stations which do not make aerial soundings their chief work. The quarterly ascensions will be made during three consecutive days, on dates to be named hereafter. It is recommended that the trajectories of the *ballons-sondes*, and of the pilot balloons, when only these are used, should be determined by angular measurements and that the same thing be done for clouds. It is also desirable, as General Rykatchef has suggested, to have at least one temporary station for these international observations in the midst of the great Asiatic anti-cyclone, especially in winter. If this can be established the observations should last seven days instead of three days, that is to say, two days before and two days after the normal days.

A subcommission consisting of Messrs. Teisserenc de Bort, Berson, Hergesell, Köppen, De Quervain and Rotch decided to adopt Professor Köppen's proposition to publish a compendium of the best methods of sounding the atmosphere, for which the several establishments actually conducting such investigations will be consulted and the publication made by the International Commission. The subcommission also recommended that a form of publication, similar to that used by the Deutsche Seewarte, be adopted for statistics relating to the kite flights and that a similar résumé for balloon ascensions be used by the institutions participating in them.

The commission expressed its satisfaction that atmospheric soundings had been begun by the United States Weather Bureau on Mount Weather and hoped that they might be extended to other stations of the service.

The conference agreed with Major Moedebeck that it would be useful for scientific as well as for ordinary balloon ascensions, if, on the topographic maps of the various states there should be indicated in red the location of collections of lights which could serve to orient the aeronaut at night, and if the lines of high electrical potential, and also the places which were sheltered from wind, should be marked on the maps.

The propositions of Professor Assmann, relative to the meetings, were adopted in this modified form: The commission shall meet but once in three years, unless there is special reason for assembling earlier. The reunions are intended to consider the organization of the work and to discuss methods and instruments, scientific communications being relegated to the last and only presented then if time allows.

It was the sense of the meeting that the entertainments in honor of the commission should be restricted henceforth and at the present convention they had been mostly combined with technical demonstrations of aeronautical apparatus in the exposition and elsewhere. Thus, on one excursion to Pavia the aero-dynamical observatory of Signor Gamba was inspected. Afterwards the university was visited and a lunch tendered by the municipality. On another excursion to Lake Maggiore, through the courtesy of Signor Mangili, president of the exposition committee, experiments in flying kites and liberating *ballons-sondes* from a steamboat, were attempted, although without much success. After the close of the meeting members of the congress had the opportunity of making balloon ascensions, under ideal conditions of weather, in eight balloons which rose from the exposition grounds and landed not far from Milan, a few hours later.

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THE DANGER OF OVERSPECIALIZATION[1]

IN the ever-recurring discussion of our

[1] Read before the meeting of April 5, 1907, of the New York Section of the American Chemical Society.

methods of education and of our pursuits in life, it has been asserted over and over again that 'this is the age of specialists.'

Is this really so? Does this age create more specialists than former epochs in history? If this be the case, does this tendency keep on increasing, and if so, may it not ultimately impede the higher development of mankind and reduce us to mere automatic machines?

The political economist tells us that division of labor increases and improves production. We also know that in any pursuit of life specialization enables us to more thoroughly master the details of a subject.

On the other hand, we ought to admit that even to-day, truly great men, who have achieved distinction by exercising a beneficial influence on the development of our race, were not merely specialists. They were persons of broad general tendencies, although sometimes their superiority was more accidentally manifested in some special line of work. If, to stave this assertion, I started to mention a list of names, I might possibly omit many men of merit known or preferred more particularly by any of you. But I shall take the liberty of turning my argument, by challenging you to name any truly great man who was merely a specialist in one single small branch of human activity.

That one-sided pursuits are apt to make us very narrow-minded will be conceded by many whose misfortune it has been to have to work or live with people who led such a specialized existence. Even the professional fields of specialized activity may lead to short-sighted pettiness. Andrew Carnegie reenforces my own belief, based on personal experience, when comparing the better class of business men to artists, he wrote: "I have learned that the artistic career is most narrowing, and produces such petty jealousies, unbounded vanities and spitefulness, as to furnish me with a great contrast to that which I have found in men of affairs. Music, painting, sculpture, one would think, should prove most powerful in their beneficent effects upon those who labor with them as their daily vocation. Experience, however, is against this."[2]

This apparent shortcoming of artists may be explained by the fact that as a class they are generally very ignorant outside of their own art, which requires more skill than knowledge, and what is worse, to many of them exact knowledge, which might help to broaden their views, is almost repulsive.

But—to come back to first principles—we ought to consider all pursuits of life from a broad general standpoint. I dare say that human life includes, as its noblest attributes, three fundamental tendencies to which all others converge, directly or indirectly. Indeed, nature prompts us—

First, to develop ourselves physically and intellectually—the latter word including all moral development.

Second, to reproduce ourselves and lend our short existence as individuals for the physical and mental betterment of our race, towards a higher goal of absolute good.

Third, to enjoy life in its material and intellectual comforts as far as the latter contribute directly or indirectly to the two first-named functions. This idea includes naturally the production of wealth and the better use of the same.

Whether we be scientists, philosophers, laborers, artists, merchants, money lenders, beggars or thieves, we all obey those laws which predetermine the ultimate destiny of mankind. Whoever, in some way or another, works in harmony with these dictates

[2] 'The Empire of Business,' Andrew Carnegie.

can not help being a benefactor to his own race and to himself in particular.

No individual whatever can try to divest himself of any of the above-mentioned attributes or functions of life, without jeopardizing in some degree or another the progress of his race.

Let us imagine, for an instant, a society only composed of four distinct classes: one, wealth-producing but vicious; a second, very moral but inactive; a third, very intelligent but bodily weak; while a fourth class would be composed of physical athletes, very stupid. Fortunately for the welfare of our race, in such a heterogeneous society, free intermarriage would tend to offset the one-sided grouping of these abnormal individuals or specialists—to call them by another name—and would bring about more homogeneity for their descendants. Furthermore, education—the great leveler of one-sided tendencies—would prove another active factor for accomplishing this result. When I speak here of education, in its broadest sense, I do not merely limit myself to so-called school education; but I include in this term all influence towards mental development, proceeding from any source whatsoever, as, for instance, self-culture and environment. But, whenever education tends to develop one of our faculties beyond reasonable necessity and to the detriment of other functions, we drift towards mental deformity—a freak; and this in about the same manner as a particular muscle exercised beyond normal requirements will leave the remainder of the body insufficiently developed and out of harmony with the other anatomical parts.

Many fundamental errors have been committed by such men as spoke or wrote of the culture or the civilization of a given nation, without according full importance to above considerations. Moreover, history teaches us that a one-sided or specialized education has been the defect of nations of the past, even to a greater extent than it occurs in our present civilization. Many examples can we give to show that such a one-sided culture was largely to blame for the downfall of at one time powerful races. The Greeks, in their overspecialization of art, neglected beyond measure the study of nature. Had her philosophers steadied their thoughts by giving more attention to the careful observation of natural phenomena, instead of dreamingly searching a solution for all problems by analytical reasoning, they would not have been led astray into casuistry and sophistry and skepticism. The great laws of nature might have opened their minds to a better understanding of equity and rights of man; while now history has to record that even the most progressive and radical Greek philosophers proclaimed chattel slavery as an indispensable institution of society. In the same way, a large part of their literature was devoted to beautifully sounding, well polished sentences, dealing mostly with imagination. The Greek writers, in their search for effect, gave their fancy full play whenever they described the war exploits of their heroes, with the result that they put themselves on record in history as the biggest braggarts in prose and in rhyme.

As another example of one-sided culture let me remind you of the inhabitants of India, who became overawed by the conception of the immensity of the universe, and the relative insignificant smallness of man. Exaggerating this feeling, they too failed to grasp the full meaning of harmony in nature and so neglected to give sufficient attention to the material development of their race. This doomed to stagnation an otherwise very intellectual people; it rendered possible their subjugation under the strong and forceful arm of warlike tribes, morally less developed, but physically bet-

ter adapted for the perpetuation and multiplication of their sturdier race.

In the same way, the Roman empire fell as a result of the wilful ignorance of the true principles of equity; her poorer classes, or vanquished foes, were denied their natural rights by their aristocratic masters. This heterogeneity of the people led to all the excesses which brought about the fall of what once had been a mighty empire.

After the advent of Christianity, the despotic Church of Rome retarded the progress of all Christendom as soon as she tried to specialize all human knowledge, so as to make it agree with her own bible. The result was that long and sad period of the dark middle ages. In the meantime, Saracen and Jew, on the north coast of Africa, or on the Iberian Peninsula, were able to cultivate science less trammeled by a restrictive religion. To their broader activity do we owe it that scientific investigation was kept alive until the day when the dawn of Reformation enabled backward Christendom to resume again the search for truth.

But, even now, our educational system is still much under the chilling effect of that cloud which during the middle ages hid the light of true knowledge. Respectable pedagogues have taken care to hand us down from generation to generation a curriculum which includes most of what formerly was erroneously called *a complete education*. In the latter, ancient literature, holy or profane, has always played a paramount importance. In its program, scant consideration is given to more real modern knowledge which refers broadly to the world we live in, or to the burning questions of the day. I know of many instances where, under the name of liberal education, such an antiquated tuition is still dealt out to the younger generation of both sexes. In fact, many well-meaning persons think that this is the kind of respectable training most desirable for a rich young man of good family and good manners. In reality, such an education is merely an overspecialization of the kind of culture which was meted out to studious sons of patricians some two thousand years ago. For our modern requirements, it is an anachronism, if not a positive danger: a danger—because it is liable to select as standards the undeveloped or erroneous thoughts of antiquity. In many instances, the tendencies of the ancients clash with our more advanced ideas of truth and justice—even if the latter are not always consistently practised by modern society.

The French Revolution encouraged some reforms in this antiquated system of education. But even to-day modern science and modern thought are grudgingly allowed a very small place in the classic curriculum so faithfully defended by some pedagogues. Small wonder, then, if we hear so many respectable people use flowery rhetoric on such inconsistent themes as 'science versus religion,' or, 'science versus art'; as if there were any *versus* possible whenever we speak of science as true science, religion as true religion and art as true art—as if truth were different, whether expressed scientifically, religiously or artistically!

Luckily for the progress of humanity, now and then some young men, less blessed with worldly goods or wealthy parents, and more eager to make a living by their own work and education, have been compelled to give a vigorous kick to the classic curriculum fetish. Some of them decided to take their education 'à la carte'—as President Eliot expressed it so picturesquely. They were compelled to select substantial and up-to-date meals, more suitable to their eager modern appetites; they had to shun the stale and indigestible dishes of education made up in antiquity, to please the palates of bygone times.

Unfortunately, the very cause of this new tendency has carried us so far as to seriously threaten us with the pitfalls of the other extreme.

Furthermore, the fact that scientific learning has found unceasing applications in the production of wealth has fostered the constantly increasing tendency for finding in scientific edueation or scientific pursuits a mere means of earning a living or making money. This has led into scientific vocations a large number of persons who in their profession expected to find a quick and easier means for making a living, but outside of this stimulant possessed few if any of the qualifications of the true scientist. Impractical in their selection, they deceived themselves by choosing an occupation which less than any other leads to wealth or power. But once having decided to enter a scientific profession, they soon became aware that the call is for specialists, and they were foreed to specialize one thing or another by their employers, whether the latter were manufacturers, merchants or even some educational institutions whom they served as teachers.

In accordance with this same tendency we find manufacturers who, themselves without other training excepting what long experience has taught them, blame our colleges, universities or technical schools because they do not turn out graduate chemists who can jump right away into their manufacturing works fully acquainted with all the intricacies of the processes; of course, all this with the prospect of a small salary so as to act in competition with a few able and better paid men who had to sacrifice a lifetime in order to acquire experience.

That greed or ignorance should make such claims is quite natural; but that we should find teachers or students who are willing to admit such abnormal educational methods, and change them into a kind of apprenticeship, is a matter of regret for anybody who believes in education as a means for the healthy mental development of his country.

What is worse, our own way of living shows beyond doubt that we all have undergone, more or less, the effects of overspecialization against which I have come to protest. Too much have we learned to look upon our usefulness in life as depending almost exclusively on the concentration of most of our energies, most of our thoughts, upon a narrow line of specialized action. Without knowing it we drift into a mere routine occupation that makes automatic machines out of us. For all generalities of life which do not fall immediately into our own specialties, we are willing to assume respectable conventionality: We are willing to join the herd of docile and unthinking sheep who are following a leader. In science as well as in politics, we are ready to follow this leader, for better or for worse, as long as we can shift upon him our own responsibilities of thought or action.

Busily burrowing along like moles, in the pursuit of our own little specialties, we are dizzily preoccupied with our specialized routine work. We lose the desire of coming once in a while upon the surface of the earth to take a stimulating look at the grand view of nature and its inspiring entity. Once upon a while, we are rather disturbed in our narrow scientific beliefs when some Curie announces radium or radioactivity, or when some Ramsay upsets our orthodoxy by pronouncing the words: evolution of elements. We get fairly shocked when a Crookes speaks of death of matter.

Just in the same way, after admitting as holy faith that weight and matter are constant or indestructible, some day, somebody may have to rouse the most timid of us and force us into the belief that gravita-

tion, like all other energies, can be modified into any of them, or better perhaps, that gravitation, being the more stable of all energies, is the final energy toward which light, health and electricity tend to change. Who knows but that ultimately a less neglected study of gravitation may allow us a glimpse into the secret of the destiny of our universe?

I admit, many of you will smile at these unorthodox hypotheses or conjectures. Yet, let me ask you: With what methods have we thus far measured any possible changes in weight? We have pinned all our faith, all our beliefs, on a mechanical instrument called a balance. A very delicate method indeed, if judged from our conceited one-sided standpoint of specialists. We are proud if we possess a balance which can weigh a one hundredth of one milligram; we work ourselves into awe and admiration before an instrument such as the one I saw two years ago which can detect a difference of a one thousandth of a milligram. A one thousandth of a milligram! How infinitesimally small such a weight appears to our limited conceptions; and yet, what a ponderous quantity this same weight becomes if we try to compare it with the mass of an electron. Our whole science of chemistry is based on the fundamental law of the conservation of matter as formulated by Lavoisier and accepted by us as an axiom. However, by what means has this law been verified, if not by balances more crude, more imperfect, than that clumsy instrument which can not weigh anything beyond 1/1,000 of a milligram? It is high time that science should discover a more delicate means for determining small weights than a mere mechanical balance; then, but only then, may we be able to demonstrate beyond doubt whether all the assumptions on which we base our chemistry are correct, or whether we simply have been building a whole science on false premises.

While we are at this subject let us continue this act of self-examination. When we speak of the descriptive part of the science of chemistry, when we describe any reactions, any compounds, any laws, we all refer these to phenomena which take place within an abnormally small range of temperature. Lately, Dewar opened our eyes to some unexpected phenomena which occur at very low temperatures; on the other hand, the electric furnace so ably manipulated by our regretted Moissan enabled him to establish many unsuspected facts at temperatures which our imperfect thermometric methods do not allow us to measure accurately. Yet, if we will drop for a moment our one-sided considerations and look upon everything in true proportions, we must admit that the range of temperatures within which we have studied natural phenomena is disappointingly small, as compared with the possible range of temperature of the universe.

Not so long ago, chemists had no better definition for organic compounds than to designate them as those that were produced under the intervention of vital forces; inorganic bodies, on the contrary, were supposed to be made under the influence of ordinary physical forces. We all know since how Liebig and Wöhler disposed of this mistake by the memorable discovery of the synthesis of urea from inorganic bodies. Nevertheless, many of us to-day are prone to think that the more delicate organic bodies, as, for instance, the constituents of the protoplasm, will never be obtained synthetically. These doubters point to the fact that as soon as we try to imitate these subtle, synthetic reactions which take place in the living cell we remain powerless to accomplish anything beyond splitting or simplifying the molecule. And yet, let me ask you, what are the laboratory methods

with which we try to imitate the subtle biological processes? Heating, boiling, distilling, desiccation, precipitation, electric currents, every one of them barbarously destructive methods, with which we blast away at exceedingly delicate compounds: We might just as well try to imitate the melodious music of a Gounod by firing some dynamite cartridges between the delicate strings of a piano!

One-sided as we are, we witness every day of our lives the fact that all vegetation accomplishes its processes of synthesis or assimilation under the indispensable action of light; nevertheless, thus far we have tried very little to avail ourselves of this powerful yet delicate source of synthetic energy. Up till now photochemistry has scarcely been used for any other purposes but the art of photography.

What have we done to utilize the effect of pressure in the study of natural phenomena? Very little, even if we take in consideration some half-hearted attempts in this direction. What are the pressures we dispose of as compared with those which exist in the center of the earth? We hear of mines about one mile deep of which the tunnels are submitted already to such a tremendous natural pressure that their walls snap together shortly after an excavation is made, leaving the miner barely time to get out, so as to save his life. If we calculate the pressures existing at these depths we come to very awe-inspiring figures. But if again, we invoke the sense of proportions, we must recognize that a mine one mile deep is a mere insignificant and imperceptible pin prick as compared to the size of the earth. After such considerations, can we expect to duplicate certain chemical or physical processes which have been going on under tremendous pressures in the bosom of the earth? Or shall we try to find means to enormously increase the pressures of which we have thus far disposed in our laboratories, and have considered sufficient, although they are absurdly small.

And how about the element of time in chemical reactions? We all now are aware of the fact that even an explosion of dynamite takes an appreciable and measurable time. On the other hand, Berthelot, in his memorable studies on estherification, has demonstrated that in some cases it requires sixteen years of continuous action before the limit of estherification is reached and a final equilibrium is maintained. We are not inclined to patiently study reactions which take months or years, and yet, in the great laboratory of nature, phenomena are accomplished just the same whether their fulfillment requires seconds or æons. But in our lives, which are of such an infinitesimal shortness if compared with eternity, we look at everything according to the very short lapse of time which is allotted to our little individual existence. We refer and compare everything to it, in about the same way as I suppose the may-fly does to her own little life, after she has become accustomed to the fact that her existence is counted only by a few hours.

I am perfectly aware that these and many other philosophical conceptions are receiving consideration from such broad-minded scientists as have not grown up to consider science as divided in water-tight compartments. For them the borderland between the different fields of specialized science becomes the favorite hunting-ground for the philosopher. To the latter, scientific pursuits mean something broader, something higher than a mere concentration on a special field, to the exclusion of all others.

On the other hand, over-specialized science is apt to degenerate into a mere hobby, where all conceptions of true proportions and harmony are lost. The corner grocer

who knows all about the prices and qualities of sugar, coffee and tea, and little else, is nothing less than an exaggerated example of over-specialized knowledge. In the same way, I am sorry to say it, I have met many an example of so-called scientists whose science does not rank higher than what is involved in the pursuits of my boy when he is eagerly engaged in the collection of cancelled postage stamps. Knowledge does not contribute necessarily to the wisdom of the individual, unless that knowledge be sufficiently diversified to stimulate his thinking powers. The scientist who spends all his time in purely theoretical work and looks down upon the man who tries to find industrial applications for our knowledge, shows just as much unwarranted one-sidedness as the so-called 'practical' man or empiricist who expresses contempt for purely scientific pursuits.

For fear that I may be misinterpreted, let me repeat that I shall be the last to deny that every one of us is compelled to specialize more or less, in order that we may become thorough in some one branch of human activity and in order to develop our individual usefulness. I am aware that even the dullest specialist, who does conscientious work, will be of some use to the community: If he be engaged in scientific research work, and carefully records well-observed facts, he renders a service to mankind; he presents us with his own home-made little bricks, which in time, will be used by the architects of science to build up the ever-increasing edifice of knowledge.

I hope, I need scarcely add, that I further believe that well-recorded scientific facts of small immediate importance may in time become immensely valuable as compared with elegant but wrongly conceived theories based on hasty generalizations.

I believe, also, that in these times of unbalanced industrialism and greed, the law of self-preservation commands us to select a specialty as a bread-winning pursuit. I am fully aware that insufficient pecuniary resources compel many of us to curtail our preliminary studies to the very minimum consistent with what we absolutely need so as to enter into a remunerative trade or profession.

But however light-weighted our educational baggage may be, when we enter practical life, nothing but our own indifference, our bad judgment, our lack of aspiration towards nobler aims, prevents us from remedying this. Every day of our life, as long as we live, is given to us for increasing by self-culture the slender outfit with which we left school. And self-culture, in order to be effective, ought to be directed so as to counteract any one-sided tendencies resulting from our specialistic daily occupations.

The majority of individuals give by far the largest amount of their work, their endeavors, their thoughts, to the production of wealth, or to put it simpler: the art of making money. Yet, engrossed as we are in this one-sided occupation, very few of us think it worth while to undertake the study of that science which investigates the laws of production and distribution of wealth. Ignoring the true, if elementary, principles of political economy or believing in a perverted political economy which has been invented to serve the ends of a few as against the rights and interests of the many, we help to perpetuate the main cause of numerous social ailments. The scant attempt of serious attention which is given to this branch of knowledge by any but a few specialists, has rendered possible the exaggerations and irregularities of our system of industrialism. It has helped to keep in bondage many deserving men of exalted character but unable to develop their possibilities, as they

might do, under a wiser system. Who does not know of some otherwise highly developed individual who now is treated with contempt because he committed the crime unpardoned by our modern society; of failing to master that greedy art of accumulating money for himself, or for others.

Over-specialists as we are in our daily pursuits, we are ever prone to scorn the politicians; we think we have done all our duties as citizens if on election day we take time to cast our vote instead of standing all day on the golf links, but only to find out afterwards that we have supported men who, through ignorance and selfishness, hoodwink us and prevent us making our country the true democratic republic so simply and forcefully defined by Lincoln as: a govenment of the people, by the people and for the people.

If we have any fault to find with our politicians and lawmakers we should blame none but ourselves and that tendency of overspecialization which keeps us in our own narrow routine and lets the politician-specialist rule us and the country as well.

If political economics is a science of momentous interest to everybody alive, it is specially of interest to the chemist, who, thorough believer in the laws of nature, can not fail to admit the same universal yet simple laws in sociology; and who, therefore, is less apt to be misled by those juggleries of reasoning which are so cleverly used to favor private interests against the weal of the community at large. Political economy, different from most sciences, can be mastered without any preparation whatsoever, excepting the relinquishment of all bias and all petty ideas of greed, conceit or inequity.

But what shall I say about our criminal neglect of eugenics, a science which goes to the very roots of our lives; a knowledge which deals with the future of our children, the happiness and betterment of our race, and yet so neglected that its very name is scarcely known in our usual vocabulary. In the meantime, we go on in our happy-go-lucky-slip-shod way; we assume the tremendous responsibility of parentage and we jeopardize the health and happiness of our children and grandchildren by our carelessness. Instead of trying to bring together in marriage, by orderly, careful and methodic selection, such persons as are physically and mentally best fit for ennobling our race, we leave this important matter entirely to the whim of chance, blinded by emotion or prejudice. Our actions in this as in many other instances, are but the logical outcome of a thoughtless one-sided education which does not deal with these subjects, while under the name of *belles-lettres* our thoughts are still further perverted in prose and in rhyme by romantic novelists, who in their own way write on the subject of love and marriage. Neither should we be astonished, if frequently those who feel proudest or brag loudest about their ancestry make very light work of their own lives, as far as their actions involve any responsibility towards their offspring.

Our one-sidedness of conceptions has fraught our whole social system with inconsistencies: we grant the unwarranted privilege to vote to illiterate blacks and whites, tramps or idlers; but from the intelligent, virtuous and active woman who is the mother of our children we absolutely withhold the *right* to participate in the affairs of the nation.

Our lack of broad-mindedness is shown in many other ways. We admit the principle of evolution, but when it comes to concede rights and friendliness towards animals—fellowbeings—we fall short of our theories: we eagerly forget that other living creatures enjoy life and suffer, feel and think as we ourselves, if not exactly in

the same way. Some of us claim to be civilized and yet find high pleasure and recreation in hunting, killing, maiming and torturing defenseless animals, although we go on criticizing the Spaniards who enjoy the gore of a bull-fight. And even those of us who admit the savage cruelty of hunting and kindred sports do not hesitate to elevate, propagate and degenerate certain species of domestic animals with the express purpose of killing them for food. We do not see anything inconsistent in the fact that, scientific though we are, and while we talk snobbishly of our refined taste, we are much less particular than plant-eating animals, and we keep feeding on corpses of fellow creatures.

We call ourselves scientists because we believe in the laws of nature. In our studies and our research work we have never-ending opportunities for admiring the marvelous harmony of nature, the invariable laws of God. Yet when we hold our annual banquet of scientists we fail to see that we blaspheme the God of law and order and deny the immutability of his laws by asking him in prayer (and in this similar to savages) to disturb these eternal laws of nature so as to grant us some petty favors, forgetting that we are merely insignificant little dots in the immensity of the universe.

Let me conclude this essay by repeating the main points mentioned therein:

If specialization may be advantageous for increasing our productiveness in a given field of activity, over-specialization, on the other hand, may develop one-sidedness; it may stunt our growth as men and citizens; even for persons engaged in scientific pursuits it may render impossible the attainment of true and general philosophic conceptions.

If I have succeeded in convincing some of us that over-specialization does not bring forth the very best there is in us, if I have contributed ever so little to keep us aloof from the life of dizzy automatic machines, if I have succeeded even in the smallest degree in stimulating you to nobler endeavors, then I shall indeed feel very amply rewarded by your kind attention.

L. H. Baekeland

SCIENTIFIC BOOKS

The Syllogistic Philosophy or Prolegomena to Science. By Francis Ellingwood Abbot, Ph.D. Boston: Little, Brown & Co. 1906. 2 vols. Pp. xiv + 317; vi + 376.

These volumes are the philosophical testament of their author (d. 1903), whose previous works—'Scientific Theism' (1883), 'The Way out of Agnosticism' (1890), and contributions to 'The Index' (1870–80), of which he was editor—constitute preliminary surveys. The work has been in preparation more or less since 1859 (*cf.* ii., 291), and was reduced to its present form in the decade 1893–1903. In his pathetic preface and valedictory words, Dr. Abbot states his purpose and expectations with no uncertain sound. He puts in a claim to have superseded all previous thinkers, to be enrolled with the greatest classics. In so doing, he remembered, doubtless, that he was also courting the stringent criticism which men accord to the classics only.

> If at last it shall receive sober, just and intelligent appreciation, I believe it will be found to have done for philosophy what was done for botany in transition from the artificial Linnæan classification to the natural system of classification by total organic and genetic relationship—a revolution never to be reversed; and to give to ethical and free religion what it has never yet had, a basis in scientific reason (I., xi). My work of forty-four years is done, and I commit its destinies to the Master of Life, whom I have resolutely but reverently sought to know by using the free reason which is his supreme gift to man (II., 296).

In the circumstances, and face to face with Dr. Abbot's *ex cathedra* earnestness, criticism becomes an ungrateful task. One can only say, to begin with, that whether these tremendous expectations are to be justified time alone can tell. But after a careful and sympathetic perusal of the contents, I feel com-