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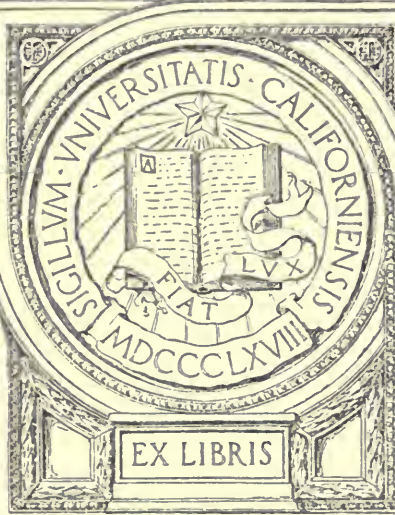


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Liberal Education

By
Thomas Hill

UNIVERSITY OF CALIFORNIA
LOS ANGELES



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LIBERAL EDUCATION.

AN

ADDRESS

DELIVERED BEFORE THE

PHI BETA KAPPA SOCIETY

OF

HARVARD COLLEGE,

JULY 22, 1858.

BY

REV. THOMAS HILL,
OF WALTHAM.

CAMBRIDGE:

PUBLISHED BY JOHN BARTLETT.

1858.

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A D D R E S S .

Brethren of the Phi Beta Kappa Society ; Ladies and Gentlemen who have honored us with your presence : —

THE motto of our society, and the avowed objects for which it was instituted, must be my apology for the seeming abruptness of entering, without any prefatory remarks, upon the subject to which I intend to invite your attention. The "promotion of a sound literature" depends, in a large measure, upon the promotion of a sound education. The natural tastes of a young student are so much modified and so unequally cultivated in the course of his preliminary and collegiate education, that his choice of a special pursuit is frequently determined more by his culture than by natural attraction ; and his proficiency in the chosen pursuit is also largely affected by the character of his preliminary study.

To what more important and more interesting question, therefore, could I invite your attention than to this : What principles should guide us in the selection

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and arrangement of studies in the academic course,— that is, in the whole course previous to the student's entering upon the particular special pursuits to which his tastes or his choice of a profession will finally lead him?

What branches are essential, and which are not essential? How far should the essential branches be carried? How far should non-essential branches be permitted to occupy the student's time? What powers of the mind most need education? How shall it be given them? What principles should guide us— this is the discussion to which I invite your attention— what principles should guide us in deciding these various points?

I do not propose to discuss this subject as a question of policy for our own Alma Mater, nor with reference to the success of the student in after-life; but, so far as my powers may suffice, in the broad light of duty,— of the relations of the soul to the universe and to its Maker.

The principles which should regulate the course of collegiate study may evidently be reached by three independent lines of approach, and the identity of the results attained by these three independent methods would be a sufficient proof of their correctness.

We might first survey the literature, arts, and science of the historic races, and from the various success of their attempts at liberal culture, compared with the various modes in which they attempted it, draw our

conclusions as to the wisdom of these modes, and the soundness or unsoundness of the principles on which they were founded. Or we might, in the second place, observe the course of Divine Providence in its dealing with us, the children and scholars of the heavenly teacher, and draw from the studies and discipline of the school of life, the principles which should govern the schools of men.

Either of these modes of inquiry will lead to the same results as those which may be obtained from a survey of the powers of the human mind and of the objects on which those powers can be exercised.

The passive powers of the human soul may be divided with sufficient accuracy for the purposes of the present discussion into three groups: sensational, emotional, and intellectual. I have named these groups in the order of their connection with, and dependence upon, the physical frame and the material world. All these are in various degrees under the control of the active power, that is of the will, and all are conjointly employed in nearly every ordinary act of life. A perfectly trained man must therefore have all his powers cultivated. They are all capable of improvement through proper education, and the culture of any one set of powers will, of necessity, in some measure improve the rest. A scholar should cultivate even the powers of simple sense; for without accurate perception and delicacy of muscular action, there can be no high executive power in the arts, and no great attainment in the sciences of

observation. That the intellectual powers need a careful training is conceded by all men. The emotional powers stand in no less need of culture, without which both morals and art (which are the expressions of the higher emotions, the one in life, the other in artistic work) must suffer. Most of all does the will need self-imposed restraints, or rather need to subject itself voluntarily to the discipline which the Father has appointed. Religion is the education of the will, to teach it to submit to the laws of reason and of duty.

And since there can be no perception through simple sense without intellectual effort; no emotion without consciousness, more or less distinct (and consciousness is thought); and, finally, no volition without motive, either based on judgment or emotion; it is manifest that a full enumeration of the objects of human thought will include all the objects that can influence the culture of the man. Nor do I consider it necessary in our rapid review of the objects on which the human powers can be exercised, to do more than to attempt a rough classification of things actually in existence, and concerning which we may attain to more or less of knowledge.

I am accustomed to regard the hierarchy of sciences as composed essentially of five different grades, according as the sciences deal with one or another of the five series of existing things. For the universe, so far as it can be the object of our knowledge, consists of only these five portions: first, the Infinite Spirit, the Supreme

Will at the head of all ; secondly, men, the finite spirits, the limited wills ; thirdly, the acts of these finite creatures ; fourthly, the actions of the Infinite Being, beside those included in the formation and guidance of our spirits ; fifthly, and finally, the field and space of time wherein these works are wrought. Thus I would include all possible sciences under these five heads : Theology, which refers to the Divine Being ; Psychology, using that word to include all that belongs to the human powers of thought, feeling, or perception ; History, extending the signification of the term to include all the thoughts and achievements of men ; Natural History, in which I place also the chemical and the mechanical sciences ; and, fifthly, Mathematics. I shall, during the remainder of the time which your indulgence may grant me to-day, use the words history and natural history in these extended senses.

I am aware that there may be some difficulty in deciding to which of these five divisions some of the special sciences belong, and we may be tempted to say that they belong to several at once, or that they are not included in any of the divisions. But I believe nevertheless that this primary classification will stand a close examination, and that the whole range of the objects of scientific study is included in, and divided between, theology, psychology, history, natural history, and mathematics.

And these five departments are so connected that one continually leads to the other, and cannot naturally

be taught without the other. They naturally follow each other in the inverse order to that in which I have named them, and it is absolutely impossible to know any thing of theology unless we first know something of psychology; any thing of psychology without some previous knowledge of history; any thing of history without some slight acquaintance with natural history; any thing of natural history without some previous idea of number and form, that is of mathematical truth. This order is observed even in the first hours of an infant's life, and no man can watch the development of his own child's mind, with any degree of care, without perceiving the folly of attempting to teach a child any thing pertaining to any one of these branches of knowledge without previously teaching him the corresponding truths in the lower branches. All knowledge is built upon a double basis of consciousness and perception; and the five great divisions of the hierarchy of science are arranged in exact proportion to the relative importance of the two bases in each branch. That is to say, in mathematics we rest chiefly on observation and perception, very slightly on consciousness; in theology we rest chiefly on consciousness, very slightly on observation; and, of the other three sciences, natural history most closely resembles mathematics in this respect, while psychology most nearly resembles theology.

The powers of the child are developed in this same order. At first he is a being of sensation and simple

emotion, with but feeble thought and feeble will ; but if he comes to the stature of perfect manhood, he becomes a being of unconquerable will, of comprehensive intellect, while the emotions are no more intense than in youth, and the sensations perhaps not so vivid. This order of development in the child's powers indicates the propriety of cultivating them in the same order ; first taking the studies most dependent on perception, and least on consciousness, and leaving a thorough examination of metaphysical questions for the adult powers. Now, geometry is least dependent on consciousness ; it deals with space, which we conceive of as wholly disconnected with our own spirits. The physical sciences, whether organic or inorganic, require a maturer consciousness that can turn inward and compare that which is written in the mind, the sense of efficiency, the love of harmony, etc., with that which is seen without, the action of the Divine will and Divine purpose. Physics are therefore fitted for riper minds than those to whom geometry appeals. In like manner history requires a more constant interpretation from consciousness, than is required by physics ; and psychology, more than is demanded by history.

Every mode, indeed, in which I have viewed the subject, brings me to the same conclusion, that the mathematics are the preliminary studies ; that they should be followed first by natural history, then by history, and finally by psychology and theology. I do not of course mean that the child is to receive no religious instruction;

until he has mastered all that is known on the other subjects ; for I have already said that the powers of the soul are developed somewhat simultaneously. The order of succession which I have named applies particularly to the periods of their attaining maturity. What I do intend to say is, that these five branches of studies should, in every stage of common or liberal education, keep proportionate pace with each other ; that the parent or teacher should watch the development of the child's mind and character, giving it the higher truth so soon as it is prepared for it ; but remembering that one necessary part of the preparation is, the study of the lower truths.

And yet what has been the usual practice, even to the present time ? The study of natural history, which in a true education naturally lies between mathematics and history, is almost wholly neglected, and men have gone to the pursuits of art, literature, law, divinity, and even medicine, without any proper knowledge, even the most elementary, of mechanics, chemistry, botany, or zoölogy. Their culture has lacked the natural and necessary basis ; their speculations have been vague and fanciful, their reasoning specious and unsound, and their practice shallow and empirical. The evil, it will be perceived, lies further back in education than in our colleges ; it commences in our nurseries and in our primary schools. The mother, and the teacher, not having themselves been taught to look upon the world of matter with an intelligent eye, as upon the means

which God himself has furnished for the instruction of children and of men, confine themselves in mathematics to the abstractions of arithmetic, leap over all natural history, to put the child upon the historical branches of spelling and grammar; or if they teach geography, they omit the physical and astronomical treatment, and confine themselves to politics and statistics. What wonder that the child thus educated should learn to despise the insect and the flower; and, being ignorant of the divine wisdom of that Word which has created all things in number, weight, and measure, and filled all things with beauty, should grow wise in its own conceit, and find its pleasures in follies of its own devising? Perhaps a judicious selection of studies in preparation for college, or in the curriculum there, might do much to repair the evil; but the selection for this collegiate education has usually been confined to mathematics and to the single historical department of philology. A knowledge of the Greek and Latin languages, and of the conic sections, with the unavoidable growth of the mind in all directions, produced incidentally in acquiring this knowledge, have been generally considered the principal results to be desired from education. There are not wanting, even at the present day, men to maintain that the study of the Greek and Latin classics comprises in itself more valuable discipline for the mind, and more valuable food for thought, than is to be found in all the pursuits of natural science. But this opinion can be sustained neither

from experience nor from the nature of things. The five great branches of the hierarchy are all essential to a complete education. The Greek and Latin classics, however thoroughly studied, give us nothing of natural history, or almost nothing. The education which is founded exclusively upon them must, therefore, however excellent in its superstructure, be defective in its foundations.

Nor should those who hold in high reverence the masters of Grecian thought, be unwilling that the attention of the student be directed in a large measure to the study of natural philosophy. The culture of the Greeks was distinguished from that of all other of the ancient nations, by its breadth and variety. The germs of most of the modern sciences are to be found in its literature. Not one of the great divisions of the hierarchy was neglected. In mathematics they pursued geometry to a height to which few of modern students can follow them. In natural history, they have given us mechanicians like Archimedes, and naturalists like Aristotle. In history, I need but mention Herodotus and Thucydides, and taking history in the wider sense which I have given it, the great proficiency of the Greeks in logic, grammar, rhetoric, sculpture, painting, and music. In psychology, we have a Plato and a Socrates, as the highest examples of a type of mind not unfrequent in the Grecian State; and, if we can show nothing worthy of high respect in their theological speculations, it is not from their want of ability

or of attention to the subject, but simply because no human intellect can treat that theme worthily, until it has placed itself under the guidance of inspired teachers. Nor did the individual masters of Greece confine their attention to a single study. Their sculpture bears witness, that they united a knowledge of anatomy and of mathematics to a love of that art. In architecture they combined the art of sculpture with the application of still more subtile mathematical and optical investigations. And some of their greatest scholars attained eminence and honor in nearly all of the great departments of thought.

He, therefore, that has imbibed the true spirit of Grecian culture, must be led to honor all the pursuits of the human mind, and to seek for truth in every direction. That man does not so truly reverence Plato, who spends his days in a critical investigation of Plato's words, as he who is led, by a single reading of those eloquent pages, to devote himself with that great master to the pursuit of the good, the beautiful, and the true,— who is stimulated by Plato's metaphysics to speculate with Hamilton of Edinburgh, or by Plato's geometry, to labor with Hamilton of Dublin. The schoolmen of the middle ages, settling all questions by an appeal to Aristotle, did not honor that great educator, naturalist, and logician, so highly as those who, in imitation of his industry and docility, inquire of nature for the secrets intrusted to her for the benefit of the wise, or endeavor to extend and perfect the

grammatical, logical, and rhetorical sciences for which Aristotle laid so secure and so broad a foundation.

That an undue estimate of the value of Greek and Latin should have been made in the sixteenth century is by no means surprising. The culture of Europe had for a long time been very narrow, almost entirely excluding physical inquiries. When the importance of physics and natural history first began to be felt, the happy change was in great measure due to the influence of Greek authors, through the medium of Arabic translations, sometimes a second time translated from the Arabic into some other tongue. The Greek literature appeared thus to be the California from which these precious treasures of science came, and the Latin language was at that day the easiest mode of approaching the Greek. Thus the knowledge of these two tongues was a key to all the learning of that period. But those languages hold now a very different place. There is not a single department of human thought in which modern nations have not surpassed the achievements,—I do not say the ability,—but the achievements of the ancient Greeks; new sciences have within the past century sprung into existence, and attained a rank of the highest importance, the germs of which were in Aristotle's day scarcely visible. New applications of science to the useful and to the fine arts have changed the whole aspect of civilized society. The scholar of the present day is to labor with and for a people whose whole mode of life and mode of thought

is different from that of the people of a hundred years ago. Shall the training which prepares him for his work be the same as that of a hundred years ago? As the course of events in the world's history runs on, and more important changes are developed in the state of human society, can it be expected that all those who desire a liberal culture for themselves or for their children, should be still satisfied with a course of instruction, that devotes a principal part of the student's time to a critical investigation of the structure of the dead languages?

I acknowledge the great importance of philological investigation. Language is one of the noblest of the works of men; it constitutes in its own structure the most complete record of human thought, and of the development of human character. The study of language is, therefore, the most essential department in that third great branch of the hierarchy of science to which I have applied the title history. Without a proper study of language, it is impossible that the student should make any progress in the higher branches of political economy, metaphysics, ethics, and religion. But the most valuable part of the study of words does not consist in acquiring that intimate familiarity with any one foreign language which will enable one to write or speak it, nor does it consist solely in the intellectual exercise of learning to read it, and in the intellectual vigor thereby produced. It consists rather in rising, by the study of particular examples, to a perception of

some of those general laws of thought, and laws of articulation, which govern, the first the syntax, rhetoric, and logic, the second the etymology, of all languages. For the purpose of attaining these general views, a moderate acquaintance with four or five languages is better than a thorough acquaintance with one or two. With larger views in the teacher, more benefit may be derived from a short course of study, than from a protracted drill under a teacher of microscopic views.

I am assuming, you perceive, that the attainment of knowledge itself is one of the objects at which the student should aim. I am aware that it has been said the true end of liberal culture is the perfection of the student. It is said, that, in the university proper, the student is to be considered as the end in himself. I have no objection to these statements provided they refer to what should be the aim of the instructors and of those who prescribe the studies. But when a man proceeds tacitly to assume that the student himself should look upon knowledge as valuable only as it exercises, and by exercise develops and invigorates the mind, I most earnestly protest against the assumption. The motive from which a course of action is ordered, and that motive from which the action is performed, are seldom rightfully the same. Self-culture, proposed as an end in itself, is only a refined selfishness, and, like all other forms of selfishness, a self-destroying absurdity. The highest culture is unattainable by one who seeks it as self-culture: it is to be obtained only by the soul

that looks away from itself, and seeks out of itself for the good, the beautiful, and the true. Equally false is a second tacit assumption, that the only powers of the mind which need the development of a liberal culture are those of reasoning. Proceeding on this assumption, various writers have issued special pleas for various branches of learning as deserving of the most prominent place in an academical curriculum. One has argued in behalf of the mathematics, that they offer the finest specimens of connected trains of reasoning, and afford the finest gymnasium for the powers of consecutive thought. Another has called our attention to the conceded fact, that these sciences reason only of one kind of relation, that of quantity, and therefore are a less valuable intellectual exercise than metaphysical and moral philosophy, which deals with all things. A third party claim for the Latin and Greek tongues the merit of giving the most varied and constant exercise to the judgment and ingenuity of the student. A tournament in which such giants as the Master of Trinity College and the Edinburgh Professor of Logic meet, is beyond controversy a grand and entertaining spectacle. But to at least one observer of that contest, it appears that both champions were contending for error, since it was assumed on both sides that the discipline of the logical powers was the chief end of liberal education. All the powers of the soul are essential to a perfect soul as much as all the members of the body are essential to a perfect body. It only needs to assert this doctrine to have it command

assent. Even the senses, the power of receiving impressions from the outward world, are to be held worthy of honor and of cultivation, since they are incontrovertibly powers of the soul.

Those who assert that speculative knowledge is of value only as it excites to speculation, and that truth is of value only as it leads a man to search after truth, must be considered as speaking in hyperbole. As distinctly as consciousness gives us the assurance of the existence of objective truth, so distinctly does the instinctive thirst for truth assure us that its possession is a positive good in itself. Without the faith that knowledge is a positive good, we could not embark upon the search for knowledge. Truth is not only to be sought, but to be gained. Truth is the prize held up before those who wrestle with difficulties and obstructions to obtain it, and if we consider it worthless in itself we cannot strive for it. Care must therefore be taken lest, while setting forth strongly the value of discipline and exercise to the student's mind, we take from him the principal stimulus which can prompt him to that exercise.

Sir William Hamilton's glorious plea in behalf of metaphysics, and his amusingly earnest depreciation of physics and mathematics as means of liberal culture, are therefore neither of them satisfactory, in so far as they assume intellectual gymnastics to be the only end of education; and it would be easy to show by extracts from his own writings, that, in his sober judgment, he

would take a much wider view of a generous education than that which, in the warmth of controversy, he has set forth in writing.

If truth is to be sought it must be with the hope of attaining it. And if the knowledge of truth is declared by our instinctive appetite to be a good, there is no kind of truth, which can be pronounced useless. A selection is doubtless to be made, since no one mind can learn all things, but that selection should not consist in choosing objects so much as in determining the amount to which each is to be studied. We instinctively accord homage to a man of general information. Liberal culture consists in the study of every thing true, the pursuit of every thing beautiful and good. It will not answer to neglect and exclude a branch because it affords but a slight gymnastic to the reason. It may afford an exercise for some other equally valuable faculty of the soul. We are to assume that whatever is true is worth knowing. The moment that we cease to make our studies general and confine ourselves to one branch, no matter how lofty, we become specialists. The mere metaphysician, or philosopher, may be as profoundly lacking in judgment and taste as the mere mathematician, or the mere physicist.

I am aware that in our own honored Alma Mater, and in some other colleges, a change in the course of instruction similar to that which I am now advocating has already begun to take place, and that I may be considered as taking on myself a superfluous task in

defending the study of the natural sciences. But I conceive that the changes already begun, have in most instances been undertaken either too rashly, or else too cautiously, and rather as concessions to the popular desire than in obedience to clear and cordial convictions of their utility. I have felt that the view which now I have given of the constitution of the great circle of sciences, vindicates the claim of physics and natural history, which I have groupèd together under the latter term, to a prominent place in every general course of instruction. It is not, as I conceive it, a question of expediency, or a question of the times, but a question of inherent necessity; a question of absolute duty. There can be, in my view, no true education that is not founded upon a knowledge of the mathematics; a thorough cultivation of the physical powers, including a discipline of the senses; and an acquaintance with the laws of the material world, both organic and inorganic. This must be followed, step by step as it proceeds, with the cultivation of the fine arts, with the analysis and use of language, with the lessons of history, and their application to the politics of our own day. And the whole must be, from first to last, conducted under the guidance of the highest Christian theology and Christian morality. I cannot see that any other culture would be liberal and broad for any people, of any age. In this scheme of education the classics hold a subordinate, but still a prominent and honorable place, in

the great department of history, while the new sciences of chemistry and its allied branches in all their multiform applications, to both the useful and the fine arts, must take an equally honorable place in the great department of natural history.

The view which I have thus given has been wholly with reference to the culture of the intellect, and founded upon the hierarchy of the sciences, strictly so called. I have already said that the same conclusions might be reached through a different mode of approach. The intellect is but one of those subordinate powers, that, in a full developed man, serve the behests of the will. Knowledge is not the only nor even the highest good. Learning to know, however much we may learn, and however great the truths we may learn, gives us but a part of the soul's nourishment. As the food of organized beings must be varied, and a plant or an animal may be starved to death if confined to any food rich in all things else, yet lacking one essential element, so a soul may be dwarfed and crippled in its growth even while daily supplied with the richest spiritual treasures, if any one essential element of spiritual life be withheld. A man may be a perfect prodigy of learning, and know all that the human mind can know, an intellectual giant capable of grappling with any problem, and yet be lacking in the highest elements of human nature; he may, for example, be lacking in that Divine energy of love which gives a man power to do and to endure;

which enables a man to use his knowledge for the benefit of his fellow-men. The mere acquisition of knowledge, the mere strengthening of the intellectual powers even to the understanding of every subject that can be fathomed by the human mind, is but a partial culture, and makes but a stunted and dwarfed man unless it is accompanied by love, by that noble enthusiasm which sees all truth as a part of the infinite treasures of God, and while filled with adoring wonder at the infinite wisdom of the Divine mind, burns also with a longing to lead other men to share with him in the holy joy.

I have spoken of the circle of sciences as though a man could attain a knowledge of all the five great branches of human thought; but we are told on high authority that if any one thinks he knows any thing, he as yet knows nothing as one ought to know. For we know only in part. The simplest truths that can be grasped by the understanding have an infinite variety of relations, and open to boundless and unexplored fields. He, therefore, who thinks that he knows any thing perfectly, proves thereby that he does not know it as one ought to know it; that he does not perceive its relations to the unfathomable truth. The whole universe is a combination of thoughts and ideas, numerous and diversified beyond our power to count, but nevertheless bound together in one harmonious whole; the whole universe being in fact but one thought of the Divine mind. The human mind can never ex-

haust its wondrous meaning. That which seems simplest to us contains in reality an infinite depth of God's thought, and it is only our ignorance or our self-conceit that makes us suppose that we perfectly understand it. The first point in true learning and the last point are always the same; namely, to learn that there is something more to be learned. This is the greatest value of learning,—to be made continually aware of the presence of something higher, something wider, something better, something more Divine, to which we may aspire.

Now it appears to me self-evident that this highest fruit of learning can be nowhere more surely gathered than from the field of the natural sciences. That which is abstract never appeals so vividly to our feelings as that which is concrete. And while I would be far from implying that education has power in itself to regenerate a human spirit, I think it not inconsistent with that written Word which has beyond controversy been the most powerful of all visible agents in redeeming the human race, to say that the study of nature in its varied aspects is another of the most effectual modes of calling out the better feelings of the heart. When the abstract teachings of ethics and theology have been forgotten, and long familiarity with the customs of society has made the soul indifferent to all higher themes, nothing more frequently penetrates to the inner seat of life and awakens those better emotions which are the pride and glory of man-

hood, than the presence of some natural object of unusual interest or unusual beauty. The sight of a flower, or the song of a bird, recalling the memory of an innocent childhood, has frequently melted a heart which would remain unmoved by the logic of an Edwards or the fervor of a Wesley.

In childhood the senses are open to the reception of truth from the outward world. A child sees and hears a thousand things that escape the observation of a man. Train him in the usual mode of education and he soon loses the habit of attending to outward things, learns to tread upon the insect and to pass by the flowers, to let the bird sing unnoticed, and the pebble glitter untouched. But give him a true education, including in his studies, as a prominent part, the elements of chemistry, botany, and zoölogy, and his eye shall not become dim nor his ear dull of hearing; in manhood his heart will be open to the sweet influence of the flowers, and to the grandeur of the starry heavens; he will read the meaning of each singing bird, and catch the true expression of the solemn tones of the thunder. When the forest ocean surges under a July breeze, and the clouds sail majestically through the blue sky, they will fill his heart with emotions unknown to one who despises these glorious works of the Most High as being mere matter. I again acknowledge that no course of education can be able to redeem a fallen soul; simple diet and exercise cannot, at least in one generation, remove the taint of hered-

itary disease. But what study can have a greater effect in leading a student to a reverence for the purposes of God, and for the laws of his own being, than that of those natural sciences which are directly occupied in investigating the thoughts, purposes, and actions of the supreme creative will? And what studies can put into the hands of one who truly desires to serve his fellow-men, more valuable instruments to serve them, than those natural sciences which, through their application to the necessities of human life and to the wants of human society, have so gloriously distinguished the eighteenth and nineteenth centuries? Far be it from me to disparage the value of artistic, literary, metaphysical, and mathematical culture. I am urging the claims of the natural sciences partly because of the aid which an acquaintance with them can give in the pursuit of all other branches of learning, and in the exercise of all branches of art. From what source does the sculptor draw his inspiration, and what enables him to make a "statue that enchants the world?" Or how does the painter give to a little piece of canvas a value that endures for ages, and makes every beholder rich? These artists had their sense of beauty cultivated by a reverent contemplation of natural forms and natural colors, their artistic powers of execution guided by a careful study of anatomy, and of the laws of light and vision. What gives the musical composer his power to control the hearts of men? His sensibilities have been cultivated by an

attention to the music of nature, and his artistic power guided by a knowledge of the laws of sound and of hearing. What can give a greater charm to the pages of literature and to the periods of the orator than fresh odors from the woods and fields, and living figures from the wild creatures of his own country? The hills of New England would furnish to a thoroughly trained New England orator, a honey of eloquence as sweet as that of the Athenian Hymettus. Where shall the metaphysician learn to correct the wandering of his thoughts and to keep his feet firmly planted upon the ground of common sense so surely as in the natural sciences, where alone his theological speculations are secured against both pantheistic and atheistic tendencies, and where alone he can learn his true relation to the wholly mortal races, and his real points of superiority to them? As for the mathematician, it is manifest that he can find no problems for the exercise of his powers in either of the branches of the hierarchy above natural history. As he derives his first conceptions of figure and number from material things, so most of the higher problems which are to engage his attention in the coming centuries will be suggested by an investigation of the forms and motions of the physical universe. The question of the organic forms has scarcely yet been touched, and only the vaguest hints been given either in botany or zoölogy of the mode by which we can approach the study of the numberless varieties of natural figures.

A practical inquiry may be made as to the extent to which I should recommend the study of each one of the natural sciences as a part of liberal culture. But as this is not a fit occasion for entering into details, I must content myself with answering, that if my views of the hierarchy of sciences are correct, the natural sciences should occupy in the general scheme of common education as prominent a place as the languages, and for general purposes of culture should precede a knowledge of other tongues. At the same time I would freely admit, that uncultivated men, seeing the great economical value of a knowledge of physical laws, will be, in our age of the world, apt to overestimate the value of natural science ; and it becomes men of liberal culture to maintain also the value of classical learning, of historical investigation, of metaphysical analysis, of ethical and theological discussions. The common-place truth, that different men have different tastes and different powers, is, like every other common truth, a valuable guide in our higher inquiries. We must no more expect by a course of education to make all men naturalists, than to make all linguists, or all mathematicians. One object in making our scheme of common study thorough and comprehensive is, I repeat it, to make men the better specialists ; and it would be as great a mistake to underrate the value of the mathematics, the languages, history, logic, or moral philosophy, as it is to underrate the natural sciences. If my plea in behalf of the latter study has any force

or value, it arises from the connection of the five great departments of thought as essential parts of one whole ; and from the logical precedence in time in which these studies should follow each other in a natural education. I should as strenuously oppose the exclusion of the Greek and Latin tongues from the general course of instruction, as I should advocate the introduction of natural philosophy, chemistry, botany, and geology. History is an absolutely essential part of a liberal education ; the study of language is the most essential part of history (since language is the necessary vehicle for conveying thought, and the history of thought is of course more important than the history of action) ; and, finally, the study of the Greek and Latin tongues is the most important part of the study of languages, because those tongues are, for many reasons, the most important that have ever yet been spoken. The Greeks, to whose authority I have appealed in behalf of mathematics, physics, and metaphysics, as branches of liberal culture, paid also much attention to grammar, logic, and rhetoric ; and our education will be inferior to theirs, if we, dazzled by the brilliant achievements of physics and mathematics in the nineteenth century, should be led to neglect the study of our own language, or of those tongues from which it draws its elements of grace and subtilty.

The practical question, to what extent any branch of science must be pursued, will depend for its solution partly on the average age and capacity of the pupils,

partly on the ability and tastes of the instructors who can be readily obtained, and principally on the length of time over which the course of studies is to be extended. The question is, theoretically, of easy solution. Each department of science is to be pursued to precisely the extent required for a foundation of the succeeding branches in the same curriculum. The difficulty will consist in determining what extent is thus required, without allowing ourselves to be biased by our individual tastes.

A second inquiry may be made as to the possibility of introducing so many branches into a limited course. It is maintained by some, that the increased breadth of culture thus obtained, does not compensate for the necessary lack of thoroughness, and that a change in our general course of academic instruction such as I here recommend, would render our scholars still more obnoxious than ever to that charge of superficiality which is so often brought against them. I might reply to this question of the possibility of studying all things, by simply saying that I have demonstrated it to be desirable, and that "whatsoever is desirable is possible, and will one day become actual." If the succession of the great departments of knowledge be such as I maintain it to be, the course of instruction which I have marked out is necessary, and therefore possible. But I believe that experience is already able to show that, in a varied course of study, such as I here recommend, the progress of the pupil is actually greater in each

branch, than it would be if he had not pursued the other studies. A change of occupation is a rest and refreshment to the mind ; and when those occupations are arranged in a natural order, the labor of taking them up successively, and making a certain amount of progress in each, is not at all proportioned to the number of pursuits. The objection to a want of thoroughness, which it is supposed might proceed from a multiplicity of studies, is based upon what I consider a misunderstanding of the essentials to a thorough understanding of any science. I admit that thoroughness of acquaintance with details, and familiarity with the minutiae of a subject, that is, the thoroughness of a specialist, is to be attained only by long continued and patient investigation, necessarily consuming much time. But a thorough acquaintance with principles, and with the main facts illustrating those principles, is far more important in the culture of the soul, than any acquaintance with detail ; and it may be acquired in much less time. On the other hand, a firm grasp of fundamental principles is very frequently not acquired by those who have gained a thorough familiarity with all the details of a subject. When a student has, in the academic course, been thoroughly grounded, as he easily may be, in the principles of all the principal sciences, he will be much better prepared to turn his attention with advantage to those sciences especially connected with his professional studies. It is impossible for a man to keep up through life a perfectly liberal culture ; we must all

become specialists in that department to which natural proclivity inclines us : —

Trahit sua quemque voluptas.

And each man will be the better qualified to labor, in whatsoever department his work lies, in proportion to the breadth and depth of his acquaintance with all other departments.

In order that our philosophy may be a safe guide of our lives, it must be a sound and comprehensive system, embracing all departments of our thought and action, and misleading us in none. As the ages roll onward, and the purposes of God with respect to our human race become more apparent, we are amazed at the greatness of the work which is intrusted to our feeble hands. It becomes evident that a subdivision of labor is necessary, and that each person must do that part for which he is best fitted by the gifts of nature and by the acquirements of education. But with the advantage of this subdivision of labor may also come the disadvantage of introducing a diversity of interests, and an alienation of sympathies among those who should be brethren. Before a man gives himself up to the special pursuits of his profession, let him so thoroughly understand the spirit and aim of other professions, as to be always in sympathy with all true minds. It is partly from the neglect of natural history, in the general course of liberal education, that men have been so much occupied in wrangling about matters

above their comprehension, while they have left unlearned the plainest lessons in the school of life. It is not from acquaintance with natural science, but from a partial ignorance of it, — ignorance of its highest teachings, — that some men have failed to see in natural objects those religious truths which are the necessary intellectual basis for understanding the plan of creation. Beyond question, the opposite fault, which, under pretence of worshipping the Father of our spirits, despises the bodies he has made, and speaks with contempt of the vain pursuits of natural philosophy, of studying stars and tides, matter and motion, arises from an imperfect and erroneous culture.

The theme to which I have invited your attention has wide relations to the future welfare of all nations and all classes of society. It is not for man to add to the original powers which the Almighty has bestowed upon each of his creatures. Those who have expected that education would transform all students alike into men of talent, and even into men of genius, are doomed to disappointment. But as surely as the products of the garden exceed the wild fruit of the forest, so surely has our common scheme of education a powerful influence over the general tone of human thought and the general extent of human attainments. A partial culture, omitting from the course of instruction essential departments of the hierarchy of science, must perpetuate narrowness of view and littleness of aim. But let our general course of education in our common

schools and colleges be planned according to wide and comprehensive views, giving a broad and liberal culture to all our people, and there shall surely arise among us men who will carry forward each branch of philosophy, science, and art toward perfection, and who shall rejoice not only at the rapid development of his chosen art or science, but at the general success of his fellows. When we reflect upon the mighty changes of the last two centuries, produced in great measure by the increasing attention to natural science, since the days of Galileo and Gilbert, and by the introduction, through the influence of Lord Bacon's educational writings, of scientific themes among the speculations of the learned; when we see also that the rate of change, both in the progress of science and of art, has, within the period of our own observation, been rapidly accelerating, we can hardly look forward with too lively a hope for the still more splendid fruits which may spring from a better cultivation of the human powers under this clearer light, which seems so rapidly approaching a noonday brightness. But the noonday of science can never arrive; her light is to increase without end. The resources of an absolutely infinite Spirit for the instruction and happiness of His creatures can never be exhausted. It has been recently stated by a member of our fraternity (of whose correctness in calculation there can be no doubt), that a single division of a single department of one branch in the hierarchy of science, contains an abundant occupation for the most

powerful human intellect, for at least a hundred millions of years. If there is so much untilled land in a single division of the single science of Geometry, it is evident that no human mind can estimate how vast the field of the whole encyclopedia ; nor weigh the irresistible strength of the presumption thence arising, that we are

Heirs of eternity, yborn to rise
Thro' endless states of being ; still more near
To bliss approaching and perfection clear.



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