Having now considered the formation of magic squares with

predetermined summations by the use of proper initial numbers and increments. it only remains to show that the summation of any square may be found, when the initial number and the increment are given, by the application of the equation shown on page 578, viz.:

$$(a \times c) + (\mathrm{K} \times b) = e.$$

EXAMPLES.

Find the summation number for a square of 3×3 using 5 as the initial number, and 7 as the increment.

$$(5 \times 3) + (12 \times 7) = 99 = \text{Summation.}$$

54	5	40
19	33	47
26	61	12

Totals = 99.

Fig. 154.

What will be the summation of a square of 4×4 using 9 as an initial number and 11 as an increment?

$$(9 \times 4) + (30 \times 11) = 366 = \text{Summation.}$$

9	163	152	42
130	64	75	97
86	108	119	53
141	31	20	174

Totals = 366.

Fig. 155 .

The preceding equations may also be used for the construction of magic squares involving zero and minus quantities, as illustrated in the following examples.

What will be the summation of a square of 3×3, using 10 as the initial number with -2 increments?

$$(10 \times 3) + (12 \times -2) = 6 = \text{Summation.}$$

- 4	10	0
6	2	- 2
4	- 6	8

Totals = 6.

Fig. 156.

What initial number must be used in a square of 3×3 with increments of -3 to produce a summation of 3?

$$\frac{3-(12\times-3)}{3} = 13 = \text{Initial No.}$$

−8	13	−2
7	1	−5
4	−11	10

Totals = 3.

Fig. 157.

What initial number is required for a 3×3 square, with increments of 1, to produce a summation of 0?

$$\frac{0-(12\times 1)}{3} = -4 = \text{Initial No.}$$

3	−4	1
−2	0	2
−1	4	−3

Totals = 0.

Fig. 158.

What initial number is required for a 3×3 square, using increments of -4 to produce a summation of 0?

$$\frac{0-(12\times-4)}{3} = 16 = \text{Initial No.}$$

−12	16	−4
8	0	−8
4	−16	12

Totals = 0.

Fig. 159.

What initial number must be used in a square of 3×3 with increments of 1, to produce a summation of -6?

$$\frac{-6-(12\times 1)}{3} = -6 = \text{Initial No.}$$

1	−6	−1
−4	−2	0
−3	2	−5

Totals = −6.

Fig. 160.

What increment must be used in a square of 3×3 wherein -5 is the initial number, and 21 the required summation?

$$\frac{21 - (-5 \times 3)}{12} = 3 = \text{Increment.}$$

16	−5	10
1	7	13
4	19	−2

Totals = 21.

Fig. 161.

What increment must be used in a square of 3×3 wherein 12 is the initial number and -12 the required summation?

$$\frac{-12 - (12 \times 3)}{12} = -4 = \text{Increment.}$$

−16	12	−8
4	−4	−12
0	−20	8

Totals = −12.

Fig. 162.

What increment must be used in a square of 4×4 wherein 48 is the initial number and 42 the summation?

$$\frac{42 - (48 \times 4)}{30} = -5 = \text{Increment.}$$

48	−22	−17	33
−7	23	18	8
13	3	−2	28
−12	38	43	−27

Totals = 42.

Fig. 163.

The foregoing rules have been applied to examples in squares of small size only for the sake of brevity and simplicity, but the principles explained can evidently be expanded to any extent that may be desired.

Professor Scheffler and others have ingeniously applied some of the curious principles of the magic square to various figures such

as triangles, rectangles, pentagons, hexagons, etc., and magic cubes of various sizes have also been constructed.

It would be outside the scope of the present article to undertake the study of these interesting problems, but any who desire to learn something about them may find a brief description of same, with a few examples, in *Mathematical Essays and Recreations* by Hermann Schubert.*

W. S. ANDREWS.

SCHENECTADY, N. Y.

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THE PROBLEM OF UNITY AND THE NOETIC POWER OF THE HEART.

> "And I perceived myself to be far off from Thee, in the region of unlikeness, as if I heard this Thy voice from on high:
>
> "'I am the food of grown men; grow, and thou shalt feed upon Me; nor shalt thou convert Me, like the food of thy flesh, into thee, but thou shalt be converted into Me.'....
>
> "And I said: 'Is Truth therefore nothing because it is not diffused through space finite or infinite?'
>
> "And Thou criedst to me from afar:
>
> "'Yea verily, I AM THAT I AM.'
>
> "And I heard as the heart heareth, nor had I room to doubt, and I should sooner doubt that I live than that Truth is not, which is clearly seen...."
>
> *Confessions of Saint Augustine*, Dr. Pusey's translation, p. 155.

THE recent discussions of the infinite, replete as they have been with interest to both the mathematician and the philosopher, have left quite untouched one historic aspect of the problem and one salient characteristic of the modern definition. As this feature has far-reaching implications in the realm of theology as well as philosophy, and leads to a distinctly monistic interpretation of life, *The Monist* seems a fitting forum in which to attempt its exposition and analysis.

For any collection, concept, or thing to be proper object of thought it must be unambiguous and capable of being viewed as in some sense a whole or unit. The traditional difficulty in the concept of infinite collections is how to view as a whole or unit that which is explicitly defined as endless. There is no need to repeat

here the arguments for and against the validity of this objection. One aspect of the problem alone is pertinent to our ends.

The notion of wholeness or unity is found to imply one or all of three qualities.

1. Containing *all* of a certain class or kind of objects.
2. Excluding all of every other class or kind of objects.
3. Recognizable as in itself an individual. This recognition taking place through the individuality of the self of the thinker or knower.

The first of these qualities or attributes has reference to the interior constitution or elements of that which is viewed as a whole; the second refers to that which is exterior to the object considered, and the third has no reference at all save to the self of the knower.

The older definitions and concept of infinite assemblages obscured the first of these qualities while emphasizing the second. The numbers derivable by continued additions of one to the number n present an assemblage obviously infinite in the old sense. The quality of wholeness in this assemblage is imparted not by having *all* such numbers present to the view, but by the certainty that *any* such number *may* be viewed and by the definite exclusion of all other numbers or objects. As Cantor has phrased it, "it is intrinsically determined of everything in the universe, whether it is or is not an element of this assemblage."[1] Hence the assemblage though endless is still unambiguous.

But this lack of ambiguity and such unity or wholeness as the assemblage presents, is by no means derived from its endlessness. It arises from the character of the elements constituting it,—from the law of their derivation. It is the unity of this law which permits us to view the assemblage as itself a unit. It is a matter of accident, or at least of subsequent determination, whether the field of this law is infinite or finite. This dependence of the possibility of viewing an infinite assemblage as a unit upon a law connecting its elements, is of the utmost importance. Mere endlessness, without the existence of law, in no wise presents us with a definite concept,

[1] *Acta Mathematica*, II, p. 363.

with a whole, or with a unit. In this lies the actual negativeness of the older definitions, far more than in the negative aspect of the word endless. Yet this latter is not without significance.

All definition is a matter of reference or comparison. Assuming the finite as the standard of reference, the infinite can not be derived from it save by direct negation or by the use of the very idea whose definition is sought. In the finite lies the infinite[2] as in the infinite lies the finite, but the relation between them can only be expressed either through negation or through the infinite.

The power of the modern definition lies in its recognition that the infinite can be referred only to the infinite and that every aggregation of things to be viewable as a whole or unit must have some law connecting its elements. If there be a law of self representation, the system is infinite; if there be not, it is finite. Or, to be more precise, any assemblage is infinite or finite according as there is or is not a one to one correspondence between the assemblage and a proper part of the assemblage.

Now here is the crux of the matter. In this not one infinite but *two* are defined, the infinite whole and the equally infinite part; or as Dedekind himself pointed out, and as Borel, Royce and others have ably expounded, an infinite number of infinites. The reference necessary for all logical definition is no longer between the finite and the infinite but between two infinites.

There is profound significance in the acceptance of such a procedure. It is an abandonment of the self-imposed limitation of the mind to the finite, of the one time delusion that man is a purely finite being and that all his knowledge must originate in and be referred to the finite. Once freed from this preconception, born in us by contact with matter, logical indications of the infinite character of man multiply on every side. Professor Royce has argued at length that the infinite sequence and order is the very type of the self, and the self representation of infinite assemblages has been skillfully connected with the phenomena of self-consciousness. In-

[2] Cf. Professor Keyser's papers: "The Axiom of Infinity," *Hibbert Journal*, Vol. II, No. 3, pp. 542 and 543; and *Bulletin of the American Mathematical Society*, 2d Series, Vol. VII, No. 5, pp. 222 *et seq.*

deed it was the "thought world" of man that Dedekind used as the assemblage on which to base his "existence proof" of the Infinite. Though it has since been objected[3] that such proof was "circular" and must always be impossible as proof, the ground of this objection was not, as Mr. Russell took it, that some special axiom was covertly invoked in discussions on the infinite, but that the sense of the infinite was so deep rooted in the mind that it underlay all proof,—that it was subtly presupposed in *all* argument and to seek to prove it was as futile as to seek to prove one's own existence, that in consequence it could only be exhibited, not proved. Emerson's saying, paraphrased from most ancient writings, that in each atom the universe contrives to integrate itself, is given in this light a concreteness of meaning not seen in it before. That which is finite becomes viewed as but a determination from that which is infinite, as finite numbers are defined through infinite series. And the nature of man, through consciousness, through his power to create, through his power of self representation, is seen to be technically and literally infinite.

But though man now knows himself to partake of the nature of the infinite, he none the less but rather the more knows himself to be *one* being and no other. Though we are freed in a large part from the limitations of finiteness we are still inexorably bound by the need of unity in every object of our thought or conception. The problem of unity is no longer the problem of finiteness but is still and always must be the central problem of knowledge.

The relation between multiplicity and unity, how that which is one may be viewed as multiple, and how that which is multiple may be viewed as one, has long furnished a fruitful field of discussion and controversy; particularly since all multiplicity has been seen instantly to lead to infinite assemblages.[4] In the case of these latter it has been indicated that the unity is to be sought in the relation between the elements, in the law by which this multiplicity arises. It has been seen that the term infinite as used in mathematics is

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[3] *Hibbert Journal*, Vol. II, No. 3, pp. 547 *et seq.*; No. 4, pp. 809-812.

[4] Cf. Royce, *The World and the Individual*, Vol. I, Supplementary Essay.

properly an adjective rather than a noun,—an attribute or quality seen to pertain to certain assemblages derived and viewable as a unit from other considerations than that of their infiniteness. It has been said that mere endlessness is in no complete sense definitive, for that which is endless may yet be sharply restricted and bounded in an infinite variety of ways, each way giving rise to a different concept. But if the assemblage is unbounded, unrestricted, and endless in all ways, to the notion of endlessness we have added the notion of all-inclusiveness. The previous ambiguity no longer exists. We have reached what Mr. Russell has called the infinite of highest order, (holding in opposition to Cantor that such is possible)[5] the totality of all things of all kinds in all relations. We have passed from the mathematical adjective infinite to the old theological infinity.

However much we may be arrayed against certain of the modern mathematicians, we are certainly not departing from ancient tradition in holding that such a concept is very fundamental and intimate to human consciousness; and in agreeing with Mr. Russell that it represents a genuine totality or unit, even though Mr. Russell is himself inclined to deny the inevitable psychological and theological inferences of his position.[6] So holding, we are presented with at least one totality or unit which it is impossible to know by reference to that which is exterior to it. This brings us to an exaggerated form of a very vital aspect of the problem of unity; how are we to know, in and of itself, that which is one?

It is a very trite statement, but one which must nevertheless receive attention, that intellectual knowledge is always relative. The mind compares, relates, orders, and correlates. It weighs relations and compares things with things. The action of the mind is thus always dual-, and so many-, pointed. It can function only in multiplicity.

Yet it cannot be denied we have knowledge of things in and of themselves, such knowledge as is given to us by our senses for

[5] Cf. *The International Monthly,* Vol. IV, No. 1, p. 95.

[6] *Vide* Mr. Russell's statement regarding the assumption of an infinite mind in his reply to Professor Keyser. *Hibbert Journal,* Vol. II, No. 4, p. 812.

example, or by the resistance to the will. Such knowledge is not one of comparison, and such reference as there is in it is directly to the knower. Therefore the distinction between knowledge of a thing in itself, and knowledge of the relations in which that thing is to other things, is a distinction known to experience as well as to metaphysics. Our problem is one of genuine significance.

In the modern definition of the infinite we have a partial answer to our question. The multiplicity necessary for definition as well as for all logical activity is there furnished by the interior structure of the thing defined, by considering the whole *and* its part. This is obviously a knowledge of the assemblage in and of itself, but it is *not* knowledge of the assemblage as a unit.

The concept of the assemblage as a multiplicity and the concept of the assemblage as a unit are entirely distinct. Though the possibility of one concept may imply the possibility of the other, yet the one concept is not the other, and knowledge of the one is not necessarily knowledge of the other. Illustrations of this distinction are easily found, for example the one used by Bolzano, the concept of a drinking glass. Viewed as a whole it is one thing, viewed as an assemblage of broken parts it is another. The first concept implies that it will hold water, the second implies no such thing. My friend is one thing, my friend *and* his indigestion quite another, though this indigestion be chronic. But there is no need of multiplying trivialities. The fact stands out sharply that the concept of unity presents the problem of knowing a thing in itself, apart from its relations to other exterior things, and apart from its relation to its own interior elements.

By the very nature of this problem such knowledge can not be derived from intellectual processes. All multiplicity has been expressly eliminated, and multiplicity as we have seen, is the fundamental requisite for all logical thought. Repugnant as it is to the pride of the intellect, flushed with the conquest of such wide realms of nature, we are yet forced to conclude that in the appreciation of a thing in itself, in *esse,* the mind is baffled: that the limits of multiplicity are also the limits of the field of logic.

But if the mind is many-pointed, the heart is single-pointed. The

action of the intellect is discursive, distributing the consciousness; the effect of love, desire and will is to concentrate and hold the consciousness upon a single object. That this retention and fixing of the consciousness results in actual knowledge has been the claim of the mystics of all ages. To this claim we may listen with the more patience once it is realized that the inner essence and individuality of each and every thing in the universe, as well as the unity of the universe itself, must remain forever unknown to us, or be known through just such a process as the concentration of consciousness resulting from love, desire, or will.

But we do not need to rely upon historic mystical perception in order to be convinced that there are genuine noetic powers of the heart. We may appeal directly to every-day experience. The knowledge and understanding springing from love and sympathy are neither remote nor hidden, but are among the most patent facts of human intercourse. In common phrase, they imply the ability to "put yourself in his place," and so to know him as he knows himself,—as an individual, neither by reference to exterior things, nor as a sum of parts, but as a unit in and of itself. Reason about a friend, and the knowledge derived is relative. We argue he is kinder than others, more unselfish, wiser perhaps. Love our friend and we perceive, not that he is kinder, but that he is kind, not that he is wiser but that he is wise. Such knowledge is not comparative but positive. In it there is reference, but this reference is wholly interior. It is to the qualities or elements of the individuality, not to anything without that individuality. As, however, the concentration of consciousness continues, even this reference disappears. We no longer view the qualities of our friend, but his individuality itself absorbs our consciousness. We know him as a unit,—as that unique something which he is to himself, and of, and in, himself.

This passage of the consciousness from qualities to inner essence is equally manifested in the contemplation of natural beauty. As we have viewed the sunlight on some distant snowclad range, rising in calm still power from gracious slopes of green, it may be the myriad tones of color, the exquisite contrasts and play of light and shade that have first compelled our notice and admiration. But

as we continue to gaze these pass from the mind. The mind itself is stilled and the consciousness of the heart awakens, wraps itself around or flows into the scene before us, is moulded into its likeness and knows its spirit and its inner meaning.

It is no reply to ask me what this inner meaning is. It escapes and forever must escape the mind, for it lies in the inner world of unities. It is felt by the heart, known by the heart, and by it the heart is uplifted. Something of peace and power and eternity for a time becomes our own. But it is not derived from reason nor can any logic prove its presence. Yet the great artists have seized and exhibited it. For as logic conveys the reference of the mind, so art conveys the perception of the soul.

What has been attempted in these illustrations is a simple description of the actual change of consciousness. The appeal of my thesis is to immediate experience. Its truth rests directly on that inner recognition and certainty which is the foundation of all knowledge, and to which it is the mission of logic to refer all things not so perceived. It is a curious psychological phenomenon that knowledge by indirection should to so many appear more certain than direct perception. In the complicated structure of formally valid reference such minds forget that that to which reference is made is *to the mind* a pure assumption. Question any scientist as to the fundamental concepts or laws of his science and he will frankly admit they are hypotheses. Question the remote logical inferences of these postulates and he will hold you in derision. Formal validity is of the mind. Truth is of the heart.

I am fully aware that in this last sentence I have exposed myself to the criticism of using undefined terms. What is Truth? I reply, I cannot say. It forever escapes definition. But its appeal I know, and it is directly to an inner feeling of certainty. It is objected that what appeals as certain to one does not so appeal to another. Perhaps this is so, I neither affirm nor deny it. Then truth is different for you and for me? Truth is individual. But truth if truth at all is universal. Truly, but so am I and so are you, yet need our universes be the same? Interpenetrating, interblending they always are, but the infinite contains within itself infinitely many

infinites, all distinct yet interblending, each individual, yet each a part, and, in definite sense, each one with the whole. So too, your universe and mine, your truth and mine, different and individual as they may be, may yet find their unity and reconciliation in a wider universe, a more inclusive truth, with which your truth and mine even now are one.

It is their reliance upon direct perception that constitutes at once the strength and weakness of all mystical philosophies: their weakness, because such perception is incommunicable; their strength because the perception of the heart brings to the individual experiencing it a depth of conviction and certainty equal to that of self existence. It is impossible to read the utterances of the great mystical teachers, from Siddartha the Buddha to the Christian mystics of France, without being impressed with the genuineness and immediacy of experience which they record. Contrary to popular opinion it is mysticism not materialism that is the philosophy of experience. For what we *know* is that we are conscious and that there are states of consciousness. The existence of matter is an inference from the qualities of consciousness. So close to immediate experience is mysticism that it is far more properly described as a life than as a philosophy. Its answer to objectors has ever been, "Ye have ears to hear and hear not, eyes to see and see not": its plea, "Live the life and ye shall know the doctrine." Its noetic states are states of *being*.

The commonplace illustrations already given should be sufficient to recall the kind of consciousness I have described as single-pointed or directly perceptive, and which, when directed by love, results in a curious feeling of identity between the self of the perceiver and the inner essence of the thing perceived. Born in the stillness of the mind and concerned with unity, we have seen that in this knowledge the reason has no share. Yet as a fact of experience this mysterious noetic process of the heart must take its place with other facts, forming with them a multiplicity whose relations are proper subject of curiosity and reason. But at the outset we must be prepared to demand only analogy, only an ordered assemblage of mental concepts corresponding to the facts consid-

ered,—for by hypothesis these facts include other than mental terms. Here the imagery of infinite collections may be again of service to us.

Following the path Professor Royce has made so plain, we may view each and every individual as typified by an infinite sequence, struck out by infinitely varying laws of self-representation from the infinite All. The actual individuality, unity or essence of these lies, we have seen, neither in the mere fact of their infinity, nor in any one term or sequence of terms, but in the single law by which each represents the whole.[7] In humanistic terms this corresponds to the doctrine that the true individuality of every man lies in the manner in which he mirrors the absolute. In terms of Christian theology it is that the essence of every man is his relation to God. As each assemblage represents the whole so each assemblage is self-representative in an infinite variety of ways,—one way for, and exactly corresponding to, each individual or other assemblage in the whole. Again in humanistic terms this corresponds to the statement that each man is one with his fellow man. The terms or elements of the assemblage may be variously interpreted; as experiences, temporal states, qualities, or what you will. The consciousness of the heart, dealing with unities, lies in the law of self-representation itself. The change and play of this consciousness, directed by will, consists in a change of attention or emphasis from one law of representation within the self to another. Love is the drawing power or attractive quality of life. It seeks unity with what it loves, and, when perfect, that which loves corresponds to or is one with what is loved. To impose this correspondence upon an infinite assemblage, is exactly to impose upon it the same law of self-representation as is exemplified by the assemblage to which it corresponds. The inner consciousness of the one who loves is thus in exact accord with the inner essence, meaning or unity of the one loved. The result is an identity of inner unity and an exact one to one correspondence of all elements.

The knowledge derived from reason may be likened to the step by step comparison or correspondence of the elements of the two

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[7] Cf. Professor Royce, *op. cit.*

assemblages. Quality after quality, or condition after condition is made to correspond with a like element. But the underlying fundamental law of representation or progression is never reached. For it must be remembered that no matter how great n may be, an infinite number of separate assemblages may have n terms in common. Actual and complete correspondence between the two assemblages is a correspondence between the *laws* of progression, acting at one stroke between *all* the elements. It is never realizable as a step by step verification, for this verification can never be complete. Here lies the analogy with the failure of reason to ever know the unity, the inner essence, or genuine individuality of that whose qualities it relates. To know God or man, beauty or truth, each must be loved and willed.

If this analogy be at all critically examined it will be seen that in it the *potential* is viewed as actually present. Such is indeed my view. Every thing is; and everything that is, is real. All reality is in some sense present. To the mathematician questions of reality are resolved into questions of classification. Every concept is a real concept; every fact, a real fact; every contradiction, a real contradiction; every potentiality, a real potentiality. No category, class or domain is exclusively real. Error arises through attributing to one domain that whose real existence is without that domain.

A plane triangle the sum of whose angles is greater than two right angles is as real as one whose angles equal two right angles. Yet we would be in error if we attributed the first to the domain of Euclidean Geometry. For this system is a coherent unit. Each of its axioms, postulates, or presuppositions, is a definite statement, sharply dividing reality into two classes, one consisting of those elements which obey this axiom, the other of those elements which do not. Together these definite statements determine a domain common to all, whose content the reason exposes in detail, but which is absolutely predetermined before the application of reason, and to which nothing can either be added or taken away. But Euclidean Geometry does not exhaust reality and our triangle whose angles are greater than two right angles finds its place in equally real non-Euclidean systems.

So, too, the unborn child is equally real with the growing boy. We would be in error at this time to ascribe to the first separate physical existence. For, from moment to moment, the domain of separate physical existence is sharply defined and its content predetermined. But no more than Euclidean Geometry, does present physical existence exhaust the world of reality, though, like the play of consciousness, it may in its temporal progression and in infinite time sweep over and embody all reality. To question the *reality* of any object of thought is to confuse the issue,—as well question the reality of my keys because they are not in the pocket where I first search for them. They could not be object of search were they not real.

In this view the merely possible as well as the potential have definite reality. They are present as all reality is present. Though not realized in a given state of consciousness they are present in consciousness as potential states, present even in the given state as potentialities. In the analogy of infinite assemblages, we have seen that each individual or assemblage is self-representative in an infinite variety of ways—one way for each other individual or assemblage in the whole. We have likened each law of self-representation to the state of consciousness which is knowledge of that assemblage to which this law corresponds. We may clarify the whole matter and particularly the subject of potential consciousness by a concrete illustration.

Let the assemblage of positive integers

$$1, 2, 3, 4 \ldots\ldots$$

typify the manifested whole. It is infinitely self-representative. Three such self-representations, typifying three individuals are

$$\begin{aligned} &(A)\quad 2,\ 4,\ 6,\ 8,\ 10,\ldots\ldots\ldots\quad 2n \\ &(B)\quad 3,\ 6,\ 9,\ 12,\ 15,\ldots\ldots\ldots\quad 3n \\ &(C)\quad 5,\ 10,\ 15,\ 20,\ 25,\ldots\ldots\ldots\quad 5n \end{aligned}$$

The individuality or inner essence of these three may be likened to the three laws of self-representation by which they were struck out from the whole and by which they progress. These are respectively $2n$, $3n$, and $5n$, where n proceeds as the whole proceeds.

The state of consciousness corresponding to the knowledge of B by A is represented by the law $3n_a$ where n_a proceeds as A proceeds. It is

(A_b) 6, 12, 18, 24,.....
| | | |
(B) 3, 6, 9, 12,.....

In this we see the inner essence of A, its *twoness,* determining the type of correspondence existing between it and B, determining its reaction from the external universe. The inner essence of B determines the law of self-representation within A, the selection and bringing to attention of a certain definite sequence of elements from the infinite richness of A's interior content. Another way of putting it would be the common expression that A, knowing B, vibrates in *unison* or *harmony* with B, the character of vibration is determined by B, but that which vibrates and the character of unison or harmony is determined by A, by the character of the harmony between A and the whole.

The state of consciousness corresponding to the knowledge of C by A is similarly given by the law $5n_a$ and is:

(A_c) 10, 20, 30, 40,.....
| | | |
(C) 5, 10, 15, 20,.....

Now obviously these noetic processes by which A knows B and C are self-representative processes within A, and whether the process A_c was ever actually performed by A or not it is always *potentially* present in A's individuality. According to our analogy therefore the knowledge of everything in the universe is potentially present in each individual thereof. Moreover there is that which corresponds to this potential knowledge in every noetic state of consciousness. That is to say, in the state of consciousness in which A knows B there is that which corresponds to the state by which he would know C. Thus within

(A_b) 6, 12, 18, 24, 30,.....$3n_a$

there is the sequence or representative system $5n_{a_b}$ where n_{a_b} proceeds as A_b proceeds

$$(A_{b_c}) \quad 30,\ 60,\ 90,\ 120,\ldots\ldots 5n_{a_b}$$
$$\qquad\quad |\quad |\quad |\quad |$$
$$(C) \quad\ 5,\ 10,\ 15,\ 20,\ldots\ldots 5n$$

Thus every noetic state contains within itself the potentiality of every other noetic state, and knowledge of the inner essence of any one thing in the universe contains in potentiality knowledge of every other thing and of the whole itself. The correspondence (6) between this potential knowledge and its object, depends both upon the inner essence of the knower (2) and the inner essence of the object (3) of the noetic state in which this potentiality is viewed ($2\times3=6$); while its rhythm or essence (30) depends upon both these factors and also upon the inner essence (5) of its object. ($2\times3\times5=30$.)

Beyond its application to potential consciousness this illustration bears upon a very common phenomenon of affection. We are all familiar with examples where what is loved is in reality a product of the lover's imagination,—a concept and pictured individuality which has but a remote correspondence to that to which it is attached in the lover's mind. In this attachment there is obvious error. But this error and confusion of identity in no way arises from any failure or uncertainty in the noetic power of love but solely in a failure actually to love the one we call our friend. Nevertheless we have seen that, though the ideal conception alone be loved, yet in the noetic state engendered there throbs a minor rhythm genuinely, if remotely, corresponding to the object to which we mistakenly attribute the fundamental chords. This lies in the heart as potential knowledge, and I would submit that its presence there may in the midst of error constitute a deeper insight into verities than any faultless mastery of attributes can give. A text for such a thesis might well be drawn from our modern nature books, which breathe a love of all wild life, but whose anthropomorphic animal psychology is not free from criticism.

Suggestive and illuminating as it is to follow the analogy of infinite sequences along other of its manifold ramifications—into the realms of free-will and predestination, of invariance and continuity in a world of change, of distinction between terms and relations,

and of how all its possible relations lie wrapped in the nature of the term itself,—these though interesting do not here concern us. The process of the realization of potential knowledge now claims attention.

Here we are apparently confronted with two general methods of procedure. The first is the process of comparison, elimination, and generalization; the second of free conception or, as I trust will become obvious, of direct perception. These are generally considered as quite distinct. The first, being scientific in character, is supposed an act of the intellect, to which we are impelled, and whose results are determined, by the facts themselves. The other is popularly viewed as a rather purposeless and entirely arbitrary act of the imagination having little reference to facts of any kind. On examination, however, the aspect of logical necessity is found largely to disappear from the first process and the two are seen to be by no means as different as they were at first thought. For however great a part ratiocination may play in the comparison antecedent to generalization, the conception of the general law itself is never an act of reason. Always it is creative. In it there is choice, desire, will, but never logical compulsion. By it something new is born from the world of the potential to the world of the actual,—something other than, and in no legitimate sense a *consequence* of, what has preceded. For as any given set of terms are included in an infinite number of infinite sequences, so any given body of phenomena admit of an infinite variety of explanation,[8] and find their place in infinitely varied systems of potential knowledge. Nor is one of these true and all others false. As a landscape may be represented by a verbal description, a painting, or a map, so we may choose at will the type of correspondence between our concepts and phenomena.

But it is not this freedom of permitted correspondence which causes the instability and ever changing fashions in scientific hypothesis. It is an inherent weakness resident in the very nature

[8] Cf. Poincaré, "Relations entre la Physique Experimentale et la Physique Mathematique," (*Rapports présentés au Congrès Internationale de la Physique.* Paris, 1900. Tome I, p. 1.)

of the scientific method. Its cause and origin lie wrapped in the problem of unity. Patiently, laboriously, with marvelous ingenuity, from generation to generation science has observed and related *terms*. But till the end of time such accumulating data can never reveal their inner essence. For so long as they be finite, they are not definitive. The *truth*, the general law by which they represent the whole, is not *determined* by them.

But if further observation cannot reveal the truth it may point out error. Though $n + 1$ distinct terms, as well as n, admit of an infinite number of containing sequences or functional laws, yet there are an infinite number of sequences which contain the first n terms and which do not contain the added $n + 1$st. Every new observation eliminates an infinity of previously valid possible hypotheses. But this elimination is never exhaustive and by it determination is never reached. Thus it is that generalization succeeds generalization and brilliant hypothesis gives way to hypothesis still more fertile,—each proceeds for a space in unison with the advancing sweep of recorded facts, then their orbits part.

It has often been held that mathematical induction presented a special exception to the otherwise universal impossibility of logical generalization. Such is not the case, for the two processes are totally distinct. Generalization is concerned with terms. Mathematical induction is concerned with the unity of the entire assemblage, with the *law* of its progression. In brief, proof by mathematical induction consists of this: Having given the law of progression it is shown that a certain property or quality is an invariant of this progression. If, therefore, this property is found anywhere in the assemblage it is known to be present everywhere. The unfortunate statements of this proof in mathematical text books have done much to conceal its genuine philosophic import. It is, in effect, a determination of the unchanging qualities of an individual through a knowledge of the inner essence or unity of the individuality itself. In this, reason appears as but the interpreter of the intuition, revealing the content of the concepts given it.

A review of the successive generalizations and hypotheses of science thus shows every advance to be a new, and in large part free,

conception of the creative imagination; a substitution of a unity known, because self-created, for a unity unknown but felt. Toward these conceptions we are guided by the observed facts, but in their creation there is always choice, always will,—always something expressing the human purpose and contributed from the heart of man himself. To understand the process by which the potential becomes the actual we must look to the heart and the will.

We have already seen that in the knowledge of the heart the potential is ever present. The existence of will and desire alike depend upon this presence. For desire is the yearning of the heart for what is not yet realized, and will is precisely that power by which realization is accomplished. As the essence of man is one with the essence of the whole, so, given over to the desire of his heart, man is lifted to the utmost limits of the manifested universe. Around him is the swirl and vague chaotic rush of unborn things,—formless but infinitely potent. All that is, is seen upborne by what is yet to be. So standing, as a God between two worlds, man knows himself of both. Here, in this infinite wild sweep, is the battle of his will. By it he claims his own and compels the law of his desire. By the heart of man, from the unseen is born the seen.

In the analogy of infinite sequences we have shown this to be the bringing to attention of a definite law of progression or self-representation from the infinite variety of possible self-representations. If the total nature of man, the universe of his potential consciousness, were likened to the assemblage of positive integers, the totality of known or realized realms might be represented by all the sequences $r.n$ where r is any given constant number and n takes all integral values. Then the creation of a new domain of thought could be symbolized by the forcing to attention of some hitherto purely potential system, such as the sequence of primes or the sequence of powers of r, r^n. *Present* they have always been, but in the knowledge of their *unity* something new is born. The potential has become the actual.

It is not without interest to perceive that the totality of such potential and so realizable sequences within any assemblage is of a far higher order of infinity than the assemblage itself. This fact has

distinct bearing on philosophic speculations as to the purpose of manifestation and the value of individualized consciousness, as by this it would appear that full self-realization would make the individual far other and greater than he is. Such considerations however transcend the limits of this paper.

The conclusions that I would draw from these views are as manifold and wide reaching as my subject. To one alone can I give prominence. It constitutes a twofold plea; first for the cultivation of the heart, and second for attention to its dictates. I make this plea not as a moralist, nor as a humanitarian, I can lay no claim to either, but solely as a man of science, as a lover of knowledge. To the heart ultimately all things are referred. In the depth of appreciation, in the sense of oneness with all that is, in the love of truth, in the purity of desire, and in the strength of will, must be sought the power by which alone knowledge is born. To know fully and in detail we need the keenness and precision of the trained reason, but to know at all we need some power of the heart.

And if this be granted me then I plead that the voice of the heart be not so often scouted. That which vibrates in it is in truth the song of life. We are not other than the whole. The idea we find within the heart is not set over against the universe but is its very essence, embodied in us as its image. I do not plead for blind acceptance. I plead only that to the voice of the heart we listen as to the voice of the senses. Neither lies to us. Sometimes we misinterpret each. But the test is always through the will. "Live the life and ye shall know the doctrine."

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THE SEMITIC CITY OF REFUGE.

AMONG the most interesting and important factors in the social development of primitive civilizations must be accounted the right of asylum. Its precise influence is yet to be determined. Data now accessible suggest that it may have been a factor in the earlier stages of all races, yet may have varied greatly in its actual contributions to progress. Its working theory seems originally to have been that the spirits of a given locality must not be disturbed. There was no real conception of the rights of the human individual, no abstract ideal of liberty for man. Connected especially with taboos and superstitions concerning blood, the right of asylum primarily declares that no blood must be shed within a certain tract, lest the local genius be enraged: hence animals as well as men are protected. Any one who preferred to risk giving minor offense to the deity of the place, rather than trust to the mercy of the enemy, would quickly discover the possibility of asylum. But as unexpected deliverances from peril impress men as profoundly as unexpected disasters like the deluge, the fall of Sodom, or of the kingdom of Israel, or the making of the pitch-lake of Trinidad, we must admit that here and there places have become noted sanctuaries after such deliverance, just as suddenly destroyed places are in consequence of such destruction deemed accursed. Yet we may not assume that this order of events has been at all general in the development of sanctuaries; we must remember that the sacred spot is sometimes first marked by the occurrence there of some disaster, as the abode of a spirit who must not be disturbed. Some rough outlines of subsequent development, however, may be recognized upon collating data now accessible.

Spencer and Gillen report such sacred spots in *The Native Tribes of Central Australia,* pp. 134 ff. No plant may be plucked therefrom, no life may be taken. The animal fleeing from the hunter is safe when it reaches the sacred tract. Chalmers and Gill report similar sacred spots in New Guinea (see *Work and Adventure in New Guinea,* 186 ff.); J. G. Kohl (in *Kitchi-Gami* II, p. 67) finds the institution familiar among the Ojibways in the territory of the Hudson's Bay Company. He knew of individuals who dwelt within such tracts as fugitives from justice. Among all North American Indians burial places are regarded with peculiar reverence, but perhaps this is especially marked among Northwest Coast tribes. The burial places of chieftains are to be especially guarded from sacrilege. As a consequence, private individuals and medicine men sometimes claim to be *protégés* of the spirits of the dead. In some South African tribes and in the South Sea Islands, the burial places of chieftains are asyla. In Samoa a tree at the burial place of a chieftain famous as a dispenser of primitive justice is known as an asylum for the criminal; in this case there seems to be an appeal to the spirit of the chieftain for justice. In the Kingsmill Islands each chieftain has his sacred mark or device, usually of red paint. A stranger may claim the protection of the chief and wear the same mark. This almost leaves the sacred ground idea for that of the clan totem or badge. But the sacred mark here is not tribal, it seems. Among the Afghans, the tombs of ascetics and holy persons are looked upon as places of refuge for murderers, where they may remain till the avenger of blood passes by. In most of these instances, the connection with ancestor worship is to be noticed. Among the Tshi-speaking peoples of West Africa the deity Brahfo has a sacred tract within which antelopes may not be killed. Réville tells of convents whose lands are enclosures for sacred animals, though the monks hunt and eat such animals if outside the sacred tract (*La Religion Chinoise,* p. 554). The Buddhist convent is an asylum, even for political refugees. In 1824 the Siamese heir-apparent took refuge in one from a usurper, remaining there twenty-seven years. Ancient Chinese family tombs because inviolable, are sometimes made the haunt of robbers.

In the above cases, we have relatively primitive usages. No social groups are apparent as a development of the usage. On the surface, the sanctuary would seem to be equally accessible to all. Perhaps in some of these cases the sacred tract is too small to support large numbers of people: especially if they are still in the hunting and fishing stage. Or, women may not have the right of asylum: hence a community could not easily arise. Our real interest lies in the further development.

Father A. Boscana reports that sanctuaries existed among the Indians of California. These were peculiar in that the criminal who once entered such a place was thereby purged from his guilt. He was free thenceforth to go whither he would. None might harm him. We might venture the opinion that the limited area of the sacred spot of a hunting tribe produced this modification: a hunter confined to a few acres would certainly starve. It suggests also how a sacred spot can foster the growth of a sacred class. The southern Indians being agricultural, the sacred spots become important communities. J. Adair and H. Schoolcraft report the institutions of the Creeks and Cherokees. The Creeks had "white towns" in which no violence could be done, and "red towns" or "war towns." But these do not involve clearly defined social classes. In Borneo we find further development. S. W. Tromp, in his studies of the Dutch East Indies tells us that refugee criminals colonize the sacred tracts, intermarry, remain as outcasts from all the clans, and become the agents or servants of the local sultan, a terror and a curse to the whole country. The descendants of such outcasts are themselves outcasts. Here women as well as men are clearly included in the refugee criminal classes. In Hindostan we find the same stage. The Khatties of Guzerat worship the sun, and consider themselves bound to extend the protection of the sun to every one who comes as a supplicant, so that outlaws and desperate men of every description find an asylum among them. The Kholies of Guzerat seem to have been similarly privileged outlaws, till they became intolerable to their Mussulman neighbors and were dispersed. In the Hindu Kush the Siah Posh Kafirs perpetuate a race of murderers by such sacred villages, whose lawless inhabitants

have become a scourge to the neighborhood. Joseph Wolff mentions a curious tradition of their Hebrew origin. Mary H. Kingsley (*Travels in West Africa,* p. 466 ff), reports similar sanctuary cities in the French Congo and Calabar. The refugees are not the *élite* of the land, and the simple stranger who falls among them quickly acquires unpleasantly vivid impressions of their free and easy manners. One would conclude, from such data, that gross abuse of sanctuary is a great town-builder. James Sebree reports that in olden Madagascar there were twelve great sacred towns whose protection was desirable. They were famous as the former seats of great chieftains. There also existed a "free" or privileged class, who were in reality slaves of the government. Perhaps their origin was like that of the Borneo knaves mentioned by Tromp. Both peoples are Malayan.

A. B. Ellis reports of *The Ewe-speaking Tribes of the Slave Coast of West Africa* (p. 220) that "any slave who takes refuge in a temple and dedicates himself to the service of the god cannot be reclaimed by his owner, but by paying a fee to the priests the owner can close the doors of all the temples in the neighborhood to his fugitive slaves." This case is interesting as illustrating a different trend in the development of the right of asylum. We have here, not a criminal taking advantage of the reverence for a sacred tract, but a man securing certain advantages by formal dedication to the service of a god. The particular class-development familiar in Mediæval Europe as "benefit of clergy" is apparent here. Also, we see a stage in which the effort is made to deprive certain classes of earlier rights, and the effort of priestly temple-guardians to blackmail wealthy neighbors. Perhaps a development of such sanctuary for the fugitive slave is the law among the Apingi and other West African tribes that any slave who can escape to the next village can attach himself to a new master there and be exempt from all claims of his former master. Yet this law may mean only the refusal of a captor to surrender a runaway slave. Asylum for manslaughter does not exist in these tribes.

These data are from communities still existing, or but recently extinct. As they represent tendencies in different surviving stages

of social development, we are in a position to determine more accurately the meaning of ancient institutions. We know of the right of asylum in classical literature. Roman historians have asserted that Rome originated as such an asylum (Dionysius of Halicarnassus, *Antiq. Rom.* I,15; Livy I, 8; Strabo V, 230; Plutarch, *Romulus* IX). Modern criticism has treated this statement too cavalierly, not considering the anthropological data bearing upon the right of asylum. Exploration, showing that the city is far older than the traditional epoch of Romulus, has not disproven the statement in question. Such right of asylum may have existed many centuries earlier, have been abolished and have been restored by Romulus. We shall presently consider evidence that such things actually occurred in other lands. We know that a right of asylum did exist at Rome in connection with the law of blood revenge. The latter was early abolished, and the right of asylum reserved for slaves, to offset in some measure their legal disabilities. Akin to this sanctity of a given spot was the power of the Vestal Virgin to save a condemned criminal. The same power is possessed by the Buddhist monk of Burmah to-day; but the rescued man must thereafter lead the monastic life.

The right of asylum was familiar in Greece also. Debtors, fugitive slaves, victims of unjust persecutions and violence, criminals of various types, sought refuge in such places. Even a traitor, judging from the story of Pausanias the Spartan, could avail himself of it. While the use of this right was more extensive than in Italy, important sacred communities did not spring up in either place, apparently because the sacred tracts early dwindled to the bare precincts of the temples. Elis claimed continuous peace, and the inviolability of her territory; but this was not regarded, save during the period of the Olympian festival, when the molestation of strangers within her borders was punished by fines. Yet such a legend as that of the origin of the Spartans may point to seizure of some ancient sanctuary by invading outlaws. If so, it would suggest Sparta as a quondam sacred community, such as Rome was asserted to be.

All the abuses and developments noticeable in modern com-

munities were known in ancient lands. Legal regulations and restrictions followed. Tacitus tells of them in his *Annals,* III, 60-64, IV, 14. The chief abuses considered are in connection with Oriental sacred cities, those of the West being at the time relatively unimportant. Let us say that the Roman government was applying to the East restrictions whose necessity had been realized centuries before in the West. Some of the most important Hellenistic cities of Palestine possessed the right of sanctuary, and some (e. g. Scythopolis) were on the site of older Jewish sanctuaries. But the Jewish city of refuge should be considered in connection with the other data from the Semitic field. We should inquire if the Semitic institutions appear unique, unrelated to those of the rest of the world, and if the Jewish institution is unique among the Semites.

The suggestion that whatever be the origin of a sanctuary, the development there of a sacred community will depend in part upon the ability of a community to gain a livelihood within the sacred tract, finds ample illustration among the Semites. We know that Arabian physiographic conditions caused small fertile tracts to be highly prized as peculiarly favored by some divinity. Any land flowing with milk and honey was necessarily a holy land. Other things being equal, the most fertile spot in the world would be the most sacred, a garden of Eden. Large sacred tracts would survive in the East as they could not in Italy or Greece. Various political and social movements would produce a "natural selection," however, among all these ba'al-favored districts.

Now Semitic survivals still show many large sacred tracts, as compared with the bare temple precincts respected in Western heathendom and Christendom. Burton tells us of Medina that the *haram* or sacred land is an irregular circle, ten to twelve miles in diameter, with the town in the center. All sins are forbidden within this tract, but there are different schools of interpretation. Imam Malik allows no *latrinæ* nearer than Jebel Ayr, about three miles from the town, and no slaying of wild animals. Some authorities even forbid the felling of trees, but others allow it, and it is general practice. All manslaughter, save of invaders, infidels, and sacrilegious persons, is forbidden. Drinking spirits and all sexual im-

morality are prohibited. There is a decided advance in theory, whatever be the practice, over the rude robber communities we have observed developing in other sacred tracts. The *haram* of Mekka Burton describes as extending for several hours journey on each side of the city. Legends make this sanctity of great antiquity, and exaggerated tales of it are told. Ravenous beasts and birds will not seize their prey within its limits, and big fish will not devour little ones. Abu Hanifah would not allow a murderer to be dragged out. The restrictions laid upon pilgrims during their pilgrimage illustrate the above mentioned advance in sacred theory. The name Mekka, signifying "concourse," probably originated in the meetings at the sanctuary: compare "the gathering of the tribes" of Israel. He who resides in Mekka by the Caaba is a *jâr Allah,* or protected guest of Allah. Perhaps the earliest inhabitants of the spot were refugees under the protection of a local god. We may compare the qualifications of the *gêr Yahveh* of the later Hebrew period, in Ps. xv. Robertson Smith in his *Religion of the Semites,* notices *gērîm* or sojourners under temple protection among the Phœnicians. In Lecture IV, the right of sanctuary among Syrians, Arabians, and Phœnicians is remarked. Renan thinks the ruins throughout the entire valley of the Adonis indicate that it was once sacred territory. Van Lennep says (*Bible Lands,* p. 693): "With Muslims the shrines or tombs of great saints, like that of Hosein at Kerbelah near Bagdad and of Fatima at Koom in Persia, afford an asylum which is rarely violated. Superstitious veneration indeed so guards these places that a refugee can be taken only by starving him out. In Abyssinia there are five churches whose precincts are legal places of refuge." Here we see sanctuaries originating in ancestor-worship. There is no extensive tract of land, as in the cases of sanctuaries arising from ba'alism. Bent, describing Adowa in *The Sacred City of the Ethiopians,* 162 f., says: "Taking sanctuary is done by going to the porch, ringing the bell, and declaring three times in a loud voice the intention of taking refuge." The refugee is dependent upon friends for food. Even treason can claim the privilege of asylum. The cases of Joab and Adonijah suggest the contrary custom in ancient Israel. Women cannot share the right

of asylum in Ethiopia. Self-perpetuating criminal colonies cannot arise. Moreover, the sanctuary privileges of the early Church are linked with ancestor or saint-worship, rather than with ba'alism. Curtiss, in *Primitive Semitic Religion To-day,* p. 161, says that the shrine of any local *weli* or saint throughout Syria is of such sanctity that it is frequently used as a storehouse for all kinds of articles, no man daring to molest another's property and all being under the protection of the saint. This practice will explain Tobiah's use of the temple in Neh. xiii. 4-9. This protective power sometimes extends over ten or fifteen miles of land. Here we have theoretical hagiolatry, which is only ba'alism revised to suit the exigencies of Mohammedan creed. Such would be the natural inference from the large size of the *haram.* Let us turn from institutions still in existence to those of the ancient Semitic world.

Very interesting material comes from Babylonia. As it has not been previously considered in this connection, it is best to give it in full, that the reader may judge the case for himself. Hugo Winckler, in *Alt-Orientalische Forschungen,* I, p. 496 ff., offers a translation of a very interesting fragment, K. 233. In one or two crucial passages he seems to have misunderstood it. The following translation offers some amendments. The final purport of the document is not affected by the differences.

"Complaint which the Babylonians spoke before the king: When the kings our lords took their seat upon the throne, they set their faces to preserve our right of asylum, and the contentment of our hearts. And we, whoever have filled our fields, whether women of Elam, of Tabal or Ahlami, (have said) for their safety, 'Let the kings our lords establish what they have spoken.' The gods have given you a broad understanding and a liberal spirit. Babylon is a binding together of the whole (or, every?) land: it is twenty lands in one. However many enter it, its right of asylum is maintained; and 'injure one, (injure) the house of Babylon' is its name, to establish its right of asylum. A dog that enters there may not be slain.

"The kings our lords know that Eteru and his sons seized the feet of (i. e. were loyal to) the king of Aššur your father, up to

the time that Suzub son of Gahal came and slew all those who seized the feet of Aššur [and fled?]. Those who kept the charge of the house of their lord Suzub [carried off?] and the hands and feet of Eteru and his sons together with....and brought (or sold?) them in the face of (before?, or in defiance of?) my lord, and those women whom [Sillâ] and Kuddinnu married in Babylon with them, ...that expulsion which?....of the whole house of Eteru....all brought to....and the foreign women....and the kings our lords from all lands....when they alter our right of asylum....[which was established by] former kings....and in the name of Babylon women who are [wedded] in Babylon have their right to protection with us maintained....

"May the good deeds which the kings our lords have done to us ascend on high. Under your shadow (i. e., protection), Bêl-ubalht....daily prays before Marduk and Sarpanit for the kings our lords."

Winckler rightly connects this protest with a remarkable passage in the Babylonian Chronicle, IV, 38, which records that on the twentieth of Tebet in the first year of Samaššumukin, Bel-eter was seized and slain in Babylon. It must have been sacrilege or a breach of peace of the most flagrant character to thus gain a place in the official records. But an important companion document Winckler has not noticed. This is a letter or brief of one Zakir, No. 702 in Harper's *Assyrian and Babylonian Letters;* 81-2-4, 77, in the British Museum. Like the preceding, it is much broken; but the two letters have little obscurity as to the general principles involved. A tentative translation is offered:

"The sons of Etêru of the Sealand concerning....which the king had placed in their care,....they received, spoke thus: 'The word of the king....to your fathers before: They gave—? in the presence of the king of Babylon and Ubaru thy servant, thus: Was not that promise of the king on this wise: Whoever suddenly [breaks into] thy city to wantonly (?) make war...to set at nought the ancient principle that in the peace of the city of Babylon [ye shall dwell?] the king will inform(?) his heart concerning you, [to redeem?]....in Babylon what is established, thus: if the city

be plundered [and he is captured?] I will hear, and I will establish his freedom.'

"Now that promise which [we heard] from the mouth of the king of lands our lord....those the king....let them put in our charge (?)....the Babylonians....and a consecrated house become heaps, the king shall redeem (them?) with money: [and fugitives?] as many as are brought from the land of Elam or the land of the Hittites he shall dedicate to Bel and Zarpanit. [And now] the dead whom the king brought to life have been sold for money: [and the] good word which the king (our) lord pledged us the hands of the king have not [performed; and Kuddinnu and] Sillâ, dwelling in Babylon he has allowed to be captured [and has not done?] as they caused to be told us. The kings (our) lords....knowing the word. As they will, so let them do. From Zakir."

Whatever obscurity is produced by the breaks, for a few of which I hazard a bracketed conjecture, certain facts stand forth clearly. This last letter mentions Ubaru as one in whose presence some pledge was given. We learn from S. 1028, Harper's [418], that Esarhaddon sent Ubaru to investigate the condition of Babylon, and Ubaru reported a general desire on the part of the new settlers of the region for the rebuilding of the city and the return of the captives. We can understand, then the reference in the above letter to "the dead whom the king has brought to life." The events, and the names of the various parties contribute to the fixing of the date. We have here again the sacrilege recorded in the Babylonian Chronicle as occurring in the first year of Aššurbanipal and Samaššumukin. We are told by these documents that Babylon protects the strangers of all lands, in the name of the gods. This right of sanctuary extends to certain surrounding fields. How large the sacred tract was we do not know; but we may recognize a reasonable basis for the marvelous stories told by Greek historians concerning the size of Babylon and Nineveh. It is quite possible that they confused in each case the size of the sacred land with that of the walled city (see the size of the *haram* of Mekka, above). Aryans, Semites, and Mongols meet on equal terms under the protection of the god: so that Babylon is a truly cosmopolitan

city—"twenty lands in one." The freedom (*duraru*) of such refugees is a result of consecration or purification (*zakutu*) to the god. This *duraru* is of old emphasized as a sacred thing: in the Code of Hammurabi we find this word written with the determinative for god (*ilu*)* before it. The letter of Zakir shows that the king must if possible redeem captives or refugees carried off from Babylon, and consecrate them to the god. Provision for such redemption is extremely old: we find it in the Code of Hammurabi. The Code also contains legislation, §171, in reference to the freedom of women married in Babylon; which may be reflected in the emphasis placed in the first complaint above, upon the rights of all women married in Babylon, whether foreign born or native. No violence may be done in the sacred tract: the very dogs are protected. An injury to a single individual is an affront to the god, a sacrilege affecting the whole house or sacred land of Babylon. The case which provokes the complaints is that of a Sealander who had settled in Babylon. The principle is said to be very ancient. These data may give us reason to question Johns' construction of the Code of Hammurabi. He is inclined to doubt if foreigner and native received equal rights under Babylonian law. We observe also that Assurbanipal is pledged to maintain the right of asylum at Babylon, and that such right of asylum, possessed by a city, was sometimes abolished by royal authority.

The Babylonian word which I translate "right of asylum" is *kidinutu*. Delitzsch rightly recognizes it as "protection," but seems to think of royal protection extended to a city. Winckler and Lehmann conjecture *Unterthanenschaft* (Lehmann, *Samaššumukin* II, page 60). R. F. Harper, translating the Sargon Cylinder in *Assyrian and Babylonian Literature*, reads "supremacy." Our documents exclude these. Babylonians would not beg to be kept subject to Assyria, and Assurbanipal would not boast that he made the Babylonians masters. Our connections show *kidinutu* here to be the protection given by a city to a stranger in the name of its god. The

*Also in Sargon XIV[4]; Khorsabad 8, and 137; *Annals* 363: cf. Brünnow 5468.

seizure and murder of Etêru the Sealander and his sons is a gross violation of sacred rights. Asurbanipal himself acknowledges the Babylonian claim as to his pledge. In Cylinder L^2 10-11 and Stele S^3 47-49, he says *ilâni Bâbili ukîn kidinut Bâbili aksur*—"I established the gods of Babylon: I confirmed Babylon's right of sanctuary," adding, "that the strong might not oppress the weak." L^1 10 and S^2 29 repeat the statement. In the letter K. 84, H, 301, the king writes, "Your brotherhood (equality) with the Assyrians, and your right of sanctuary which I confirmed." He connects confirmation of *kidinutu* with the re-establishment of the gods. Later he acknowledges, in the Rassam cylinder, that the sacred land was defiled by the blood shed in his capture of Babylon. He purified the streets and pacified the enraged divinities with penitential psalms and ceremonial elegies, and with restoration of sacrifices upon the scale of olden days. That the right of sanctuary which he confirmed was not originated by him, we know from other inscriptions. Esarhaddon calls Babylon an *ali kidini* in 1 R 49, Col. IV, 18; in line 34 he says, "its *kidinutu* anew I confirmed."

We hear of other cities that possess this right of sanctuary. Sargon in his Cylinder, Bull, and Bronze inscriptions tells us that the *kidinutu* of the city of Aššur had ceased, and that he restored and confirmed it; also the *zakutu* of Harran. In the Khorsabad inscription we find a claim of the restoration of the *kidinutu* of Aššur and Harran, which had ceased. In Khorsabad 7, Sargon XIV, 3, Sargon stele I^{11}, we have reference to *sabê kidini,* people or troops under the protection of a god. These "*protégés* of the great gods" are found also in the Balawat inscription, VI^4. The "protection of Belit" is mentioned in K. 11, 35. It is interesting to notice that the names Etêru, Kuddinnu, and Sillâ in the Babylonian complaints above translated are all derivations of roots meaning "to preserve or to protect." In a ten-column building-inscription written in the first year of his reign and published by Meissner-Rost, BAS. III, 252, Esarhaddon curses the man who shall disregard the *Kidinutu* of Babylon confirmed by the lord of lords, Marduk. In col. VII he says, *sabê kidin subarê ilu Anim u ilu Bel ilu durarsunu essis askun*—"As for the protégés of Anu and Bêl (at Babylon)

I established their sacred freedom anew." Merodach-baladan II in col. III, 10 ff. tells us he provided lands in the cities of Nebo and Marduk for the *sabê kidinu* of Sippara, Nippur, and Babylon. Their ancient lands had been confiscated: he determined their boundaries and returned them to the *sabê kidinnu* of Babylon and Borsippa, *musallim parsi*—"confirming the decrees."

Another word of interest, linked with *kidinutu* in this connection is *zaku*. In the Babylonian complaints above translated, the man who has been "purified" to Bel and Zarpanit is entitled to the protection of the god. Delitzsch recognizes that *zaku* means, as in Hebrew, "to be clean or pure," but the intensive form, which is the one in use in the connection under discussion, he translates "to set free." This somewhat obscures the leading idea. It is true that every sacred personage or implement, everything which is dedicated to a god or which has touched sacred soil, acquires among Semites as among other primitive peoples, certain exemptions, or has its secular uses restricted. In the *Letters of Hammurabi,* published by L. W. King, we learn that such privileges were recognized fifteen hundred years before the Sargonid period. Temple servants, patesis, and royal herdsmen claim and obtain exemption from the *corvée* and from military service.* Yet it is a mistake to think of these as "chartered" or "free" in our sense. They suggest rather the "benefit of clergy" familar in mediæval Europe. The repeated *uzakki,* usually read, "I set free," in royal inscriptions seems fairly to be "I dedicated, hallowed, devoted, or consecrated" to the god in question; for a god is always connected with it. Exemption from certain secular claims followed as a matter of course. Jesus alluded to a survival of it in his criticism of the Pharisees (Mark vii. 11). Its frequent occurrence in connection with setting aside

* Compare Ezra vii. 24. In D. T. I, iv. R. 48, Assurbanipal mentions freedom from *sisitu* confirmed to Babylon, Borsippa and Nippur. Another phase of religious exemption comes from the inscriptions of Gudea: "After I finished his chosen temple, the temple Eminnu, I remitted penalties, I made gifts. During seven days obedience was not exacted. The mistress became the equal of her maid servant, the master the equal of his slave; in my city the chief became the equal of his subject." Compare the Hebrew prophet's view of feasts as periods of license, and J. G. Fraser's discussion of the Sacaean in *The Golden Bough.*

land for some god has misled Peiser. In consequence he conjectures that legalization of title is meant, and that following periods of disorder certain kings applied themselves to adjusting contested titles. We have such royal deeds, but they do not contain the term in question, unless the land is secured to some god or temple. The tenants are not exempt from tribute or rentals; they merely change landlords becoming tributary* to the god, and acquire thereby certain privileges. Besides the connection established between *zakutu* and *kidinutu* in the Babylonian complaints cited, we have Sargon's use of the terms. He speaks of the interrupted *kidinutu* of Harran and Aššur, as above cited, and in some passages he connects therewith *zakutu,* as in his Cylinder and Bull Inscriptions. In the Khorsabad inscription the *zakutu* of these cities in line 10 is linked with their *kidinutu* in line 11.

Now an examination of the inscriptions brings out two or three very significant facts. The linking of the two words is almost peculiar to the Sargonids. We are continually reminded by this last Assyrian† dynasty that they restored these rights, which had ceased to be recognized. Just as emphatically we are told of three great sacred cities so recognized: Babylon, Aššur, and Harran. We know of the effort to establish a *modus vivendi* on the part of Esarhaddon, and his division of authority, so that Aššurbanipal reigned at Nineveh, Samaššumukin as "King of Kar-Dunias" (L^3,11), the ancient "garden of God"; and two other sons were assigned respectively as "Great Protectors" of the priestly fraternities of Aššur(?) and Harran. We have above proof of the readiness of these cities of refuge to protest against any infringement of their prerogatives. We have the evidence of many lands showing the readiness with

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* The ideogram for *zakû* is also ideogram for tithe or tenth. Land in various Semitic countries to-day still pays a tenth to the king. See BAS III, p. 582.

† Excepting Sennacherib. He claims no old priestly titles, as Sargon did: he does not boast of maintaining the *kidinutu* of ancient sacred cities, as do the other Sargonids. His successors must do anew what Sargon did. Sennacherib seems as radical a reformer as Hezekiah, Josiah, Henry VIII, or Juarez. The other Sargonids we must account religious reactionaries, or more conservative reformers.

which abuses of the right of asylum may develop, and the testimony of Tacitus that Rome was compelled to serious measures in the case of such Oriental cities. We are then able to realize that these sacred cities formed one of the largest practical problems that confronted any Assyrian king. Sargon narrates in K. 4467 his reconsecration to Aššur of a tract of land originally set aside by Adadnirari, more than sixty years before. The conclusion is inevitable that some one of the intervening kings had confiscated it. The case is one of many now familiar in cuneiform literature, which enable us to perceive that Assyria had its alternation of religious progressives* and reactionaries, just as Israel had. But the data at present available show us the conflict in Mesopotamia in the array of city against king or city against city. In Israel it is painted as a conflict of god with god and we hear of no warring cities, save the two capitals. But one portrayal is probably the complement of the other. To rightly estimate the religious struggles in Israel, we may find it necessary to consider them also as the struggles of tha monarchy with the pretentions of Levitical cities whose right of asylum made them what the prophets declare them to be, centers of arrogance, uncleanness, and oppression; the "sojourners of Yahveh" considered themselves delivered to do all manner of iniquity. The destruction of the high places, the centralization of worship, would not have been possible without the abolition of the political privileges and sacred prerogatives of asylum cities. The religious indifference of some Hebrew kings is explicable, upon the supposition that the monarch is concerned with such cities only so far as they may obstruct his authority, while the prophet views their moral and social influence. Assyria must have had similar champions of a better order. The existence of many such privileged centers could

* Tiglath-pileser III mentions his seizing the very cities which Sargon later "freed," and his imposing a tribute of one tenth upon them. But for the sake of his old and faithful palace-herald he decreed the *zakûtu* of the old city of Kulbari, renamed it, and "made straight its road." So he records in a stele in the Constaninople Museum: Scheil, *Rec. Trav.* XVI, 1894. Sargon consecrates the city of Asur; his grandson Esarhaddon again frees it from forced labor. Sennacherib must then have seized it as a royal possession. So also Nebuchadnezzar I reconsecrates Bit-Karziabku, made *zaku* by the decree of a former king.

not, in the nature of the case, have been universally acceptable. There is evidence that the Esarhaddon scheme was distasteful to many, yet certain favored* oracles and religious centers rallied to its support. But the final Sargonid regime may have been reformatory, not reactionary. Confirming the right of asylum of three important ancient centers may but emphasize the abolition of such prerogatives for all others. Sargon, it is true, in various inscriptions says of Ur, Uruk, Eridu, Larsa, Zarilab, Kisik, Nimid-Laguda, and Dur-ilu, "their *ilu dururu* and their plundered gods I restored to their cities." But his successors do not seem to have perpetuated this policy towards them.

Another Sargonid word linked with *kidinutu* is *šubarû*. Esarhaddon, already quoted, speaks of the *sabê kidin* of the *šubare* of Anu and Bel. Sargon fixes the *šubarû* of various sacred towns. This is perhaps a technical term for the *haram* or cultivable land attached to each sanctuary city.

That the existence of such jealous independent centers was incompatible with any unified system of law or secular authority is apparent upon the surface.† Babylonian and Assyrian history must be considered as illustrating the same steps in social evolution that we find elsewhere. The asylum city advances through corruption and abuse to the point of judicial regulation. The right of asylum does not appear in the ancient Code of Hammurabi; but his letters show that exemptions from civil and military service for certain classes were recognized. Whether formally disallowed or not in the criminal code, as in early Rome, we cannot yet decide. Probably abuses were not yet felt. Treason may have claimed sanctuary privileges, else the asylum city could not so seriously hamper royal authority. But under the Sargonid reconstruction treason was

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* In the Sinjirli inscription Esarhaddon says that he smote the yoke of forced labor from the city of Asur at the command of the gods.

† Special privileges to sacred cities but meant heavier burdens upon others. For illustration, Tab-sil-esarra, a *saknu* of Asur, writes to Sargon in K. 5466 that the new *zakûtu* of Asur had made it impossible to raise the usual levies for the public works. Who was to do this extra labor? The curses in III R. 41 upon any one who ignores this deed to the land and presents it to any god, king, or patesi, also suggest much.

probably not accorded asylum privileges, for the Babylonians in their protest are careful to state that Etêru and his sons were loyal subjects to Assyria to the day of their death. The distribution of the three asylum cities between the two great rivers is suggestive. Palestinian geography necessitated three on each side of the principal stream. Were Jewish reformers influenced by Sargonid schemes?

That the Israelite city of refuge as described in Numbers xxxv is a late institution is now generally recognized by critical students. The judicial origin attributed to the scheme can only mean judicial regulation; for in Exodus xxi. 13, 14, the law admits that the altar of Yahveh is the place of asylum, while after the Deuteronomic reform the altar of Yahveh does not exist save at Jerusalem. All the anthropological data introduced would suggest their development from earlier Levitical cities, through stages of abuse and judicial restriction. The historical cases of taking sanctuary do not concern these six cities, but merely the altar of Yahveh, wherever that was. Jewish scholars (e. g. Maimonides) have claimed that all Levitical cities once possessed the right of asylum in some degree. We know that of the so-called Levitical cities some were important religious centers before the period of Hebrew domination. Of the six "cities of refuge," at least Hebron and Shechem were noted Canaanite sanctuaries. Another mark of readjustment is that the *haram* extends but two thousand cubits from the wall of each city. quite at variance with the large and irregular domain of the primitive *ba'al* or modern *wêlî*. The restriction of the right to unintentional manslayers may not go beyond the Babylonian practice: the Code of Hammurabi deals with such matters without discussing the asylum.

Another feature gives room for conjecture. The refugee must remain in the asylum till the death of "the high priest." We have seen that Babylon, Harran, and Aššur had their sacred heads, a local *urigallu* or "great protector" or "elder brother" being at the head of the priestly fraternities of the two latter cities. (Compare the "sister of a god" of the Code of Hammurabi.) Is the Hebrew regulation now misunderstood? Does it point to a time when each

Levitical city had its local sacred head, like the Mesopotamian *urigallu?* We do not at present know of any time limit to the protection afforded in Mesopotamia. But there may be significance in the internal disturbances connected with the accession of each Assyrian king. Esarhaddon's scheme avoided these—save for a minor disturbance at the ancient sanctuary of Nippur. Were his hostile brothers opponents of a religio-political reactionary policy?

The anthropological data showing the assembly of foreign refugees at great sanctuaries, added to the rights of the Semitic *gêr* and the practice of dedicating captives to a god, as did Mesha of Moab, cause us to wonder if the transportation policy of Assyrian kings tended to strengthen or multiply asylum cities, whose individual interests were more or less mutually opposed. A transported god, we know, was considered to be angry with his land: his protection was for the time withdrawn from his worshipers. Aššurnasirpal tells of his peopling Calah with captives, and in a great monolith inscription warns future kings not to seize Calah as a treasure house or house of captivity. The captives he has placed there one shall not confine: the royal abode must remain there; the redemption (*naptartu*) of the city shall not be violated, nor shall any camp in its midst. Heavy curses are launched against him who violates the pledges of this memorial stone. But Sargon seized it anew, and placed the captives of Bit-yokin there.

When we add to the suggestions made concerning the evolution of the Hebrew city of refuge the general fact growing ever clearer that Israelite institutions were in no small degree a remodelling of older Canaanite ones; the fact that while sacred cities in general are carefully guarded they are the prizes of great struggles, like that of the Koraysh for Mekka, of various peoples for Babylon and Jerusalem: when we add to these the fact that the ministers in control of Semitic sanctuaries are sometimes of a different tribe or clan from its patrons ,we have room for some speculations upon Hebrew origins. Were the earlier Levites Hebrews who attached themselves to local Canaanite sanctuaries and learned the ritual and manner of the god of the land? Did they gradually displace the older race till the latter became an inferior order, as in post-exilic times?

Were these post-exilic Levites in their turn "strangers who were Levited unto Yahveh" as Is. lvi. 3 may be read? Would exilic proselyting and training account for the enormous disparity in the numbers of priests and minor attendants in Ezra ii, and the remark that some were unable to show that they were Israelites? Was Yahveh known and worshiped in some Canaanite districts before the settlement of the Hebrews, as he seems to have been known in the northland in Assyrian times? Such fact, if it were established, would not conflict with Budde's theory that he was also known to the Kenites.

Take the interesting case of the Gibeonite sanctuary. This place originally must have been under the protection of Jerusalem. It chooses to ally itself with the invading Hebrews, stipulating that its sacred character be respected, and is attacked in consequence. The story in Josh. ix. 23 that the Gibeonites were immediately made very inferior temple attendants must point to their final relation to the temple at Jerusalem: for the events immediately subsequent to the invasion show that they were not scattered in Israel, nor attendants upon the tabernacle, nor connected with Shiloh, the earlier meeting-place of the tribes. They remain at Gibeon, and are locally influential. We learn that Saul attempted to exterminate them and failed. When David is warring with Ishbosheth, the forces of the rival kings meet, under Joab and Abner, at Gibeon. Is possession of that sanctuary an issue in the contest? As soon as David is master of Jerusalem, he brings up the ark, and places it, not in Jerusalem, but in a tabernacle at Gibeon, on the great high place. Is that the sanctuary where Joab and Adonijah took refuge? Some years after the placing of the ark there we find the Gibeonites able to demand and secure satisfaction for Saul's attack upon them. Yahveh is understood to be there—the Gibeonites have Saul's sons hanged before him. Later we find Absalom tries to gain the support and prestige of the old sanctuary of Hebron; Adonijah, of Zoheleth; but the successful claimant has control of Gibeon; his opening religious ceremonies are at that shrine. Is there trace here of feuds between sacred cities? Such data suggest interesting possibilities. Yahveh may have been a Gibeonite divinity. But only archæological evidence can be decisive in the matter.

Babylon's prominence as a sacred city may be parallel to that of Jerusalem. We know a long struggle between the sacred cities of the Euphrates and Tigris was terminated by an Elamite irruption which prostrated or destroyed older competitors for the hegemony. Babylon, not before in the front rank, took the leadership under the Hammurabi dynasty. Had she suffered little from the Elamites, and so acquired great religious prestige, as Jerusalem did when it escaped Sennacherib?

Whatever conclusion be reached in purely speculative matters, we may feel confident that the Semitic asylum cities are not to be distinguished in their origin and process of development from those of other races. They are characterized, however, by a far earlier development, perhaps by a more logical one; and they remain a feature and problem for a longer period, because a chief constituent of early Semitic settled life; while in other lands the sanctuary did not always reach the city stage, or, if it did, remained in most cases a secondary social feature.

In the Semitic world there is early manifest the effort to withdraw protection from criminals, and to insist upon moral qualifications for the *protégés* of a god. Glimpses of such ideas meet us in the West, as in Oedipus warned from the sacred grove of Colonus; but, broadly speaking, the West modified the institution by limiting the tract or abolishing the asylum and improving the judicial system. The Semite strove to preserve the asylum and establish some qualifications of character as prerequisite to the enjoyment of the right, while judicial procedure improved little. He who would comprehend the East must have the sacred land and the right of asylum and the qualifications of the *protégé* of a god before him at every turn of history. In Europe, the free cities as they developed had to contend with the barons, the king, and the sacred classes: in the East, the free cities were composed of the sacred classes. A certain feeling of the identity of Church and State was inevitable: the Church is the logical survival of the Semitic theory of qualifications of the inhabitant of the holy city.

Within the Semitic circle, however, historic investigation brings the early Hebrew ever closer to his kinsmen. The movements in the

valley of the Great River are repeated in no small measure in Palestine. The two ancient lands appear more and more clearly to be unconscious collaborators in the task of preparing the way for the religion of the Nazarene. A proper historical apprehension of either of the three requires our knowledge of the other two. Whatever we may understand by "the peculiar people," we cannot consider them as apart from the world, unformed and uninfluenced by the currents of ancient civilization: and when they acted as transmitters of all that was best in the many currents that flowed through them they best served the interests of the modern world.

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A MATHEMATICAL ANALOGY IN THEOLOGICAL REASONING.

COMMENT ON DR. WILLIAM NORTH RICE'S BOOK "CHRISTIAN FAITH IN AN AGE OF SCIENCE."

IN the October issue of *The Open Court* there was a review of Professor Rice's book on *Christian Faith in an Age of Science.* The review drew attention to a mathematical illustration of what is set forth as a possible explanation of the resurrection of Christ, —not as a miracle, but as a possible instance of natural law.

The singularity of the argument attracted my attention, and having had, by the editor's kindness, an opportunity to read the work, the following additional remarks may not be out of place. So far as I can recall their statements, all writers on old style metaphysics have claimed that *moral* and *mathematical reasoning* differ wholly in their nature, and can not be applied to the same subject.

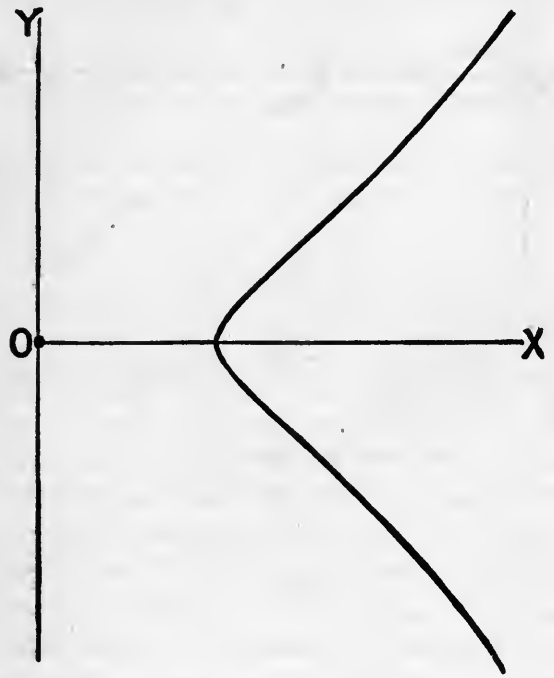
The Professor candidly states some of the difficulties which call for explanation, and he evidently accepts some of the results of the "higher criticism." In this paper I give attention only to the mathematical illustration—which if applicable at all, either proves nothing, or proves too much.

Dr. Rice gives a very good account of the way by which men have discovered and formulated a law of nature. He gives also a fair statement of the method by which mathematicians trace out curves of a simple kind; and then directly applies the same method to curves of the higher orders, where it can not possibly apply—as any one who makes the attempt will readily see. And yet this implied but erroneous application is made the basis of an argument to show that in a certain question of history, that which hitherto has

always been called a *miracle,* a contravention of a law of nature, was no miracle at all; or, at least, *might* be considered as an instance of natural law, even if a very unusual one.

So far as the x is concerned, the equation is of the third degree. This class of curves was quite fully treated by Newton, under five heads, under the name *Diverging Parabolus.*

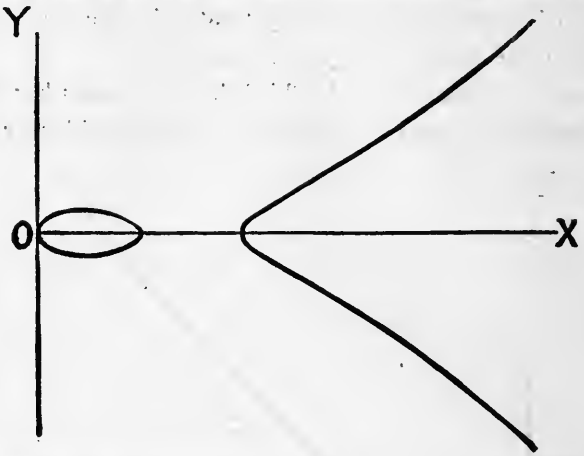
The x in an equation of the third degree, always has three values; and these values may be equal or unequal, positive or negative,



CURVE REPRESENTED BY EQUATION $ay = \pm x\sqrt{x-c}$.

whole or fractional, real or two of them may be imaginary. These different values give rise to the different curves. The particular form given by Dr. Rice requires that one value of x is zero, b and c the other two, of which b is the smaller, and it denotes the length of the oval from left to right. But b may be of any size you please; and if it is made smaller and smaller, the oval becomes less and less; and when b becomes zero, the oval is reduced to a point: i. e., when the two smaller values of x are made equal. The curve shows

a point and also the infinite branch. But when the two larger values of x are made equal, there is no oval or isolated point,—only the infinite branch. Wherefore the same equation may stand for oval or no oval, for point or no point, but always shows the infinite



CURVE REPRESENTED BY EQUATION $ay = \pm\sqrt{x(x-b)\ (x-c)}$.

branch. But all the values of y are absolutely of one kind; the equation being

$$ay = \pm\sqrt{x(x-b)(x-c)}.$$

If in one example that value should be made to stand for a case of resurrection, then all the innumerable points of the infinite branch should have a like meaning,—and this would be the destruction of the whole argument. The argument, however, is wholly fallacious, and, as hinted in your note, is liable to be considered *ingeniosus quam verius*—"more ingenious than true."

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CRITICISMS AND DISCUSSIONS.

SOME PHILOSOPHICAL TERMS.

It is generally admitted that one of the principal needs of philosophy at the present time is a precise and satisfactory terminology. Without such a terminology philosophers are liable to be inaccurate in presenting their own views and to misunderstand the views of others. The present diversity is due, in part to the existence of different schools of philosophy, and in part to the use for philosophical purposes of several different languages, one of which, the German, has but little affinity to the rest. I have no intention now of entering on a general discussion of philosophical terms, but I wish to criticize a few of the terms now in use and to suggest a few others.

To begin with, I want to know what philosophers mean by "experience." The word is in constant use by thinkers of all schools and shades of opinion; but I have sought in vain for a clear elucidation of its meaning. I have sometimes used it myself in criticizing other writers, because they used it, and then I understood it in the vague sense which it bears in common speech and general literature. But when I tried to ascertain more precisely what those writers meant by it, I was completely balked. One school of thinkers maintains that all our knowledge is derived from experience; another school vehemently denies that, and affirms that we have knowledge independent of experience and transcending experience. From those expressions one would naturally think that experience must be a faculty, or power, of the mind, which it uses to obtain knowledge. But I cannot find such a faculty in my own mind, nor any sign of its existence in the minds of others.

Locke, who held that all knowledge is derived from experience, defined it as the observation of external objects, and of the operations of our own minds. But that is a very insufficient account of it; for, surely, feeling and action are parts of experience. When a man says that he has had experience of shoemaking, he does not mean that he has observed other men making shoes, he means that he has made shoes himself; and when I had experience of toothache, I certainly thought it was a feeling. But perhaps Locke or his followers would say that all acts and feelings that are results of observation

are parts of experience. But what criterion have they for distinguishing such feelings from those that arise from other sources? They are not entitled to beg the question and say that all acts and feelings result from observation alone. Moreover, if experience is nothing but observation, the theory that all knowledge is derived from experience is untenable; for a large part of our knowledge is the result of reasoning, and observation is not reasoning. And how about imagination? is that a part of experience? Most people, I think, would say that it is; but it is very different from observation, and contains an element which observation does not. Locke's definition is quite as obscure as the thing he undertook to define; yet I have not found any other that is more satisfactory.

Baldwin's *Dictionary of Philosophy and Psychology* defines experience as "consciousness considered as a process taking place in time." But if experience is the same as consciousness, it is a mere platitude to say that all knowledge arises from experience. Of course, all knowledge arises from consciousness; nobody ever thought otherwise. But then what becomes of the famous dispute about the origin of knowledge?

It seems to me that experience, far from being an elementary faculty or function of the mind, is a highly complex activity, and therefore that it is unphilosophical to speak of it as a primary source of knowledge. Yet philosophers and psychologists habitually use the term in that sense, and as if its meaning was perfectly well known. If some of the knowing ones will tell me what it does mean, I shall be much obliged.

Another term about which I want information is "positive," as applied to the philosophy of Auguste Comte. I have never seen a definition of it, and have not the least idea what it means, or whether it means anything. To my mind it is nothing but a proper name to designate Comte's philosophy; as if he had called his system the Parisian philosophy or the Clotilde de Vaux philosophy; and whether it had a meaning for him or not, I have never been able to find out. Of late years, too, I often meet with the term "positive science," which is just as enigmatical as "positive philosophy." Is there any such thing as negative science? If not, what does "positive" mean?

Among the philosophical terms now in use none are more common than "subjective" and "objective." Their meaning is of course too well known to require elucidation here. "Subjective" means pertaining to my thought or consciousness; "objective" pertaining to the things I think about. My mind is for me the only subject, and all other things, including other minds, are objects. These words have had a great vogue, and it has been thought that the distinction they express, and which is admitted to be important, can be expressed in no other way. Hamilton expressly says so, and he illustrates their meaning by the following example:

"Suppose a lexicographer had to distinguish the two meanings of the

word 'certainty.' 'Certainty' expresses either the firm conviction which we have of the truth of a thing, or the character of the proof on which its reality rests. The former is the subjective meaning, the latter the objective." (*Metaphysics,* Lecture 9.) Ruskin, on the other hand, declares that these are "two of the most objectionable words ever coined by the troublesomeness of metaphysicians," and that they owe their introduction to "German dullness and English affectation." (*Modern Painters,* Part 4, ch. 12.)

I confess myself strongly disposed to agree with Ruskin. I particularly object to the use of the term "subject" to denote the mind, as it is needed in a wider signification. A subject is anything that has attributes. That is the original meaning of the word, and is essentially the same as the grammatical and logical meaning. I have sometimes used the adjectives "'subjective" and "objective"; but I have never liked them and have tried to find substitutes for them. A few years ago it occurred to me that the terms "noetical" and "factual" would express essentially the same distinction, and express it better and more intelligibly. "Factual" needs no explanation; it means pertaining to fact. "Noetical" from the Greek verb *νοέω*, to think, to have in mind, means pertaining to thought or to consciousness in general. The latter term is not quite synonymous with "subjective" which means pertaining to my thought only, "noetical," pertaining to any body's thought; but I maintain that the latter meaning is much the more important. In the example given by Hamilton "noetical certainty" is our firm conviction of the truth of a thing, "factual certainty" the character of the proof on which its reality rests. Other examples might be given. In ethics, for instance, an act may be wrong though the agent thinks he is doing right, and in such cases we all agree that the agent is blameless. Such an act I call "noetically right" but "factually wrong"; and these terms express the distinction far better than "subjective" and "objective" do. So in the Greek language the negative *ου* is factual, *μη* noetical, and the same distinction appears in the Greek moods. I commend the terms here suggested to the attention of thinkers and writers.

Another philosophical term in common use for which I have no affection is "esthetics" as a name for the science, or philosophy, of beauty and the ideal arts. This meaning of the word is not in accordance with that of the Greek word from which it is derived, which meant sensation or sense-perception, and had no relation to beauty. It is an ill-sounding word too, and this is still more true of some of its derivatives, especially "esthetician." The proper name for the science of beauty is "calonomics," formed on the analogy of "economics" from *καλός* and *νομικός*. The Greek word *νόμος* does not denote what we call a natural law, or law of nature. It means a rule, norm or standard to which we ought to conform, and hence is specially fitted to use in naming a normative science, which the science of beauty admittedly is.

The same etymology gives the adjective "calonomic," which will enable us to distinguish the kalonomic arts from the economic arts; and we can also form a personal noun "calonomist," like "economist." I doubt if I ever have occasion to use these terms myself, and perhaps others may not think them worth having; but they are at least worth considering.

I have another word to suggest of much greater importance than any of the preceding. English philosophical writers have often felt the need of a word to designate the intuitive element in perception. Locke used "sensation" for that purpose, but he also used it in other senses, thereby causing great confusion. Reid employed "perception," distinguishing it clearly from "sensation." But "perception" includes an element that is not intuitive. When I perceive the table before me, I not only perceive the thing, but also perceive that it is a table; and that involves the general idea of a table which I have acquired by generalizing from previous observations.

The Germans, as is well known, have a word for the very purpose in question, namely, *Anschauung.* I am not a German scholar; but I know the meaning of *Anschauung,* and have noticed the difficulty which English writers have had in translating it. I have read two lives of Pestalozzi, in one of which that word is rendered "sense-impression," and in the other "sense-perception"; both of which are wrong. The former is the worst, for *Anschauung* is an act, not an impression, Meiklejohn, in his translation of Kant, called it "intuition," and Max Müller called it "perception," neither of which is correct. Yet the word they wanted had been in the English language for three centuries, as it had previously been in the Latin language, and I am surprised that none of them had the wit to find it. The word I mean is "aspection." This word, with the verb "to aspect" and other cognates, was often used by English writers of the seventeenth century, but for some reason they have all passed out of use except the noun "aspect," which everyone knows. The following definitions and quotations, which I take from Dr. Murray's *English Dictionary,* will show how these words were used in the seventeenth century.

Aspect: To look at, behold, survey, watch. Gwillim, 1610: "As if they were worn by two persons aspecting, or beholding, each other." Dareil, 1625: "Those which aspect the beames of the sunne think a long time after they behold still a sunne before their eyes."

Aspection: The action of looking at, beholding, viewing. Sir T. Browne, 1646: "That this destruction should be the effect of the first beholder or depend upon priority of aspection."

Aspectable: Capable of being seen, visible. Raleigh, 1614: "God was the sole cause of this aspectable and perceivable universal."

Besides the three forms above given there is an adjective "aspectual," which will be useful in philosophy and psychology from its resemblance to

"perceptual" and "conceptual," and several other adjectives. Adverbs, which are not given in the Dictionary, can be readily formed from the adjectives, and there is a personal noun "aspector."

I propose to revive all these words for philosophical purposes. In a work on the elements of philosophy, which I have begun to write, but may never be able to finish, I am using "aspection" to denote the intuitive element in perception, defining it as the immediate knowledge of concrete things, whether those things are external or internal, material or mental. The word is the more necessary to me because I maintain the doctrine of natural realism, and could not express my views properly without it. I first thought of the word about twelve years ago, and did not know then that it had ever been used in English. I speak of aspection by touch and all the other senses as well as by sight, and also of self-aspection, which is the same as introspection. spection.

The Germans use *Anschauung* to denote the aspection of an object by the "mind's eye" in imagination; but, if we are to follow their example, we ought to call that act imaginative aspection, and not confound it with anything so radically different as real, or intuitive, aspection. The Germans use the term *Weltanschauung* to denote the view of the world and its properties which a philosopher forms for himself. But that term is not strictly correct, for a philosopher's view of the world is partly the result of reasoning, and therefore contains an element of conception. Nevertheless, "world-aspection" has a vividness which "world-conception" has not, and, if properly understood, there is no objection to its use.

It seems to me that the importance of this group of words for philosophical purposes can hardly be overestimated, denoting, as they do, one of the most important faculties and functions of the human mind, and one for which we have hitherto had no name in English. And philosophers will not be the only persons to profit by them; writers on science, art, and education can use them also. They can be used in French and Spanish as well as in English, but not, perhaps, in Italian, which employs *aspettare* with the meaning of watch for, or wait for. In time, I hope they will all become a part of the popular speech.

JAMES B. PETERSON.

DIFFICULTIES IN PHILOSOPHICAL NOMENCLATURE.

Mr. James B. Peterson's communication on "Some Philosophical Terms" is very suggestive and contains valuable hints. His propositions concerning *Anschauung* and esthetics we deem especially worthy of consideration.

As to his complaints concerning the apparent carelessness prevalent in the use of the terms experience, subjective and objective, and positive, we

would call his attention to the fact that the difficulties of these very terms, their drawbacks and their advantages, have been repeatedly discussed in detail in several publications of the editor of *The Monist.* We have pointed out the wrong uses to which they have been subjected and stated our own interpretation of them without having as yet met with any criticism that might induce us to change our views.

The term "experience," as used in the popular sense, means the practice of an expert, and not mere observation nor purely "consciousness" which is quoted as its philosophical definition. Yet the philosophical use of the word is nearer the popular notion of it than Mr. Peterson might be inclined to think. Kant identifies it with the result produced by sense-impressions upon the organism of any sentient being. Though the experience of a shoemaker in making shoes is somewhat different from experience as a philosophical term in which sense it denotes the basis of all possible knowledge that appears in the range of consciousness, the process is fundamentally the same. Reactions upon sense-impressions are various sensations of functions which harden into habits, and the comparison of different sensations finally produces consciousness.

That experience is an active process and not a mere passive attitude has been recognized by neo-Kantians such as Wundt, and will be conceded even, I believe, by those who have not insisted on it.

Mr. Peterson says that "all knowledge arises from consciousness" and he thinks that "nobody ever thought otherwise." But his statement is more than doubtful, for it would be easier to argue for the reverse and to say that consciousness arises from knowledge; more explicitly, that consciousness is simply a mental state in which feeling reaches such a high degree of intensity that it can be produced only by a wealth of classified perceptions which have been stored up in the shape of memories, and thus allow a comparison between the present and past states of mind. Consciousness is not a faculty but a function, and as a function it deserves its name only when a certain intensity has been reached.

The term "positive" is not, in my opinion, an adequate description of Comte's philosophy which as a philosophy might rather be called negative, since it denies the right of philosophy to solve properly philosophical questions and would limit its domain to a mere hierarchy of the sciences. The subject has been treated in a discussion with Mr. Louis Belrose, Jr., an adherent of Comte's philosophy in *The Monist*,[1] and the same subject is dealt with in the author's *The Surd of Metaphysics*.[2]

[1] Belrose, "Defence of Littré," II, 403.—Carus, "Emile Littré's Positivism," II, 410.—Schaarschmidt, "Comte and Turgot," II, 611.—Belrose, "Comte and Turgot," III, 118.

[2] See Index, *s. v.* "Comte."

Ruskin is apparently so little conversant with philosophical literature that his condemnation of the terms subjective and objective which he puts down to "German dullness and English affectation," may fairly well be ignored. The terms are quite appropriate and, we might add, indispensable in philosophy. At any rate, no other terms have as yet been invented to take their place. Mr. Peterson's proposal to replace them by "noetical" and "factual" would be acceptable only in a limited sphere of their application. The term "noetical" can apply only to thinking beings endowed with mind. It refers to thinking processes only, while "subjective" denotes the inner aspect of anything in its contrast to the surrounding world. The amœba does not think; it would be a misapplication of the word to speak of noetic processes taking place in its amœboid soul, and yet there is a certain something going on in the feeling of the amœba which is analogous to the psychic processes of man. It is not noetic but subjective. If a better term than subjective can be invented, let us have it, but noetic is decidedly insufficient.

"Factual" means obviously anything that belongs to the domain of facts, a thing or event that is real, or unquestionably existent. And what is more factual than the existence of consciousness, the main phenomenon of subjectivity? Moreover, noetic processes take place in all thinking beings and can be observed and described as processes of the objective world like the processes of physiological functions and the motions of material bodies. Thus the terms noetical and factual would not cover the same ground, nor do they form the same contrast as do subjective and objective.

The contrast to factual is "imaginary" or "illusive," while the contrast to noetic should rather be "sensory," i. e., the raw sense-material which noetic processes work out into knowledge.

The difficulties in regard to the term *Anschauung* have received especial attention in the columns of *The Monist,* and we have proposed to translate it by the neologism "atsight," coined after the analogy of foresight and insight, and denoting, in opposition to insight, the act of beholding or sighting external objects, with which a thinking being is confronted. That the meaning of atsight should not be limited to the sense of sight is a matter of course which is equally true of the German *Anschauung,* and also of Mr. Peterson's "aspection." Such widening of terms is quite in keeping with the philological spirit of all languages and need not be defended here. But we must admit that Mr. Peterson's proposal to introduce the term "aspection" appeals to us, although it would need as much explanation as the other translations of *Anschauung*: intuition, atsight, perception, etc.

Mr. Peterson's statement that intuition is a wrong translation, is scarcely tenable. He should have said that our present use of the term interferes with its original and proper application which is the sense in which Kant uses the term *Anschauung.* Far from being wrong, the word intuition is the original

term which German philosophers have translated by *Anschauung*. The Latin *intueor* means "I behold," and *intuitio* is the act of beholding. This is the sense in which the word is used by Kant and Kantians, and those readers of Meiklejohn's translations who know Kant's usage of the Latin *intuitio* will have no difficulty in understanding the term correctly.

Unfortunately, mystics misapplied the term intuition. They cherished the fond hope of a visionary knowledge which should be as direct and immediate as sense-perception, unincumbered with the complication of our noetic processes. Prophetic minds should be able to behold the truth at a glance and comprehend the most intricate problems of life by immediate perception, as in the darkness a landscape with all its most intricate details may be suddenly revealed to our eyes by a flash of lightning. This mystical beholding of truth being called by the Latin name intuition, we have proposed, in analogy with the Teutonic *Anschauung*, to introduce a Saxon term for the concrete act of beholding real things.

One more point: It seems strange that so many philosophers neglect the establishment of a philosophical terminology, and Mr. Peterson trusts that he will be able to create one that would at least do away with the technical difficulties connected with the meaning of terms. But we fear that no attempt at establishing a terminology acceptable to all schools would be successful, for the sole reason that each terminology reflects a particular philosophy. The introduction and acceptance of a certain terminology will necessarily, we might almost say mechanically, influence thinking minds and force them into a definite conception of the world. If this be the correct view, it will be an advantage, but there are still differences of opinion on that subject. The acceptability of certain contrasts implies an acquiescence in their legitimacy. The contrast between objective and subjective, for instance, involves a great many philosophical conclusions which many people of a dualistic bent are not inclined to concede, and the acceptance of these two terms implies in fact the acceptance of monism, for the very conception of the contrast recognizes the oneness of two opposites and conceives their duality as being due to a difference of aspect.

Accordingly we believe that all attempts at establishing a commonly accepted terminology will fail, until we have realized the ideal of a philosophy of science,—a philosophy which would be a science as much as mathematics, chemistry, and physics. That this is possible we do not doubt. We have insisted on its feasibility and offered our own solution for many years, ever since the first appearance of *The Monist*.

EDITOR.

DEFINITION OF GOD.

It is always more easy to criticize the work of another than to improve upon it. Hence it is with some diffidence that I make these remarks upon the definition of God contained in the article "Definition of Religion" in *The Monist* for October, 1904. Nevertheless that definition that "God is the highest authority for moral conduct" appears to me so far from the truth that I feel compelled to protest against it.

The Christian idea of God is derived from the Bible. Here we first meet it in the form of a powerful being represented as creating the heaven and the earth, plants, animals, and men. This idea was never given up by Jews or Christians. Jeremiah represents God as saying, "Before I formed thee in the belly, I knew thee," and Jesus says, "If God so clothe the grass of the field etc., shall he not much more clothe you?" It is evident, therefore, that the idea of God as Creator is an essential part of the God-idea in Christianity. It is also a part of the idea of God in Mohammedanism, *vide* Koran, chap. iv: "O men, fear your Lord, who hath created you out of one man, and out of him created his wife, and from them two hath multiplied men and women." The same idea occurs in Hinduism, where God is called Brahma, the Creator, and by other names as Jaganath, Visvesvara, etc. with a similar signification.

It appears to me on analyzing the popular conception of God that it may be resolved into two distinct portions. The first is the idea of God as Creator and sustainer of all things. This idea is prominent in Old Testament theology, in Mahomedanism, in Brahman and Saivite Hinduism, in the Persian religion, and in many others. But a second idea is also sometimes present. This is the ethical ideal. In some religions these two ideas are combined; in others they are kept separate. They are combined in Christianity, where Jesus, the ethical ideal, is confused with Yahveh, the Creator. They are combined in Vaishnava theology, where Vishnu, the ruler of the world, is confounded with his incarnations Krishna and Rama. But they are separate in Buddhism, where Buddha is worshiped (if at all) as the ethical ideal, while the first idea of God as Creator is omitted and denied. But it must be noted that the idea of God as Creator is found in Thibetan Buddhism where Siva takes the place occupied by Yahveh in the Christian Trinity.

Thus it is possible to divide religions into three classes, (*a*) where the idea of God as Creator predominates, as in Judaism, Mahomedanism, Zoroastrianism, Brahmanism, Saivism, etc.; (*b*) where the idea of God as the ideal man prevails, as in Buddhism; and (*c*) where these two ideas both exist and coalesce, as in Christianity, Thibetan Buddhism, and Vaishnavism. It should be observed that as a real man is preferable to an ideal one as a model for imitation, so those religions which conceive God as an ideal man

always represent him in the form of a real one, as Christianity (Jesus) Buddhism (Gautama), and Vaishnavism (Krishna and Rama).

It should also be remarked that the founder of each religion is always considered the real highest authority for moral conduct. Thus Moses was the highest ethical authority for the Jews, Jesus for the Christians, Mahomet for the Mahomedans, and Gautama for the Buddhists. Nevertheless only Jesus and Gautama Buddha have been worshiped as God, and primitive Christians and primitive Buddhists did not do this. The worship of the supreme ethical authority, or moral ideal as God is a corruption therefore, and not true religion. From all of which it is evident that the idea of God as Creator is the essential one to religion, and the idea of God as perfect man and supreme moral authority is a secondary one and not sanctioned by the highest religious authorities.

It may be objected that the prophets Moses, Jesus, and Mohamet always ascribed their moral doctrines to God, and that therefore we should do so likewise. But this is not altogether true. Each prophet ascribed his call to God, and claimed the sanction of God to his doctrines, but not much more. Jesus used to say, "It was said of them of old time so and so, but *I* say unto you so and so." Obviously therefore he was his own supreme ethical authority. This is even more apparent in the case of Gautama Buddha. Mahomet also altered his precepts from time to time according to circumstances, which he would not have done had he believed them to be divine. Therefore we must suppose that the supreme ethical authority of the prophets was not God, but the opinion held by each as to what course of conduct was best for his followers and the human race. Surely then it must be evident that the idea of God as Creator is the most important one.

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BOOK REVIEWS.

MASS AND CLASS. A Survey of Social Divisions. By *W. J. Ghent.* New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1904. Pp. ix, 260. Price, $1.25.

Some time ago Mr. W. H. Mallock published a book on *Classes and Masses,* which, however, according to the opinion of Mr. W. J. Ghent, does not do justice to the subject. Mr. Ghent says of Mr. Mallock: "His argument and illustration are confined solely to an attempt to prove the interesting assumption that out of the modern increase of wealth in Great Britain the 'working classes' have received an altogether disproportionate share."

In contrast to Mr. Mallock's book our author proposes the result of his own investigations which he characterises as follows: "In my present work I have sought to analyse the social mass into its component classes; to describe these classes, not as they may be imagined in some projected benevolent feudalism, but as they are to be found here and now in the industrial life of the nation; and to indicate the current of social progress which, in spite of of the blindness of the workers, the rapacity of the masters, and the subservience of the retainers, makes ever for an ultimate of social justice."

The author divides all classes of those directly concerned with production, distribution, exchange, and service, into six groups to the exclusion of non-wage-earning women and children. These six classes are (1) proletarians or wage-earning producers, (2) self-employing producers, among whom the land-holding farmers and handicraftsmen are the most important ones, (3) social servants, (4) traders, (5) idle capitalists, and (6) retainers whose occupations consist in contributing to the comforts and interests of capitalists, traders, etc.

The most important parts of the book are chapters 7 and 8 on "The Reign of Graft," which contain our author's accusations of the present state of conditions, "an inescapable result of individualist competitive industry." Many of the evils pointed out in these chapters are no doubt based on justice, but we cannot help thinking that the author is strongly biased by his preconceived notions of a one-sided social ideal. He concludes his book with these words:

"Slowly among the victims arises a sense of the injustice, the chaos, and the waste of this practice; and more slowly, but still surely, the determination to be rid of it; to apportion, upon equitable terms, the common burdens, and to distribute, in equitable shares, the common hoard. That determination is the growing and expanding will of the producing classes, and its fulfilment will be the co-operative commonwealth."

AN OUTLINE OF THE THEORY OF EVOLUTION, With a Description of some of the Phenomena which it Explains. By *Maynard M. Metcalf.* New York: The Macmillan Co. 1904. Pp. xvii, 204. Price, $2.50 net.

The author, Maynard M. Metcalf, is professor of biology in the Woman's College of Baltimore, and the present book incorporates a series of lectures which he gave before a number of visitors who had expressed a desire to attend, as well as the students in his classes. For this reason the lecturer has especially endeavored to avoid technicalities as far as possible, treating the subject in a popular way and supplying a great part of information by means of illustrations. In fact we may say that the illustrations of the book are its most important feature, and the author has purposely selected them from the best scientific sources, in the hope that his students will thus be encouraged to study up the subject more carefully in the expositions of those prominent writers who have been the chief contributors to the development of this most significant branch of science. The style of the lectures is easy and fluent, and the illustrations (some of which are in colors, especially those referring to mimicry) are not only instructive but elegant as well.

AN INTRODUCTION TO THE PHILOSOPHY OF HERBERT SPENCER. By *William Henry Hudson.* Issued for the Rationalist Press Association, Ltd. London: Watts & Co., 1904. Pp. 128.

This booklet contains a biography of Spencer. It contains a review of Spencer's early work preparatory to his main theme, an exposition of the *Synthetic Philosophy*, a condensed statement of the *First Principles*, the *Principles of Biology* and *Psychology*, a sketch of Spencerian sociology, a summary of his ethics, and finally the religious aspect of his philosophy. The appendix contains a list of Spencer's works. This book, which makes no claim of offering anything new, may be useful to those who are not familiar with Spencer's theories. It is adorned with a picture not of Mr. Spencer but of his interpreter, Mr. Hudson.

The Monist