JAMES JOSEPH WALSH

EDUCATION: HOW OLD THE NEW

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Содержание

James J. Walsh
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Most of the thoughts contained in this volume were originally expressed at our breakfasts. It seems only fitting, then, that on presentation to a larger audience they should be dedicated to you.

J. J. W.

Our Lady's Day. August 15, 1910

PREFACE

The reason for publishing this volume of lectures and addresses is the persuasion that present-day educators are viewing the history of education with short-sighted vision. An impression prevails that only the last few generations have done work of serious significance in education. The history of old-time education is neglected, or is treated as of at most antiquarian interest and there is a failure to understand its true value. The connecting link between the lectures and addresses is the effort to express in terms of the present what educators were doing in the past. Once upon a time, when I proclaimed the happiness of the English workmen of the Middle Ages, the very positive objection was raised, "How could they be happy since their wages were only a few cents a day?" For response it was only necessary to point out that for his eight cents, the minimum wage by act of Parliament, the workman could buy a pair of handmade shoes, that being the maximum price established by law, and other necessaries at similar prices. If old-time education is studied with this same care to translate its meaning into modern values, then the very oldest education of which we have any record takes on significance even for our time.

While it is generally supposed that there are many new features in modern education, it requires but slight familiarity with educational history to know that there is very little that is

novel. Such supposedly new phases as nature-study and technical training and science, physical as well as ethical, are all old stories, though they have had negative phases during which it would be hard to to trace them. The more we know about the history of education the greater is our respect for educators at all times. Nearly always they had a perfectly clear idea of what they were trying to do, they faced the problems of education in quite the same spirit that we do and often solved them very well. Indeed the results of many periods of old-time education are much better than our own, even when judged by our standards.

Unfortunately there exists a very common persuasion that evolution plays a large role in education and that we, "the heirs of all the ages in the foremost files of time," are necessarily in the forefront of educational advance. There has been much progress in education in the last century, but it would, indeed, be a hopeless world if there had not been progress out of the depths in which education was plunged in the eighteenth century. There were a number of reformers in education at the end of the eighteenth and the beginning of the nineteenth century. It was rather easy to be an educational reformer at that time. The lowest period in the history of education was about the middle of the eighteenth century. It has been assumed that since we are far ahead of that generation we must be still farther ahead of the people who preceded them. That is the mistake. There are periods of education of very great significance centuries long before that time.

In educational lectures and addresses for the past five years, I have been trying to translate into modern terms the meaning of these old periods of education. A great many teachers have thought the ideas valuable and suggestive and so I am tempted to publish them in book form. There is an additional reason, that of wishing to create a bond of sympathy between the two systems of education that have grown up in this country. For some three generations now Catholic educators have been independently building up a system of education from the elementary schools to the university. The American world of education is coming to recognize how much they have accomplished. There has even been some curiosity expressed as to how it was all done in spite of apparently insuperable obstacles. One phase of Catholic education, its thorough-going conservatism and definite effort to value the past properly and take advantage of its precious lessons, is here represented.

My own educational interests have been taken up much more of late years with medicine than with other phases of this subject. Hence the volume contains certain addresses relating to the history of medical education. They are more intimately linked with the general subject of education than might perhaps be thought. We have had finely organized medical education at a number of times in the past, and, indeed, at the present moment can find inspiration and incentive in studying the legal regulation of medicine and of medical education in what might seem to be so-unpromising a time as the thirteenth century. For

true educational progress there has always been need of close sympathy between the non-professional and the professional department of universities. Only when the professional schools are real graduate departments, requiring under-graduate training for admission, is the university doing its work properly. This was the rule in the past–hence the precious lessons for the present in the story of these old-time universities.

These lectures and addresses were actually delivered, not merely read. They were written with that purpose. Certain repetitions that would have been avoided if the articles had been prepared directly for reading and not for an audience, may be noted. Some of the subjects overlap and certain phases had to be treated usually in variant form in different lectures. For these faults the reader's indulgence is craved.

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"Nothing under the sun is new, neither is any man able to say: Behold this is new: For it hath already gone before in the ages that were before us."

–-***Ecclesiastes i:10***.

"Nullum est jam dictum, quod non dictum sit prius."

–-Terence, ***Eun. Prol.,*** 41.

[Nothing is now said which was not said before.]

St. Jerome relates that his preceptor Donatus, commenting on this passage of Terence, used to say:

"Pereant qui ante nos nostra dixerunt."

[May they perish who said our good things before us.]

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Popular lectures are usually on some very up-to-date subject. Indeed, as a rule they are on subjects that are developing at the moment, and the main aim of the lecturer is to forecast the future. It is before a thing has happened that we want to know about it now, and though, as not infrequently occurs, the lecturer's forecast does not in the event prove him a prophet nor the son of a prophet, for nature usually accomplishes her purposes more simply than the closet philosopher anticipates, at least we have the satisfaction for the moment of thinking that not only are we up to date but a little ahead of it. Unfortunately I have to claim your indulgence this evening in this matter, for taking just the opposite course. I am to talk about the oldest book in the world, its old-fashioned yet novel contents, its up-to-date applications, and its significance for the history of the race and, above all, the history of education. The one interesting feature,

[1] Material for this lecture was gathered for one of a course of lectures on Phases of Education delivered at St Mary's College, South Bend, Ind., at the Sacred Heart Academy, Kenwood, Albany, N. Y., and at St. Mary's College, Monroe, Mich, 1909. In somewhat developed form it was delivered to the public school teachers of New Orleans at the beginning of 1910. In very nearly its present form it was the opening lecture at the course of the Brooklyn Institute of Arts and Sciences, on "How Old the New Is," delivered in the spring of 1910.

as I hope, of what I have to say, is that old-time methods in education as suggested by this little volume are strangely familiar and its contents are as significant now as they were in the old time from which it comes. The book was written almost as long before Solomon as Solomon is before us, yet there is a depth of practical wisdom about it that eminently recalls the expression "there is nothing new under the sun."

So much attention has been given to education in recent years, we have made such a prominent feature of it in life, have spent so much money on it, have devoted so much time and thought to its development and organization, that we feel very sure that what we are doing now in every line of educational effort represents–indeed must represent–a great advance over anything and everything that was ever accomplished in the past. To say anything else would seem to most people pure pessimism. It would mean that in spite of all the efforts of men we were not making advances. As a matter of fact, all of us know that it is quite possible to make heroic efforts so sadly misdirected that they accomplish nothing and get us nowhere. Progress depends not on effort but on the proper direction of the effort. We are supposed, however, to represent one phase and that at the front rank of an inevitable advance in things human, pushed forward, as it were, by the wheel of evolution in its ceaseless progress, and bound therefore to make advancement. It is with this idea, so commonly accepted, that I would take issue by showing how much was accomplished in the past that anticipates much of what

we are occupied with at the present time, and that serves to show what men can accomplish at any time when they set themselves to doing things with high ideals, well-considered purpose and strenuous effort.

There are those who insist that unless men have the encouraging feeling that they are making progress, their efforts are likely to be less strenuous than would otherwise be the case. There are those who think apparently that compliments make the best incentive for successful effort. Some of us who know that the world's best work, or at least the work of many of the world's great men, has been done in the midst of opposition, in the very teeth of criticism, in spite of discouragement, may not agree with that opinion. The history of successful accomplishment seems to show, indeed, that incentive is all the stronger as the result of the opposition which arouses to renewed efforts and the criticism which strips whatever is new of errors that inevitably cling to it at the beginning. On the other hand, if there is anything that the lessons of history make clear it is that self-complacency is the very worst thing, above all for intellectual effort of any kind, and that criticism, when judicious, is always beneficial.

Above all, comparisons are likely to be chastening in their effects to make us realize that what we are doing at any particular time does not mean so much more than what many others have done and may indeed even mean less. It is rather interesting, then, to set our complacent assurance that we are doing such wonderful work in education and represent such magnificent progress over

against some of the educational work of the past. After all we are not nearly so self-congratulatory about our education, its ways and methods and, above all, its success as we were a dozen years ago. There are many jarring notes of discordant criticism of methods heard, there are many deprecatory remarks passed with regard to our supposed success, and there have been some educators unkind enough,–and, unfortunately, they are often of the inner circle of our educational life,–to say that we are lacking in scholarship to a great degree, and that much of our so-called educational progress has been a tendency toward an accumulation of superficial information rather than a training of the intellect for power. The absolute need of the distinction between education for information and for power has been coming home to us. Above all, we have felt that we were not a little deceived by appearances in education and so are more ready to listen to suggestions of various kinds.

Under these circumstances it has seemed to me, that a calling of attention to what was accomplished at certain long-past periods for education, would not only be of interest as information for teachers, but might possibly be helpful or at least suggestive, in the midst of the somewhat disordered state of mind that has resulted from recent criticisms of our educational methods and success, by men whose interest in education cannot be doubted and whose opportunities for knowing are the best. For we are in a time when nearly every important educator, president of a university, dean of a department, old-time teacher

or old, thoughtful pupil with the interest of ***Alma Mater*** at heart, who has had something to say with regard to education has said it in rather derogatory fashion. Perhaps, then, it will do us good to study the periods of the past and see what they did, how their methods differed or still more often were like our own, what their success was like and what we may learn from them. The surprising thing is the number of repetitions of present-day experiences in education that we shall find in the past. This is true, however, in every mode of thinking quite as well as in education, once careful investigation of conditions is made.

If we begin at the beginning and take what is sometimes called the oldest book in the world, we shall see how early definite educational ideas took form. It is a set of moral lessons or instructions given, or supposed to be given, by a father to his son. The father's name was Ptah Hotep. He was a vizier of King Itosi of the Fifth Dynasty in Egypt, some time about 3500 B.C. The Egyptologists used to date him earlier than that, but in recent years they have been clipping centuries off Egyptian dates until perhaps King Itosi must be considered as having lived probably not earlier than 3350 B.C. That makes very little difference for our purpose, however. The oldest manuscript copy of the book was written apparently not later than 2900 b.c. It exists as the famous Prisse Papyrus in the Bibliothèque Nationale in Paris. There is another copy in the British Museum. There is a pretty thorough agreement as to these dates, so that we can be sure that this little book which has come to be known as the Instruction

of Ptah Hotep, or the Proverbs of Ptah Hotpu–another form of his name with a variation in the title–represents the wisdom of the generations who lived in Egypt about 5000 years ago. It was written, as I have said, almost as long before Solomon as Solomon is before us, so that the character of the moral instructions which it contains is extremely interesting.

There must have been a number of copies of it made. This and books like it were used as schoolbooks in Egypt. They were employed somewhat as we employ copybooks. The writing of the manuscript is the old hieratic, cursive writing of the Egyptians, not their hieroglyphics, and the children used portions of this book as copies, listened to dictation from it and learned to write the language by imitating it. Of books similar to it we have a number of manuscript copies. Some of these copies preserved from before 2000 B.C. are full of errors such as school children would make in taking down dictation. This was their method of teaching spelling, and after the children had spelled the words the teacher went over them and corrected the mistakes. These corrections were made in a different colored ink from that used by the pupils! The whole system of teaching, as it thus comes before us, resembles our own elementary school teaching much more than we might think possible. Spelling, writing, composition are all taught in this way yet, or at least they were when I was at school, and while I have heard that some of the old-fashioned methods were going out, I have also received some hints of the reaction by which they are coming in again, so that

the Egyptian methods take on a new interest.

Perhaps there is no more interesting feature of the education of that olden time than the fact that these books which were used as copybooks in the school contain moral lessons. We have been neglecting these in our schools and have come to recognize the danger of such neglect. Definite efforts at the organization of moral teaching in some form are being made by many teachers, and their necessity is recognized by all educators. All of these old Egyptian books, then, will have a special claim on our interest at the present time. Above all, the oldest of them, though it is literally the oldest book in the world, merits our attention, because its moral teaching is very clear-cut and its emphasis on ethical precepts very pronounced.

We would be very prone to think that what an old father has to say to his boy over fifty centuries ago would have, at most, only an antiquarian interest for us. It is not easy even to imagine that the old gentleman could have known human nature so well and written from so close to the heart of humanity because of his love for his boy, that his words would always have a practical application in life. Such, however, is actually the case. Any father of the modern time would be proud to be able to give to his boy the eminently practical maxims that this old father has written down. If there is any advice that will be helpful for youth, for the young usually demand that they shall have their own experience and not take it at second hand, this is the advice that is of value. Only fools, it is said, learn by their own experience, but then there

is good Scripture warrant for believing that they were not all wise men in the olden time, and we are pretty well agreed that all the fools are not dead yet. If advice can be of service, however, from one generation to another, then here is the wisdom of age for the inexperience of youth. At least it will serve after the event to show youth that it was properly warned and that it is entirely its own fault if it has been making a fool of itself–as other generations have done before.

It might be expected that at least in form these old-time maxims would be rude and crude, expressed with an old man's loquaciousness and with many personal foibles. Fortunately for us, while to his son Ptah Hotep was very probably an old man, he was not what most of us would call old. In Egypt they married comparatively young. This boy was probably the oldest son. It is usually for the oldest that such advice is treasured up and written out. The father then, giving his advice just as his son was leaving the paternal household when he had married a wife and was about to set up a home of his own, was probably not more than forty. To seventeen or eighteen, forty is quite ancient. To most of the rest of us it is entirely too young to be trusted absolutely in serious matters. Aristotle declared that a man's body reaches physical perfection at thirty-five and his mind reaches intellectual maturity at forty-nine. His students were inclined to think that this age was entirely too old, his philosophic contemporaries of his own generation and the members of national academies and learned societies of most of the generations since, have been

quite sure that the term set was entirely too young.

Ptah Hotep's son, then, very probably looked on his father as most sons under twenty are prone to do, as a dear old-fashioned gentleman (he does not like to use the word old fogy for his father, reserving it for the fathers of others), who would be quite tolerable if he only had a little more sympathy with the wonderful advance that is in the world in this new generation. The real young man of the time, however, was the father who wrote his maxims, the condensed wisdom of his experience of life, with a directness, an absolute clarity, an occasional appeal to figures of speech and a variety of expression so striking as to make his work literature. As such it has come down to us. It is eminently human in every way, and while there is here and there an unfortunate tendency to repeat words of similar sound and different meaning, after the fashion of what we call punning, this is pardonable enough since so many of our friends indulge in it and give us practice in pardoning, while, on the whole, the old man wrote as wisely as Polonius, and in a style not quite as artificial as that which Shakespeare has invented as suitable to the old Danish Prime Minister, whom the ancient vizier of Egypt recalls so vividly in many ways.

No idea is probably more ingrained in modern thinking, no opinion is more generally accepted, no conclusion is surer to most people, than that we are in the midst of marvellous progress in this little world of ours, and that our generation is somewhere at the apex of the Pyramid of Progress, elevated thereto by the

attainments of the generations that have preceded us. As the Poet Laureate put it at the close of the nineteenth century, "we are the heirs of all the ages in the foremost files of time"; and because we have the advantage of our predecessors' progress in their time, we are, of course, in all that makes for human happiness and fulness of life, very far ahead of those gone before us. The farther back we go in history, then, the lower down men are supposed to be found in all that stands for intellectuality and in all that represents the possibilities of human achievement at its best. It is now well understood that the generations of the past are not so much to be blamed for their backwardness as to be pitied for the misfortune that, having come earlier in the world's history, they could not have the advantages that we enjoy, and therefore could only attain much lower stages in human progress than ours.

Apparently, there are very few people who do not share in the opinions thus expressed. The nineteenth century has been proclaimed the century of evolution; and the idea of evolution has become so much a part of the thought of our time that man also is assumed to be in the midst of it, and history is presumed to show distinctly the wonderful advance that humanity has made. As a matter of fact, it is extremely difficult to point out definitely where progress in humanity may be observed. Ambassador Bryce was asked, two years ago, to deliver an address before Phi Beta Kappa at Harvard, and took for his subject "What is Progress?" Phi Beta Kappa is the fraternity that admits into its classes only the best students,–men who have

proved their ability by success. Mr. Bryce, speaking to the most intelligent university graduates, might be expected to make much of our wonderful recent progress. The address subsequently appeared in the ***Atlantic Monthly*** for August, 1907. Far from any glorification of progress, the historian of the American Commonwealth, who has demonstrated his breadth of view and his notable lack of British insularity by the large way he has written about us, so that we have adopted his work as a text-book of information about ourselves, is very dubious as to whether there is any progress in the world. There is certainly no progress in man's highest expressions of his intelligence. As Mr. Bryce says: "The poetry of the early Hebrews and of the early Greeks has never been surpassed and hardly ever equalled. Neither has the philosophy of Plato and Aristotle, nor the speeches of Demosthenes and Cicero." No one pretends that there is any progress in art. The masterpieces of architecture, sculpture, and painting date as a rule from long before our time, some of them nearly twenty-five hundred years back.

As has been very well said, the man who talks much about progress in our time usually knows only the history of human thought in his own generation, and not very much about that. In nearly every important phase of human achievement, we are, in present accomplishment, far behind the great predecessors. In our generation, we are confessedly imitators in every phase of aesthetic expression. In painting, sculpture, art and literature, our models are all in the past, and we are quite frank in confessing

that we are doing no work at all so good as the work of our forefathers of many generations and sometimes many centuries ago. Whence, then, comes the idea of progress? It has obtained most of its vogue from the theory of evolution; and the lack of evidence for evolution in general, in spite of the persuasion on the part of many educated people that there are proofs for it, can be very well judged from the corresponding lack of evidence with regard to progress in humanity. There is complete absence of proof for this latter, when the situation with regard to human achievement in the really great things of human life is examined. Indeed, it would be amusing were it not amazing to think how readily we have come to accept notions for which there is so little substantiation. To many this will doubtless seem a surprising declaration to make, after all that has been written, and universally accepted as most people think, with regard to evolution by the great minds of the nineteenth century. What evolution means, however, is summed up in the theory of descent, that is that living things as we know them now, have all come from simpler forms and perhaps all from a single form. The only other phase of interest in evolution is what concerns the theory of natural selection, which is supposed by many people to have been demonstrated in the nineteenth century. It may be well for those who think thus to have recalled to them what a recent writer on the subject, himself a distinguished investigator in biology, a professor at Leland Stanford University, where under the influence of President Jordan biology is thoroughly yet

conservatively cultivated, has to say with regard to these theories and the objective evidence for them. Professor Vernon L. Kellogg in his "Darwinism To-day,"[2] p. 18, though himself an evolutionist and a Darwinian, says: "What may for the moment detain us, however, is a reference to the curiously almost completely subjective character of the evidence for both the theory of descent and natural selection. Biology has been until now a science of observation; it is beginning to be one of observation plus experiment. The evidence for its principal theories might be expected to be thoroughly objective in character; to be of the nature of positive, observed and perhaps experimentally proved, facts. How is it actually? Speaking by and large, we only tell the general truth when we declare that ***no indubitable cases of species forming or transforming, that is of descent, have been observed; and that no recognized case of natural selection really selecting has been observed.*** I hasten to repeat the names of the Ancon sheep, the Paraguay cattle, the Porto Santo rabbit, the Artemias of Schmankewitch and the de Vriesian evening primroses to show that I know my list of classic possible exceptions to this denial of observed species forming, and to refer to Weldon's broad-and-narrow fronted crabs as a case of what may be an observation of selection at work. ***But such a list, even if it could be extended to a score, or to a hundred, of cases, is ludicrous as objective proof of that descent and selection, under whose domination the forming of millions of species is***

[2] Henry Holt and Co., New York, 1907.

supposed to have occurred." (Italics mine.)

Mr. Kellogg, as might be expected from this, objects very much to the application that has been so heedlessly made of certain supposed principles of evolution to pedagogy. In practically every science to which Darwinian principles have been applied it is the weakest of the principles that have been appealed to as the foundation for presumedly new developments in the particular science. With regard to the so-called science of education Professor Kellogg says:

> "In Pedagogy it is also the theory of descent rather than the selection theory which has been drawn on for some rather remarkable developments in child study and instruction. Unfortunately it is on that weakest of the three foundation pillars of descent, namely the science of embryology with its Müllerian-Haeckelian capitulation theory or biogenetic law, that the child-study pedagogues have builded. The species recapitulates in the ontogeny (development) of each of its individuals the course or history of its phylogeny (descent or evolution). Hence the child corresponds in different periods of its development to the phyletic stages in the descent of man. As the child is fortunately well by its fish, dog and monkey stages before it comes into the care of the pedagogue, he has to concern himself only with safe progress through the various stages of prehistoric and barbarous man. Detect the precise phyletic stage cave-man, stone-age man, hunter and roamer, pastoral man, agriculturalist, and treat with the little barbarian accordingly! What simplicity! Only one trouble

here for the pedagogue: ***the recapitulation theory is mostly wrong and what is right in it is mostly so covered up by the wrong part, that few biologists longer have any confidence in discovering the right.*** What, then, of our generalizing friends, the pedagogues?"

It is in educational matters, above all, then, that we must be careful about assumptions with regard to evolution and supposed inevitable progress because we must, forsooth, be taking advantage of the accumulated experience of previous generations. There is no inevitability about progress in any line. The attainment of any generation depends absolutely on what that generation tries to do, the ideals that it has and the fidelity with which it sets itself to work. We can make just as egregious mistakes, and we have made them, as any generation of the past. We can foster delusions with regard to our all-knowingness just as many another foolish people before us have done, and our one hope of real accomplishment for ourselves and our generation is to choose our purposes carefully and then set about their accomplishment with strenuous effort. The lessons of the past in history are extremely precious not only because they show us where others made mistakes but also because they show us the successes of the past. The better we know these, the deeper our admiration for them, the better the outlook for ourselves and our accomplishment. This is the ideal that I would like to emphasize in this series of lectures and addresses and in this, far from there being any pessimism, there is, as it seems to me, the highest

optimism. Any generation that wants to can do well, but it must want to do efficaciously.

Any one who thinks that education, in the sense of training of character or advice with regard to practical, every-day life, has evoluted in the course of time, should read this little book that I bring to you this evening. Indeed, it is as the first chapter in the history of education that it finds its most valuable place in literature. This teacher of the old-time, who had his boy's best interest at heart, not only knew what to say but how to say it so as to attract a young man's attention. Of course it is probable that, even with all this good advice, the young man went his way in his own fashion; for that is ever the mode of the young. But, so far as the experience of another could supply for that personal experience which every human being craves, and will have, no matter what the cost, surely this oldest book in the world supplies the best possible material. As literature, it has a finish that is quite surprising. Art is said to be the elimination of the superfluous. Surely, then, this is artful, in the best sense of that word, to a supreme degree. It is surprising how few repetitions there are, how few tergiversations, how few unnecessary words; and yet the style is not so austere as to be dry and lacking in human interest.

Probably the most interesting feature of the book is the fact that in it God is always spoken of in the singular. It is not the "gods" who help men, who punish them, who command and must be obeyed, whose providence is so wonderful, but it is

always "God." The latest editor,[3] Mr. Battiscombe G. Gunn, in his version always inserts the definite article before the word God because, he says, in different places there were different local gods, and the idea of the writer was to emphasize the fact that the god of any particular locality would act as he declared in his instructions. There are many distinguished Egyptologists, however, who insist that the expression "the God," which occurs not only in this but in many other very early Egyptian writings, is a monotheistic deity whose name is above all names, and transcends all the power of humanity to name him, and hence is spoken of always without a name but with the definite article.

It is curious indeed to find that the very first bit of instruction given to his son by this wise father is, not to be conceited about what he knows. How striking the expression of his first sentence of this oldest book: "Be not proud because thou art learned." And the second is like unto the first: "But discourse with the ignorant man as with the sage." And then at the end of this very first paragraph comes the first figure of speech in human literature that has been presented for us. It is as beautiful in its simplicity and illuminating quality as any of the subsequent time. "Fair speech" (by which is meant evidently kindly speech toward those who know less than we do) "is more rare than the emerald that is found by slave maidens on the pebbles." Then

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[3] "The Instructions of Ptah Hotep." Translated from the Egyptian, with an Introduction and an Appendix, by Battiscombe G. Gunn. E. P. Dutton & Co. Wisdom of the East Series, 1909.

there comes a series of directions as to how the young man should treat his superiors, his equals and his inferiors. If in argument he is worsted by some one who knows more than himself, he is cautioned. "Be not angry." If some one talks nonsense. "Correct him." If an ignorant man insists on arguing, "Be not scornful with him, but let him alone; then shall he confound himself"; for "it is shameful to confuse a mean mind."

The advice may be summed up. Do not argue with your superiors, it does no good; nor with your equals, state your case and let it go; but above all, not with your inferiors; let them talk and they will make fools of themselves.

Kindness is always insisted on as the quality most indispensable to a man. "Live therefore," says the father, "in the house of kindliness, and men shall come and give gifts of themselves." There are lessons in politeness as well as in kindliness. For instance: "If thou be among the guests of a great man, pierce him not with many glances. It is abhorred of the soul to stare at him. Speak not till he address thee. Speak when he questioneth thee; so shalt thou be good in his opinion." Again, he wants his son not to eat the bread of idleness: "Fill not thy mouth at thy neighbor's table." He insists much on the lesson that God helps those who help themselves. "Behold," he says, "riches come not of themselves. It is their rule to come to him that actively desires. If he bestir him and collect them himself, God shall make him prosperous; but He shall punish him if he be slothful." On the other hand, the gaining of riches for riches'

sake is not worth the while. "When riches are gained, follow the heart; for riches are of no avail if one be weary." As much as to say, after having gained a competency, do not spend further time in amassing wealth, but enjoy in a reasonable way that which has been obtained.

There are certain things, however, that a man should not follow; they are unworthy of his nature as a man. "As to the man whose heart obeyeth his belly, he causeth disgust in place of love. His heart is wretched, his body is gross. He is insolent toward those endowed by God. He that obeyeth his belly hath an enemy." While the old man warns his son against gluttony and against sloth, he has much to say with regard to covetousness: "If thou desire that thine actions may be good, save thyself from all malice, and beware of the quality of covetousness, which is a grievous inner malady." This expression is rendered still more striking by what is added to it; for the father insists that it is particularly relatives-in-law who quarrel over money. "Covetousness setteth at variance fathers-in-law and the kinsmen of the daughter-in-law. It sundereth the wife and the husband; it gathereth unto itself all evils. It is the girdle of all wickedness." It needed only the next sentence to make these expressions supremely modern: "Be not covetous as touching shares, in seizing that which is not thine own property."

The God of this earliest book that we have from the hand of man has nearly all the interesting and important qualities that we refer to the Deity. He is looked up to as the giver of all

good things. He loves his creation, and above all loves man, and observes men's actions very carefully, and rewards or punishes them according to their deserts. He desires men to be fruitful, and to multiply upon the earth for their own good and for his glory. Nothing unworthy of the Deity, as he is known by the most educated people, is attributed to this God, who transcends a personal name. There is an utter disregard of all trivial mythology and of all mysterious riddles, though these trimmings of truth are to be found constantly in other Egyptian works of later date. Indeed, the picture of God is as striking a presentation of the fatherliness and the providence of the Almighty and of most of the lovable characteristics of the Deity as there is to be found anywhere in literature until the coming of the Saviour.

One might think that after having warned his son about most of the Seven Deadly Sins as we know them–pride, covetousness, gluttony, envy, sloth and anger,–at least we should not find lust touched on in the modern way. There is, however, in this matter an extremely chaste bit of advice that sums up the whole situation as well as a father can tell his son. The writer says: "No place prospereth wherein lust is allowed to work its way. A thousand men have been ruined for the pleasure of a little time short as a dream. Even death is reached thereby. It is a wretched thing. As for the lustful liver, every one leaveth him for what he doeth; he is avoided. If his desires be not gratified, he regardeth no laws."

The father tells his son, straightforwardly and emphatically, that indulgence in this vice inevitably leads to loss of friends, of

health, of everything that the world holds good; and that once a man has started down this path he has no regard for law or order or decency or self-respect. This eighteenth paragraph on a thorny subject is probably one of the most wonderful passages in this advice of a father to his son. Fathers of the modern time ask what shall they say to their boys. Here is something to tell them that does not excite pruriency, that does set the full state of the case before them and represents probably all that can be said with assurance and safety.

In recent years we have heard much of moral and social prophylaxis and the necessity for giving precious information with regard to this subject that may prove helpful to young people. Most people are sure to think that this is the first time in the history of the race that there has been an awakening to the necessity for this. Of course there is no doubt that owing to delayed marriages and unfortunate social conditions in our large cities we have more need of it than past generations, yet here in this old schoolbook from Egypt we have very definite and very wise teaching in the matter. A physician is prone to wonder what did the old man mean by "a thousand men have been ruined for the pleasure of a little time short as a dream. Even death is reached thereby." Is it possible that he knew something of the physical, or let us rather say, the pathological dangers of the vice? In the discussion of the pictures of old-time surgery in ***The Journal of the American Medical Association*** I suggested that these generations seem to have known more about this phase

of pathology than we are inclined to admit.

On the other hand, the father emphatically warns his son that his happiness will depend on loving his wife and caring for her to the best of his ability; though some of the details of that advice are so naively modern in their expression that it seems almost impossible to believe that they should have been spoken nearly six thousand years ago. He says: "If thou would be wise, provide for thine house, and love thy wife. Give her what she wants to eat, get her what she wants to wear [literally, fill her stomach, clothe her back]. Gladden her heart during thy lifetime, for she is an estate profitable unto its lord. Be not harsh, for gentleness mastereth her more than strength."

There is a variant translation of this passage quoted in Maspero's "The Dawn of Civilization," which brings out even more clearly the ideas that seem most modern, and which makes it very sure that it is not the translator who has found in vague old expressions thoughts that, when put into modern words, have modernized old ideas. Maspero reads: "If thou art wise, thou wilt go up into thine house and love thy wife at home; thou wilt give her abundance of food; thou wilt clothe her back with garments; all that covers her limbs, her perfumes, are the joy of her life. As long as thou lookest to this, she is as a profitable field to her lord [master]."

The old gentleman's idea evidently was that, looked at merely from a material standpoint, it was worth a man's while to spend as much time caring for his wife as for his estate. She meant just

as much for his happiness in the end and might mean probably more for his unhappiness. It is a very practical way of looking at the subject and perhaps the romancists might think it sordid. It must not be forgotten, however, that this is only the secondary motive suggested. At the beginning he commands him to love his wife for her own sake, and then, after suggesting the material benefit that comes from caring for her, he says that "gentleness mastereth her more than strength."

Immediately after this valuable advice with regard to the care of the principal member of his household the old man turns to the question of the care of his servants. We are surely prone to think that the servant problem at least is a new development in this little world of ours. Many literary works serve to foster the impression that in the old days servants were easy to obtain, that they were always respectful, that they could readily be managed and life with them was, if not one sweet song, at least a very smooth course. Men, however, have always been men, and women and even servants have always had minds of their own, and strange as it may seem to us there has always been a servant problem and there was one in Egypt 5,500 years ago.

Ptah Hotep said: "Satisfy thine hired servants out of such things as thou hast; it is the duty of one that hath been favored of God. In sooth, it is hard to satisfy hired servants. For one saith, 'he is a lavish person; one knoweth not that which may come from him.' But on the morrow he thinketh, 'he is a person of exactitude (parsimony), content therein.' ***And when favors***

have been shown unto servants, they say 'we go.' (Italics mine.) Peace dwelleth not in that town wherein dwell servants that are wretched."

A difficult problem; presents will not solve it but only complicate it, exact justice is necessary, but the peace that follows is worth the trouble it entails. The principle would be valuable in many a squabble of corporate employer and hosts of servants in the modern time.

For domestic happiness, it needed only the advice given a little later in this instruction: "Let thy face be bright what time thou livest. Bread is to be shared. He that is grasping in entertainment himself shall have an empty belly. He that causeth strife cometh himself to sorrow. Take not such a one for thy companion. It is a man's kindly acts that are remembered of him in the years after his life."

There is one phase of life in which Ptah Hotep differs entirely from the present generation,–at least if we are to judge the present generation from its results in this matter. Of course there are many of us who consider that, in spite of six thousand years of distance in time, the old Egyptian prime minister is far ahead of our contemporaries in this important subject. He thought that obedience was the most important thing in life. For him independence of spirit, in a young person particularly, was an abomination. In spite of the tendency to loquacity and to repeat itself, often said to be so characteristic of old age, the father, who in all his instructions has never sinned against this literary

canon, almost seems to do so when it comes to the question of obedience. Over and over again he insists that obedience is the one quality that must characterize a man if he is to get on in life, and if he is to secure happiness, and have a happy generation of his own group around him. The sentences read more like à Kempis or some mediaeval writer on spirituality, and seem meant for monks under obedience rather than for a young man of the world, the son of a prime minister, just about to enter on his life work in business and politics. Two of the paragraphs are well worth quoting here:

> "A splendid thing is the obedience of an obedient son; he cometh in and listeneth obediently. Excellent in hearing, excellent in speaking, is every man that obeyeth what is noble. The obedience of an obeyer is a noble thing. Obedience is better than all things that are; it maketh good will. How good it is that a son should take that from his father by which he hath reached old age [obedience]! That which is desired by the God is obedience; disobedience is abhorred of the God. Verily, it is the heart that maketh its master to obey or to disobey; for the safe-and-sound life of a man is his heart. It is the obedient man that obeyeth what is said; he that loveth to obey, the same shall carry out commands. He that obeyeth becometh one obeyed. It is good indeed when a son obeyeth his father; and he (his father) that hath spoken hath great joy of it. Such a son shall be mild as a master, and he that heareth him shall obey him that hath spoken. He shall be comely in body and honored by his father. His memory shall be in the mouths of the living,

those upon earth, as long as they exist.

"As for the fool, devoid of obedience, he doeth nothing. Knowledge he regardeth as ignorance, profitable things as hurtful things. He doeth all kind of errors, so that he is rebuked therefor every day. He liveth in death therewith. It is his food. At chattering speech he marvelleth, as at the wisdom of princes, living in death every day. He is shunned because of his misfortunes, by reason of the multitude of afflictions that cometh upon him every day."

Of one thing the old prime minister was especially sure. It was that employment at no single occupation, no matter what it was or how interesting soever it might be, could satisfy a man or even keep him in good health. He felt, probably by experience, the necessity for diversity of mind and of occupation, if there was to be any happiness or any real success in life. He has a quiet way of putting it, but he says, as confidently as the most modern of pedagogues, that all work and no play makes Jack a dull boy, and all play and no work makes it impossible for Jack to get on. But a proper mixture of both makes life livable; and if a man has only the work that he cares for, and can get some of his pleasure in life out of his work, then is all well. "One that reckoneth accounts all the day passeth not an happy moment. One that gladdeneth his heart all the day provideth not for his house. The bowman hitteth the mark, as the steersman reacheth land, by diversity of aim. He that obeyeth his heart shall command."

There are some conclusions in the philosophy of life that we are very much inclined to think are the products of modern

practical wisdom, and it is rather surprising to find them stated plainly in this old-time advice of the father to his boy. If there is one idea more than another that we are confident is modern, and are almost sure to attribute to the social development of our own generation, it is that riches do not belong to the man who makes them to be used for his own purpose alone, but their possession is justified only if he uses them for the benefit of the community. This is so up-to-date an idea indeed that it is startling to find it expressed in all its completeness in this oldest of books. Ptah Hotep said: "If thou be great after being of no account, and hast gotten riches after poverty, being foremost in these in the city, and hast knowledge concerning useful matters so that promotion is come unto thee, then swathe not thine heart in thine hoard, for thou art become the steward of the endowments [of God]. Thou art not the last; another shall be thine equal, and to him shall come the like [fortune and station]."

After all this it may be necessary to trace the pedigree of the book, since it might seem to be possible that it was a modern invention. The original of it is the so-called "Prisse Papyrus," which is well known by name to all students of archaeology and especially of Egyptology, and the contents of which are familiar to all who are acquainted with Egyptian history and literature. It appears to have been found at Thebes, but the exact place is not known. M. Prisse d'Avennes, the well-known French archaeologist after whom it is named, is said to have bought it from one of the Egyptian native workmen, or ***fellahin,***

whom he had hired to make excavations in the tombs of Thebes. Egyptologists generally have accepted the idea that it was actually taken by this workman from the tomb of one of the Kings Entef, who were of the Eleventh Dynasty and reigned about 3000 B.C. This is not certain, however. After publishing a translation in 1847, M. Prisse presented the precious papyrus to the Bibliothèque Royale (now Nationale). There it may still be seen. Spread out flat, it measures about twenty-four feet in length and six inches in width. There are about eighteen pages of clear red and black writing in the Hieratic character.

The first part of this manuscript is a portion of another book, the so-called "Instructions of Ke'gemni."[4] This is, however, only a short fragment, though probably of even older date than the "Instructions of Ptah Hotep." This work we have in its entirety. Doubtless its preservation was due to the fact that many copies of it had been made, though only two have come down to us.

There is a second manuscript of the "Instructions of Ptah Hotep,"–or the "Proverbs of Phtahhotpû," as the book is called by Maspero. This was discovered not long ago in the British Museum, by Mr. Griffith; and, while it is not so complete as the French copy, there is such an agreement between the two

[4] These Egyptian names are spelled differently by different modern scholars, according to their idea of the value of certain sounds of the older language as they should be expressed in the modern tongue to which they are most familiar. Many English scholars spell this as I have done, Ke'gemni. Maspero, however, and most of the French scholars, spell it Qaqimni. Maspero prefers the form Phtah-Hotpû to that of Ptah Hotep, which has been adopted by English scholars.

manuscripts that there is no doubt about the authenticity of the book and of the fact that it represents the oldest book in the world.

Its date would be about 3650 B.C. if we were to follow,–as does the translator of the most easily procurable English edition, Mr. Gunn,–the chronology of Flinders Petrie. Recent advances in our knowledge of Egyptology, however, have brought the dates nearer to us than they were placed before. Such men as Breasted of Chicago, and Maspero, would probably take from three hundred to five hundred years from this date. There is a definite tendency in all the histories to bring dates much nearer to the present than before. For a time, the older one could place a date the more scholarly seemed to be the appeal of such an opinion. Now the tendency is all the other way. Even the latest date that can be given for Ptah Hotep, or Phtahhotpû, would still make his little book the oldest book in the world, however.

Fortunately for us the manuscripts of the instructions of Ptah Hotep that have come down to us are in much better condition than those of most of the other instructions of similar kinds formerly used in the schools that have been preserved. In some of these there are a great many errors of writing, spelling and grammar with the corrections of the master above in a different-colored ink. Verily, education has not changed much in spite of six millenniums, or very nearly so, of supposed progress since these were written, for the whole process is as familiar as it can be. As Mr. Battiscombe Gunn says in his Introduction to his

edition "a schoolboy's scrawl over 3,000 years old is no easy thing to translate." We would seem, however, to have been blessed in the preservation of this oldest book in the world, either of the original copies set by the masters or of such copies as were made by advanced students. The series of lucky chances that have combined to bring to us, in the comparatively perfect form in which it exists, this oldest book in the world is interesting to contemplate. Without them we would have no idea of how closely the first people of whom we have any definite records in history resembled us in every essential quality of humanity, even to the ways and modes by which they tried to lift humanity out of the barbaric selfishness inherent in it to what is higher and nobler in its nature.

With this surprising resurrection of our school-teaching methods from the past it is interesting to study other phases of the education of these early times, and at the same time to note the accomplishments of the men, of the period, their tastes, the state of their culture as regards the arts and crafts and personal adornment and the decoration of their houses and buildings of various kinds. Flinders Petrie, the distinguished English Egyptologist, in an article on "The Romance of Early Civilization," printed recently in ***The Independent*** (New York), said:

> "We have now before us a view of the powers of man at the earliest point to which we can trace written history, and what strikes us most is how very little his nature or abilities

> have changed in seven thousand years; what he admired we admire; what were his limits in fine handiwork are also ours. We may have a wider outlook, a greater understanding of things, our interests may have extended in this interval; but as far as human nature and tastes go, man is essentially unchanged in this interval."

We have enough of the products of the arts and crafts of these early Egyptian generations to show us that there must have been no inconsiderable training of the men of this time in the making of beautiful art objects. For instance, the interior decoration of their tombs shows us men skilled as designers, clever in the use of colors, with a rather extensive knowledge of pigments and with a definite tendency not to repeat designs but to create new ones. Most of the diapered designs of modern interior decorations were original with the Egyptians, and some of those found in the tombs uncovered in recent years have been adopted and adapted by modern designers. It is in the matter of jewelry particularly that the ability and the training of the old Egyptian workmen are most evident. It would be quite incredible to think that these workmen developed their artistic craftsmanship without training, and therefore there was at least the germ of a technical school or set of schools in oldest Egypt. It would be quite impossible to believe this only that we know so much more about other features of Egyptian education as anticipations of our own. A special word about their jewelry then, because it illustrates a definite training quite different from that of our time, will not be out of

place.

Their jewelry, it may be said at once, is in striking contrast with what we call jewelry in our time. It is true that we are in the midst of one of the worst periods of jewelry-making, but then we are so prone to think of anything very modern as representing the highest evolution, that the contrast is chastening and illuminating. Mr. Petrie has insisted on the beautiful jewelry, carved precious stones and gold ornaments of the very early period in Egypt. In our time we have no jewelry that deserves the name. I doubt whether we even know the real definition of jewelry, so I venture to repeat it. Jewels are precious stones themselves of value, usually of a high degree of hardness so that they do not deteriorate with time or wear, to which a greatly enhanced value is added by the handiwork of man. Jewels are made by artistic carving and cutting so that besides their precious quality as beautiful colored stones, they have an added charm and interest from human workmanship. We wear no such jewelry in our generation. What we have are merely precious stones. These by an artificial rigging of the market and a combination of the great commercial agencies that control the sale of diamonds and other precious stones, remain very expensive in spite of their comparative abundance. They are worn only because they are a display of the amount of money that a person can afford to spend for mere ornaments.

There is nothing in these precious stones themselves that carries an appeal to the educated mind. It is true that they

are pretty, but only with the prettiness of the play of rainbow colors that delights a childish or uncultured eye. It requires no taste to like them, no culture to appreciate them, and their cost alone gives them value. This is so true that those who possess a magnificent ***parure*** of diamonds often also have an imitation of them in cheaper stones that may be worn on most occasions. The danger of loss or the risk of robbery is so great that it has seemed worth while to have this imitation made in many cases. No one except an expert will recognize the difference, and if you are known to possess the real stones it will of course be supposed that you are wearing them. What gives them value as an adornment in the eye of the possessor, and presumably also of the onlookers, is the fact that they must have cost such a large sum of money. They are a vulgar display of wealth. They are typically barbaric and, worn in the profusion now so common, carry us back to the uncultured peoples who like to wear gaudy things. The taste is perhaps a little better, but the essential quality of mind that dictates the wearing of heavy brass rings and strings of beads and that which impels to the display of many diamonds, is hard to differentiate.

Artistic objects produce a sense of pleasure in the beholder, an appreciation of the beautiful handiwork of man. Precious stones worn as is now the custom produce only a sense of envy. Of course envy comes only to baser minds, but it is perfectly clear that most of those who are supposed to be affected by the sight of diamonds worn in profusion have this particular

quality rather well developed. This distinction is often forgotten. Personal adornment as well as the adornment of one's house should be in order to give pleasure to others, and not merely a display of wealth for wealth's sake in such a way as is likely to produce envy. The old Egyptians made their jewelry with the true artistic sense. Flinders Petrie has told how beautifully they carved hard gems of various kinds and how the remains of these show us a people of good taste, even though their technique in the manufacture of such objects may have left something to be desired. In connection with this oldest of books it is important to recall this, for it shows that not alone in the applied wisdom of life and the knowledge gained from personal experience were these Egyptians of over 5,000 years ago brothers and sisters beyond whose wise saws we have not advanced, but also in the realm of art their work takes its place beside what is best in the modern time.

Some may be inclined to say that while the Egyptians may, as indeed we must admit they did, know many things about art and literature and practical wisdom, yet they did not have exact knowledge. Their knowledge, though large and liberal, had not become scientific. This will scarcely be maintained, however, by any one who realizes how much of applied science there was in the building of the old temples and pyramids and how much they must have developed mechanics, applied and theoretic, in order to accomplish the tasks they thus set themselves. Cantor, the German historian of mathematics, acknowledged this and

paid a worthy tribute to the old Egyptians' development of mathematics, pure and applied, in discussing the expression that had been used by Democritus, the early Greek geometer, who once declared that "In the construction of plane figures with demonstrations no one has yet surpassed me, not even the rope fasteners (harpedonaptai) of Egypt." For a long time this word harpedonaptai was a mystery, but Professor Cantor cleared it up, and explaining for us the exact meaning of the compound which means literally either rope fasteners or rope stretchers, he says, "There is no doubt that the Egyptians were very careful about the exact orientations of their temples and other public buildings. Old inscriptions seem to show that only the North and South lines were drawn by actual observation of the stars. The East and West lines were drawn at right angles to the others. Now it appears from the practice of Heron of Alexandria and of the ancient Indian and probably also the Chinese geometers, that a common method of securing a right angle between two very long lines was to stretch round three pegs a rope measured in three portions which were to one another in the ratio 3:4:5. The triangle thus formed is right-angled. Further the operation of rope stretching is mentioned in Egypt, without explanation, at an extremely early time (Amenemhat I). If this be the correct explanation of it, then the Egyptians were acquainted 2,000 years B.C., with a particular case of the proposition now known as the Pythagorean theorem."

This may not seem to mean very much. Yet what it illustrates

is just this. These men wanted a certain development of mathematics. They needed it for the work that they were engaged at. They set themselves to the solution of certain problems and in doing so evolved a theorem in pure mathematics and an application of it which greatly simplified construction and gave an impetus to mechanics. In so doing they anticipated the work of a long after time. This is what I would insist is always true with regard to man. When he needs some intellectual development he makes it. When he requires an application of it he succeeds in working it out. Later ages may go farther, but had he needed further developments he evidently had the power to make them and probably would have made them.

The old Greeks had a much better opportunity to study Egyptian remains than we have, and especially was this true after the foundation of Alexandria. There must have been a lively interest in things Egyptian aroused in the Greek minds by this Greek settlement in old Egypt. It is not surprising, then, to find some magnificent compliments to the old Egyptians in the mouths of some of the writers about the time of the foundation of Alexandria. Eudemus, for instance, the pupil of Aristotle, wrote the history of Geometry in which he traces its invention to the Egyptians, and states that the reason for its invention was its necessity in the remeasurement of land demanded after the removal of landmarks by the annual rise of the Nile. Always does one find this, that when there is a serious demand for an invention in theory or practice men make it. It is not a change or

development in man that brings about inventions, but a change in his environment which causes new necessities to arise, and then he proceeds with an ability always the same to respond properly to those necessities.

Eudemus says: "Geometry is said by many to have been invented among the Egyptians, its origin being due to the measurement of plots of land. This was necessary there because of the rising of the Nile, which obliterated the boundaries appertaining to separate owners. Nor is it marvellous that the discovery of this and other sciences should have arisen from such an occasion, since everything which moves in development will advance from the imperfect to the perfect. From mere sense-perception to calculation, and from this to reasoning, is a natural transition."

The old Egyptians made some fine developments of arithmetic. These were afterwards lost and were reinvented probably several times. I have already quoted from Cantor the opinion that the Egyptians were familiar with the properties of the right triangle whose sides were in the ratio 3:4:5 over 4,000 years ago. In the ***Papyrus*** of Ahmes, whose contents probably come from before 2400 B.C., there are the solutions of many problems which show how far the Egyptians had gone in arithmetical calculations. For instance, there are methods of calculating the solid contents of barns. The solutions are not absolute but are very closely approximate. Ahmes has problems that were solved in connection with the pyramids, which make it

very clear that the old Egyptians had more than a little knowledge of the principles of proportion, of certain geometrical figures and probably were familiar also with the simpler phases at least of trigonometry. The area of a circle is found in Ahmes by deducting from the diameter one-ninth and squaring the remainder, which gives a value for the ratio of the circumference to the diameter of a circle much more nearly correct than that used by most writers until comparatively recent times.

As a teacher of the history of medicine with certain administrative functions in a medical school, I have been very much interested in the old-time medicine and above all the details of medical education that we find among the Egyptians. Ordinarily it would be assumed that there was so little of anything like medical education that it could be scarcely worth while talking about it. On the contrary, we find so much that is being constantly added to by discoverers, that it is a never-ending source of surprise. There is a well-grounded tradition founded on inscriptions that Athothis, the son of Menes, one of the early kings, wrote a work on anatomy. This king is said to have died about 4150 B.C. There are traces of the existence of hospitals at that time in which diseases were studied and medical attendants trained. Even earlier than this there was a great physician, the first physician of whom we have record in history, whose name was I-Em-Hetep, which means "the Bringer of Peace." He had two other titles, one of which was "the Master of Secrets," partly because he possessed the secrets of health and disease, very

probably also because so many things had to be confided to him as a physician. Another of his titles was that of "The Scribe of Numbers," in reference, doubtless, to the fact that he had to use numbers so carefully in making out his prescriptions.

His first title, that of the bringer of peace, shows that very early in the history of medicine it was recognized that the physician's first duty was to bring peace of mind to his patients. A distinguished French physician (Director) of the department of physiology of the University of Paris, Professor Richet, said not long since, that physicians can seldom cure, they can often relieve, but they can always console, and evidently this oldest physician took his duty of consolation seriously and successfully. He lived in the reign of King Tehser, a monarch of the Third Dynasty in Egypt, who reigned about 4500 B.C. or a little later. How much this first physician was thought of will be best appreciated from the fact that the well-known step pyramid at Sakkara, the old cemetery near Memphis, is called by his name. So great indeed was the honor paid to him that after his death he was worshipped as a god, and so we have statues of him seated with a scroll on his knees, with an air of benignant knowledge, a placid-looking man with a certain divine expression of sympathy well suited to his name, the bringer of peace. While they raised him to their altars he does not wear a beard as did all their gods and their kings when they were raised to the godly dignity, but evidently they felt that his humanity was of supreme interest to them.

There is another monument at Sakkara that is of special interest to us in its consideration of old-time medicine. I discussed it and its inscriptions in the ***Journal of the American Medical Association*** (Nov. 8, 1907). It is the tomb of a surgeon, decorated within with pictures of surgical operations. The grandeur of the tomb and its location show us that the surgeon must have held a very prominent place in the community of that time. The date of this tomb is not later than 2500 B.C. Certain of the surgical operations resembled those done at the present time. There is the opening of a carbuncle at the back of the neck which shows how old are men's diseases and the modes of their treatment. After this the oldest monument in the history of medicine is documentary, the Ebers Papyrus, the writing of which is probably not much later than 1700 B.C. This consists, moreover, of a collection of older texts and suggestions in medicine, and some of the idioms are said to belong to several distant periods. It is probable that certain portions of this papyrus were composed not much later than the oldest book in the world, and that they date from nearly 3000 B.C. This papyrus is as interesting and as startling in its anticipation of some of our modern medical wisdom as is the Instruction of Ptah Hotep in the practical wisdom of life. This seems a good deal to say, but there is ample evidence for it.

According to Dr. Carl von Klein, who discussed the "Medical Features of the Ebers Papyrus" in some detail in the ***Journal of the American Medical Association*** about five years ago, over

700 different substances are mentioned as of remedial value in this old-time medical work. There is scarcely a disease of any important organ with which we are familiar in the modern time that is not mentioned here. While the significance of diseases of such organs as the spleen, the ductless glands, and the appendix was of course missed, nearly every other pathological condition was either expressly named or at least hinted at. The papyrus insists very much on the value of history-taking in medicine, and hints that the reason why physicians fail to cure is often because they have not studied their cases sufficiently. While the treatment was mainly symptomatic, it was not more so than is a great deal of therapeutics at the present time, even in the regular school of medicine. The number and variety of their remedies and of their modes of administering them is so marvellous, that I prefer to quote Dr. von Klein's enumeration of them for you:

> "In this papyrus are mentioned over 700 different substances from the animal, vegetable and mineral kingdoms which act as stimulants, sedatives, motor excitants, motor depressants, narcotics, hypnotics, analgesics, anodynes, antispasmodics, mydriatics, myotics, expectorants, tonics, dentifrices, sialogogues, antisialics, refrigerants, emetics, antiemetics, carminatives, cathartics, purgatives, astringents, cholagogues, anthelmintics, restoratives, haematics, alteratives, antipyretics, antiphlogistics, antiperiodics, diuretics, diluents, diaphoretics, sudorifics, anhydrotics, emmenagogues, oxytocics, ecbolics, galactagogues, irritants, escharotics,

caustics, styptics, haemostatics, emollients, demulcents, protectives, antizymotics, disinfectants, deodorants, parasiticides, antidotes and antagonists."

Scarcely less interesting than the variety of remedies were their methods of administration:

"Medicines are directed to be administered internally in the form of decoctions, infusions, injections, pills, tablets, troches, capsules, powders, potions and inhalations; and externally, as lotions, ointments, plasters, etc. They are to be eaten, drunk, masticated or swallowed, to be taken often once only–often for many days–and the time is occasionally designated–to be taken mornings, evenings or at bedtime. Formulas to disguise bad tasting medicaments are also given." We have no advantages over the early Egyptians even in elegant prescribing.

The traditions with regard to Egyptian medicine which came to the Greeks seemed so incredible as we found them in the older historians that they used to be joked about. Herodotus came in for a good deal of this scoffing. He was said to be entirely too credulous and prone to exaggerate in order to add interest to his history, but every advance in our knowledge in modern time has confirmed what Herodotus has to say. In the eighteenth century Voltaire said of him, "The Father of history, nay, rather the Father of lies." That was Voltaire's way. Anything that was above him he scoffed at. Homer was a wandering minstrel such as you might find in the streets of Paris, Dante was a mediaeval barbarian, our own Shakespeare was a dramatic

butcher, producing his effects by bloodshed and cruelty upon the stage. The nineteenth century has reversed Voltaire in every point of this, though some still listen to him in other matters. Above all, Herodotus has been amply justified by modern investigations. Herodotus tells us of the tradition of the number of different kinds of medical specialists in existence among the Egyptians. We are very prone to think that specialism is a development of modern medicine. What we know of Egypt shows us how old it is and makes it very clear that there must have been specialized modes of medical education for these many doctors who treated only very limited portions of the body and no other.

Herodotus tells us, to quote for you the quaint English of one of the old translations:

> "Physicke is so studied and practised with the Egyptians that every disease hath his several physician, who striveth to excell in healing that one disease and not to be expert in curing many. Whereof it cometh that every corner of that country is full of physicians. Some for the eyes, others for the head, many for the teeth, not a few for the stomach and the inwards."

The Ebers Papyrus shows us that the specialties were by no means scantily developed. We have traditions of operations upon the nose, of remedies for the eyes there are many and the diagnosis and treatment of eye diseases are rather well developed. The filling of teeth seems even to have been practised,[5] and while

[5] Burdett: "History of Hospitals."

the traditions in this matter are a little dubious, the evidence has been accepted by some good authorities. This specialism in Egyptian medicine probably existed long before Herodotus, for he seems to speak of it as a very old-time institution in his time, and indeed Egypt had degenerated so much that it would be hard to believe that there was any such development there in his time. In the old temples they seem to have used many modes of treatment that we are likely to think of as very modern. Music for instance was used to soothe the worried, amusements of various kinds were employed to influence the disturbed mind favorably. In many ways some of the old temples resembled our modern health resorts. To them many patients flocked and were treated and talked about their ailments and went back each year for "the cure" once more, all the while being more benefited, as is true also in our own time, by the regularity of life, the regulation of diet and the mental influence of the place, than by any of the drugs or even the curative waters.

In a word, our study of old Egypt and Egyptian education shows us men doing things just about the way that our generation does them and succeeding just about as well as we succeed. They taught writing, spelling and composition as we do and the moral content of their teaching is admirable. They had training schools for the arts and crafts, their taste is better than ours in many things, above all, they trained workmen very well, and the remains of their achievements are still the subject of our admiration. They solved mechanical problems in the building

of the pyramids quite as well as we do. They made enough experiments that we would call chemical, to find enduring pigments for decorative purposes and they succeeded in making tools that enabled them to carve stonework beautifully. Even their professional education was not very different from our own and its results, particularly in the line of specialism, are startling anticipations of the most modern phase of medicine. They anticipated our interests in psychotherapy and some of them were mental healers, and more of them used the influence of the mind on the body than our physicians have been accustomed to until very recent years. Their physicians and surgeons were held in the highest veneration, and what we know of them shows that the judgment of the old Egyptians in this matter was very good and better than the average appreciation of physicians at the present time.

After all is said no one with any pretence to knowledge of the past would claim for a moment that we were doing better work in anything than men have done at many times in the history of culture. Our idea of progress is just one of these vague bits of self-sufficiency that each generation has had in its own time and that has made it feel that somehow what it is accomplishing means much in the world's history. It is rather amusing to compare the estimate that any generation has of itself with the appreciation of it by succeeding generations. Especially is this true for generations separated by 100 years or more. Generations are only made up of men and women, and what man or woman

is there who has not thought many times during life that though his or her work might not be estimated very highly by those close to it, this was due but to a sad lack of proper appreciation, since it represented certain qualities that well deserved admiration? We are all gifted with this precious self-conceit, which is not so bad a thing, after all, since it makes us work better than if we had a proper but much less exalted appreciation of our real worth. It is much easier to encourage people to do things than to scold or criticise them into doing them. We shall not quarrel with our generation, then, for being self-conceited,–it is made up of human beings,–but we shall try and not let a due appreciation of our accomplishment be smothered entirely, by this self-conceit.

After all, did not our favorite English poet of the late nineteenth century declare us to be "the heirs of all the ages in the foremost files of time," and how could it be otherwise than that we should be far ahead of the past, not only because the evolution of man made him more capable of handling difficult problems, but also because we had the advantage of the accumulated wisdom such as it was of the past, of the observations and the conclusions of our forefathers and, of course, we were far ahead of them. This idea, however, so widely diffused that it might almost be spoken of as universal, has received many jolts in recent times, since we have come to try to develop the taste and the intellect of our people and not merely our material comforts and our satisfaction with ourselves. It has been pointed out, over and over again, in recent years that, of course, there is no such

thing as progress in literature, that in art we are far behind many generations of the past, that in architecture there is not a new idea in the world since the sixteenth century, that in all these modes of human expression we are mere imitators and not originators. Our drama is literally and literarily a farce, and no drama that any one expects to live has been written for more than a century. Our buildings are replicas of old-time structures, no matter what their purpose, whether it be ecclesiastical, or educational, or municipal, or beneficiary.

Of course from the scientific standpoint this is, after all, what we might expect. In all the years of history of which we have any record there has been no change in the nature of man and no modification of his being that would lead us to expect from him anything different from what had been accomplished by man in the past. There is no change in man's structure, in the size of his body in any way, in his anatomy or his physiology, in his customs, or ways of life, or in his health. The healthy still have about the same expectation of life, to use the life insurance term, and though we have increased the general average duration of life this has been at the expense of other precious qualities of the race. The healthy live longer, but the unhealthy also live longer. The weaklings in mind and body whom nature used to eliminate early are now a burden that must be cared for. In general it may be said, and Virchow, the great German pathologist, who was one of the world's great living anthropologists of his time–and that but a few years ago–used to insist, that man's skeleton

and, above all, his skull as we can study them in the mummy of the olden time, were exactly the same as those that the race has now. Man cannot by thinking add a cubit to his stature, nor an inch to the circumference of his skull. The seventh generation of an academic family each member of which has been at the university in his time, is not any more likely to have special faculties for the intellectual life, indeed it is sometimes hinted that he has less of a chance than if his parents had been peasants for as long as the history of the family can be traced. Of course this has no proper bearing on evolution from the biological standpoint, for the length of time that we have in human history may be conceded to be entirely inadequate to produce any noticeable changes on man's body or mind, granting that such were in progress. At the most we have 7,000 years of history and the evolutionists would tell us that this is as nothing in the unnumbered aeons of evolution. In the popular estimation, however, evolution can almost be seen at work just as if one could see blades of grass growing by watching them closely enough. This impression of man's progress supposed to be supported by the theory of evolution is entirely unfounded. Just as his body is the same and his brain the same size, and the relative proportion of brain weight to body weight or at least to skull capacity the same now as they were 6,000 years ago; and this is true for both sexes, so that because women have smaller bodies by one-eighth they also have smaller skulls, and this, too, occurs among the mummies in Egypt quite as in our own time; so in what he is

able to do with body and mind man is unchanged. Something of dexterity, of facility, of self-confidence and assurance of results is gained from time to time in history, but lost as often, because a few generations fail to be interested in what interested their immediate predecessors immensely.

It is not surprising, then, that history should show us at all times men doing work about like that which they did at any other time–provided they were deeply interested enough. The wisdom of the oldest book in the world, a father's advice to his son, is as practical in most ways as Gorgon Graham's letters to his boy–and ever so much more ethical and true to life. The decorations of the old Egyptian tombs, the architecture of their temples, their ways and habits of life so far as we know them, all proclaim them men and women just like ourselves, certainly not separated from us by any gulf or even streamlet of evolution. What are more interesting than any supposed progress in mankind, are the curious ups and downs of interest in particular subjects which follow one another with almost definite regularity in history as we know it. Men become occupied with some phase of the expression of life, literature, architecture, government, sometimes in two or three of these at the same time, and then there comes a wonderful period of development. Just when this epoch reaches an acme of power of expression there come a self-consciousness and a refinement, welcomed at first as new progress, but that seem to hamper originality. Then follows a period of distinct decadence, but with a development of criticism

of what was done in the past, with the formulation of certain principles of criticism. Just when by this conscious reflection it might be expected that man would surely advance rapidly, further decay takes place and there is a negative phase of power of expression, out of which man is lifted by a new generation usually neglectful of the immediate past, sometimes indeed deprecating it bitterly, though this new phase may have been awakened by a further past, which gets back to nature and to expression for itself.

The most interesting feature of history is how men have done things, wonderful things that subsequent generations are sure to admire and continue to admire whenever they have sense and training enough, yet forget about them. This is true not only for artistic productions but also for practical applications in science, for inventions, useful discoveries and the like. In surgery, for instance, though we have a continuous history of medicine, all of our instruments have been re-invented at least three or four times. After the reinvention we have been surprised to discover that previous generations had used these instruments long before us. Even the Suez Canal was undoubtedly open at least once before our time. Personally I feel sure that America was discovered at least twice before Columbus' time and that during several centuries there was considerable intercourse between Europe and America. It is extremely important for us then to realize these cycles in human progress and not to deceive ourselves with the idea that because we are doing something that

immediately preceding generations knew nothing of, therefore we are doing something that never was done in the world before. This is particularly important for us now, for in my estimation the eighteenth was one of the lowest of centuries in human accomplishment, and therefore we may easily deceive ourselves as to our place in human history in this century.

Reflections of this kind are, it seems to me, particularly important for educators, especially in the midst of our tendency to accept evolution unthinkingly in this generation. Man's skull has not changed, his body has not been modified, his soft tissues are the same as they used to be. His brain is no different. Why, then, should he not have done things in the olden time just about as he does them now? We do not think that acquired characters are inherited. Oliver Wendell Holmes talks of Emerson as the seventh generation of an academic family, but there are none of us who think that this made it any easier for Emerson to acquire an education, or gave him a better development of mind. Those of us who have experience in education know that the descendant of a family of peasants for centuries or of farmers for many generations, easily outstrips some of the scions of academic families in intellect. It is the man that counts and not his descent.

Just this is true of generations as well as of individuals. Whenever men have set themselves to doing things they have accomplished about as good results at any time in history as at any other. We apparently do not benefit by the accumulation of the experience of our predecessors. At least we can find no

trace of that in history. For a certain number of enterprising generations there is manifest upward progress. Then something always happens to disturb the succession of ideas, sometimes it is nothing more than an over-refinement that leads to bad taste, and decadence takes the place of progress. The accomplishment of any particular generation, then, depends not on its place in any real or fancied scheme of evolution, but on its own ideals and its determined efforts to achieve them.

There are people who insist that this doctrine is pessimistic and discouraging and that, if we do not keep before men the consoling feeling that they are advancing beyond their forebears, there is not the same incentive to work as there would be under other circumstances. On the contrary, as it seems to me, this other idea that everything depends on ourselves and not on our predecessors, constitutes the highest form of incentive. We at the present time are far below many preceding generations in art, literature, architecture, arts and crafts and many developments of taste. Here is no evolution, but the story of how each generation sets itself to work. Why, then, should we think that in education, one of the highest of the arts, the moulding of the human mind into beautiful shapes instead of the moulding of more plastic material, we should be far ahead of the past and, therefore, in a position to find no precious lessons in it? The history of education not alone of the last three centuries of education, but of at least 6,000 years of education, is worth while knowing and it magnificently exemplifies how old is the new in education.

THE FIRST MODERN UNIVERSITY

"What is it that hath been? The same thing that shall be. What is it that hath been done? The same that shall be done." ***–Ecclesiastes i:10.***

"To one small people . . . it was given to create the principle of Progress. That people was the Greek. Except the blind forces of nature, nothing moves in this world which is not Greek in its origin." –Maine.

THE FIRST MODERN UNIVERSITY [6]

We are very prone to think that our universities represent new developments in the history of humanity. We are aware that there were great educational institutions in the world at many times before the present, and that some of them profoundly affected the intellectual life of their time; we are likely to think, however, that these institutions were very different from our modern universities. They were not so well organized, they lacked endowments, their departments were not co-ordinated, they did not have the libraries and, of course, not the laboratory facilities that our modern universities have, and then, above all, they did not devote themselves to that one department of knowledge, physical science, in which absolute truth can be reached, and in which each advance in knowledge as made can be chronicled and set down as a sure basis for future work and workers in the same line for all time. The older institutions of learning were given up to speculation, to idealism, to metaphysics, and, of course,

[6] The material for this address was gathered for lectures on the History of Education at St. Mary's Seminary, Scranton, Pa., and St. Joseph's College, Chestnut Hill, Philadelphia. It was largely added to for the introductory lecture in a course to the teachers of the parochial schools of Philadelphia, March, 1910. Very nearly in its present form it was delivered before the Brooklyn Institute of Arts and Sciences as the second lecture in the course on "How Old The New Is," April, 1910.

therefore, their work, as many educated people are now prone to look at it, was too shadowy to last, too cloudy to serve as a foundation for any enduring scientific knowledge. I do not think that I exaggerate when I make this as the statement of the thought of a good many people of our time who are at least supposed to be educated and who consider that they are reasonably familiar with the educational institutions of the past.

It has seemed to me, then, that it would be interesting and opportune to trace the origin, the development and the accomplishments of the first institution of learning that is very similar to our own; and to retrace some of the achievements of its professors, the circumstances in which they were done and the conditions surrounding an ancient school which I think our study will make clear as well deserving of the title of the first modern university. This was not the collection of schools at Athens, though there is no doubt at all that great intellectual and educational work was accomplished there, but not in our modern university sense. The schools were independent, and while the rivalry engendered by this undoubtedly did good so long as genius ruled in the schools, it brought about a degeneration into sophistry, from here comes the word, and argumentativeness, once the great master had been displaced by disciples who were sure that they knew their master's mind, and probably thought, as disciples always do, that they were going beyond their master, but who really occupied themselves with curious and trifling tergiversations of mind within the narrow circle of ideas laid

down by the master,–as has nearly always been the case.

The first modern university was that of Alexandria. It was quite as much under Greek influence as the schools of Athens. There have been commentators on the story of Cleopatra, who have suggested that her African cast of countenance did not prove a deterrent to her success as a conqueror of hearts, and who argue from this to the fact that it is not physical charm but personality that counts in woman's power over men, quite forgetting, if they ever knew, that Cleopatra was a Greek of the Greeks, a daughter of the line of the Ptolemys, probably a direct descendant though with the bar sinister of Philip of Macedon, born of a house so watchful over its Greek blood and so resentful of any possible admixture of anything less noble with itself, that for generations it had been the custom for brother to marry sister, in order that the race of the Ptolemys might be perpetuated in absolute purity. Alexandria, while a cosmopolitan city in the inhabitants who dwelt in it and in the wide diffusion of commercial interests that centred there as a mart for East and West, was absolutely ruled by Greeks and represents for many centuries after the decline of Athens had come, the brightest focus of Greek intellectual life, Greek culture and art, Greek letters and education and every phase of that Greek influence in aesthetics which has always meant so much in the world's history.

The interesting fact about Alexandria in the history of education, is that it was the home of a modern university in every sense of that term, having particularly the features that many

people are prone to think of as representing modern evolution in education. The buildings of the university were erected practically by a legacy left by the great Conqueror himself, Alexander. The central point of interest in the university was a great library, the nucleus of which was the library of Aristotle, tutor of Alexander, which had been collected with the help of that great Conqueror and was the finest collection of books in the world of that time. The main subject of interest in the university was physical science and its sister subject mathematics, which raises mere nature-study into the realm of science, and this scientific physical education was conducted in connection with the great museum or collection of objects of interest to scientists that had also been made partly by Aristotle himself and partly for his loved tutor by the gratitude of Alexander during his conquering expeditions in the far East. Finally professors were attracted to Alexandria by the offer of a better salary than had ever been paid at educational institutions before this, and by the additional offer of a palace to live in, supplied by the ruler of the country. It is no wonder, then, that in attendance also, as well as in the prestige of its professors, Alexandria resembled a modern university.

It was its devotion to science, however, that especially characterized this first great institution of learning of which we have definite records. This devotion to science went so far that even literature was studied from the scientific standpoint. Such details as we have of the instruction at Alexandria

and the books that have come down to us, all show men interested in philology, in comparative literature, in grammar and comparative grammar, rather than in the idealistic modes of knowledge. We have commentaries on the great authors, but no great original works of genius in literature from the professors of Alexandria. The translation of the Septuagint version of the Old Testament is a typical example of the sort of work that was being done at Alexandria. They collected the documents of the nations and translated them for purposes of comparative study. It was an education for information rather than for power. The main idea of the time and place was to know as much as possible about literature, rather than to know what it represented in terms of life, and the real meaning of both literature and life was obscured in the study about and about them. People studied books about books rather than the books themselves. There was much writing of books about books, and it was nearly always comparatively trivial things in the great authors that attracted most attention from the many scholiasts, critics, editors, commentators, lecturers of the time.

Personally I could well understand such an incident happening at Alexandria as is said to have happened at a well-known English (of course not American!) university not long ago. The class was construing Shakespeare and one of the students asked the professor what the meaning of a particular figure used by the great dramatist was. The professor replied that they were there to construe Shakespeare's language and not bother about his

meaning–yet it was a class in literature. Literature in recent years as studied at the universities has come to be quite as scientific in its modes and methods as it was at the University of Alexandria. May I also add that it has become quite as sterile of results of any importance. There is very little real study of literature, practically no encouragement of the attempt to draw inspiration from the great authors, but all devotion to the grammar, to the philology, to comparative literature as exemplified in the old writers.

Books were the great essentials at Alexandria. This is not surprising seeing that the university was founded around a great library, and that this library continued to be the greatest in the world in its time. Every student who came to Alexandria bringing a book with him of which there was no copy in the library, was required by a decree of the authorities to leave a copy behind him. In all the university towns of the times–and there were many founded in the rising eastern cities of Alexander's empire, as it gradually crumbled into smaller pieces providing new capitals with less power but with quite as much national feeling as the capital cities of larger states, libraries became the fashion and a city's main claim to prestige in education and the intellectual life was the number of its books. Antioch, Tarsus, Cos, Cnidos and Pergamos are examples of this state of affairs. Pergamos was so jealous of the prestige of the Alexandrian Library that it forbade the exportation of parchment, an invention of Pergamos which received its name from that city. Petty jealousies were quite as much the rule among educational institutions then as they have

been at any time since.

To many people it will seem quite absurd to talk of Alexandria as having done serious scientific work because the methods of science and scientific investigation are supposed to have been, as they think, discovered by Lord Bacon in the seventeenth century. It is curious how many educated people, or at least supposedly educated people, have this as their basic notion of the history of science. Men wandered in the mazes of inductive reasoning utterly unable to bring observations together in such a way as to discover laws, utterly incompetent to note phenomena and bring them into relations to one another so as to show their scientific bearing, until Queen Elizabeth's Lord Chancellor came to show the way out of the labyrinth and leave the precious cord through its corridors, by which others may easily thread their way into the free air of scientific truth. I know nothing that is more absurd than this. It is a commonplace among educators, however; it is frequently referred to in educational addresses as if it were a universally accepted proposition, and to dispute it would seem the rankest kind of scientific heresy to these narrow minds. Fortunately there are two writers, Macaulay and Huxley, to whom even these people are likely to listen, who have expressed themselves with regard to this precious historic superstition that Lord Bacon invented the inductive method of reasoning with what my long-worded friend would call appropriate opprobrium.

Macaulay says: "The inductive method has been practised ever since the beginning of the world by every human being.

It is constantly practised by the most ignorant clown, by the most thoughtless schoolboy, by the very child at the breast. That method leads the clown to the conclusion that if he sows barley he shall not reap wheat. By that method the schoolboy learns that a cloudy day is the best for catching trout. The very infant, we imagine, is led by induction to expect milk from his mother or nurse, and none from his father. Not only is it not true that Bacon invented the inductive method; but it is not true that he was the first person who correctly analyzed that method and explained its uses. Aristotle had long before pointed out the absurdity of supposing that syllogistic reasoning could ever conduct men to the discovery of any new principle, had shown that such discoveries must be made by induction, and by induction alone, and had given the history of the inductive process, concisely indeed, but with great perspicuity and precision."

And Huxley quite as emphatically points out: "The method of scientific investigation is nothing but the expression of the necessary mode of working of the human mind. It is simply the mode by which all phenomena are reasoned about–rendered precise and exact."

While the whole trend of education, even that of literature, was scientific at Alexandria, the principal feature of the teaching was, as we have said, concerned with the physical sciences and mathematics. It is in mathematics that the greatest triumphs were secured. Euclid's "Geometry," as we use it at the present time in our colleges and universities, was put into form by Euclid

teaching at the University of Alexandria in the early days of the institution. Euclid's setting forth of geometry was so perfect that it has remained for over 2,000 years the model on which all text-books of geometry of all the later times have been written. There seems no doubt that writers on the history of mathematics are quite justified in proclaiming Euclid's "Geometry" as one of the greatest intellectual works that ever came from the hand of man. The first Ptolemy was fortunate in having secured this man as the founder of the mathematical department of his university. His example, the wonderful incentive of his work, the absolute perfection of his conclusions, must have proved marvellous emulative factors for the students who flocked to Alexandria.

Commonly mathematicians are said to be impractical geniuses so occupied with mathematical ideas that their influence in other ways counts for little in university life. If we are to believe the stories that come to us with regard to Euclid, however, and there is every reason to believe them, for some of them come from men who are almost contemporaries, or from men who had their information from contemporaries, Euclid's influence in the university must have been for all that is best in education. Proclus tells the story of King Ptolemy once having asked Euclid, if there was any shorter way to obtain a knowledge of geometry than through the rather difficult avenue of Euclid's own text-book, and the great mathematician replied that there was "no royal road to geometry." Stobaeus relates the story of a

student who, having learned the first theorem, asked "but what shall I make by learning these things?" The question is so modern that Euclid's answer deserves to be in the memory of all those who are interested in education. Euclid called his slave and said, "Give him twopence, since he must make something out of everything that he does, even the improvement of his mind."

Probably even more significant than the tradition that Euclid did his work at this first modern university, and that besides being a mathematician he was a man of very practical ideas in education, is the fact that he was appreciated by the men of his time and that his work was looked up to with highest reverence by his contemporaries and immediate successors as representing great achievement. It is not ever thus. Far from resenting in any way the magnificent synthesis that he had made of many rather vague notions in mathematics before his time, his contemporaries united in doing him honor. They realized that his teaching created a proper scientific habit of mind. Pappus says of Apollonius that he spent a long time as a pupil of Euclid at Alexandria and it was thus that he acquired a thorough scientific habit of mind. After Euclid's time the value of his discoveries as a means of training the mind was thoroughly appreciated. The Greek philosophers are said to have posted on the doors of their schools "Let no one enter here who does not know his Euclid." In the midst of the crumbling of old-fashioned methods of education in the introduction of the elective system, in the modern time, many of our best educators have insisted that at

least this portion of mathematics, Euclid's contribution to the science, should be a required study, and most educators feel, even when there is question of law or medical study, that one of the best preparations is to be found in a thorough knowledge of Euclid.

Almost as wonderful as the work of Euclid was that of the second great mathematician of the Alexandrian school, Archimedes, who not only developed pure mathematics but applied mathematical principles to mechanics and proved besides to have wonderful mechanical ability and inventive genius. It was Archimedes of whom Cicero spoke so feelingly in his "Tusculan Disputations," when about a century and a quarter after Archimedes' death, he succeeded in finding, his tomb in the old cemetery at Syracuse during his quaestorship there. How curious it is to think that after so short a time as 127 years from the date of his death Archimedes was absolutely forgotten by his fellow-Syracusans, who resolutely denied that any trace of Archimedes' tomb existed. This stranger from Rome knew much more of Archimedes than his fellow-citizens a scant four generations after his time. Not how men advance, but how they forget even great advance that has been made, lose sight of it entirely at times and only too often have to rediscover it, is the most interesting phase of history. Cicero says, "Thus one of the noblest cities of Greece and one which at one time had been very celebrated for learning, knew nothing of the monument of its greatest genius until it was rediscovered for them by a native of

Arpinum"–Cicero's modest designation for himself.

We have known much more about Archimedes' inventions than about his mathematical works. The Archimedian screw, a spiral tube for pumping water, invented by him, is still used in Egypt. The old story with regard to his having succeeded in making burning mirrors by which he was enabled to set the Roman vessels on fire during the siege of Syracuse, used to be doubted very seriously and, indeed, by many considered a quite incredible feat, clearly an historical exaggeration, until Cuvier and others in the early part of the nineteenth century succeeded in making a mirror by which in an experiment in the Jardin des Plantes in Paris wood was set on fire at a distance of 140 feet. As the Roman vessels were very small, propelled only by oars or at least with very small sail capacity, and as their means of offence was most crude and they had to approach surely within 100 feet of the wall to be effective, the old story therefore is probably entirely true. The other phase of history according to which Archimedes succeeded in constructing instruments by which the Roman vessels were lifted bodily out of the water, is probably also true, and certainly comes with great credibility of the man of whom it is told that, after having studied the lever, he declared that if he only had some place to rest his lever, he could move the world.

The well-known story of his discovery in hydrostatics, by which he was enabled to tell the King whether the royal goldsmiths had made his crown of solid gold or not, is very

well authenticated. Archimedes realized the application of the principle of specific gravity in the solution of such problems while he was taking a bath. Quite forgetful of his state of nudity he ran through the streets, crying "Eureka! Eureka! I have found it! I have found it!" There are many other significant developments of hydrostatics and mechanics, besides specific gravity and the lever, the germs of which are at least attributed to Archimedes. He seems to have been one of the world's great eminent practical geniuses. That he should have been a product of Alexandria and should even have been a professor there would be a great surprise if we did not know Alexandria as a great scientific university. As it is, it is quite easy to understand how naturally he finds his place in the history of that university and how proud any modern university would be to have on the rolls of its students and professors a man who not only developed pure science but who made a series of practical applications that are of great value to mankind. Such men our modern universities appropriately claim the right to vaunt proudly as the products of their training.

When we analyze something of the work in pure mathematics that was accomplished by Archimedes our estimation of him is greatly enhanced. His work "On the Quadrature," that is the finding of the area of a segment of the parabola, is probably his most significant contribution to mathematical knowledge. His proof of the principal theorem in this is obtained by the "method of exhaustion," which had been invented by Eudoxus but was

greatly developed by Archimedes. This method contains in itself the germ of that most powerful instrument of mathematical analysis in the modern time, the calculus.

Another very important work was "The Sphere and the Cylinder." This was more appreciated in his own time, and as a consequence, after his death the figure of a sphere inscribed in a cylinder was cut on his tomb in commemoration of his favorite theorem, that the volume of the sphere is two-thirds that of the cylinder and its surface is four times that of the base of the cylinder. It was by searching for this symbol, famous in antiquity, that Cicero was enabled to find his tomb according to the story that I have already related.

Within the last few years the reputation of Archimedes in pure mathematics has been greatly enhanced by the discovery by Professor Heiberg of a lost work of the great Alexandrian professor in Constantinople. Archimedes himself stated in a dedication of the work to Eratosthenes the method employed in this. He says: "I have thought it well to analyze and lay down for you in this same book a peculiar method by means of which it will be possible for you to derive instruction as to how certain mathematical questions may be investigated by means of mechanics. And I am convinced that this is equally profitable in demonstrating a proposition itself, for much that was made evident to me through the medium of mechanics was later proved by means of geometry, because the treatment by the former method had not yet been established by way of a demonstration.

For of course it is easier to establish a proof, if one has in this way previously obtained a conception of the questions, than for him to seek it without such a preliminary notion. . . . Indeed, I assume that some one among the investigators of to-day or in the future, will discover by the method here set forth still other propositions which have not yet occurred to me." On this Professor Smith comments: "Perhaps in all the history of mathematics no such prophetic truth was ever put into words. It would almost seem as if Archimedes must have seen as in a vision the methods of Galileo, Cavalieri, Pascal, Newton, and many other great makers of the mathematics of the Renaissance and the present time."

Many other distinguished professors of mathematics have, since this declaration of Archimedes came under their notice, declared that he must have had almost a prophetic vision of certain developments of mathematics and especially applied mathematics and mechanics and their relation to one another, that were only to come in much later and indeed comparatively modern times. Undoubtedly Archimedes' works proved the germ of magnificent development not only immediately after his own time but in the long-after time of the Renaissance, when their translation awakened minds to mathematical problems and their solutions that would not otherwise have come.

We know much less of the life of the third of the great trio of teachers and students of Alexandria, Apollonius of Perga. Perhaps it should be enough for us to know that his contemporaries spoke of him as "the great geometer," though

they were familiar with Euclid's book and with Archimedes' mighty work. Apollonius was surely a student of Alexandria for many years and he was probably also a professor of mathematics there. He developed especially what we know now as conic sections. His book on the subject contains practically all of the theorems to be found in our text-books of analytical geometry or conic sections of the present time. It was developed with rigorous mathematical logic and Euclidean conclusiveness. These three men show us beyond all doubt how finely the mathematical side of the university developed.

After Archimedes the greatest mechanical genius of the University of Alexandria was Heron. To him we owe a series of inventions and discoveries in hydrostatics and the construction of various mechanical toys that have been used in the laboratories since. There is even a little engine run by steam–the aeolipile–invented by him, which shows how close the old Greeks were to the underlying principles of discoveries that were destined to come only after the development of industries created a demand for them in the after time. Heron's engine is a globe of copper mounted on pivots, containing water, which on being heated produces steam that finds its way out through tubes bent so as to open in opposite directions on each side of the globe. The impact of the escaping steam on the air sets the globe revolving, and the principle of the turbine engine at work is clear. We have used steam for nearly 200 years always with a reciprocating type of movement, so that to apply energy in one direction the

engine has had to move its parts backwards and forwards, but here was a direct-motion turbine engine in the long ago. Our great steamboats, the ***Lusitania*** and the ***Mauretania,*** now cross the ocean by the use of this principle and not by the reciprocating engine, and it is evident that it is along these lines the future developments of the application of steam are to take place.

Another extremely interesting invention made by Heron is the famous fountain called by his name, and which still is used to illustrate principles in pneumatics in our classrooms and laboratories. By means of condensed air water is made to spring from a jet in a continuous stream and seems paradoxically to rise higher than its source. Probably his best work in the domain of physics is that on pneumatics in which are given not only a series of discussions, but of experiments and demonstrations on the elasticity of air and of steam. These experiments could only have been conducted in what we now call a physical laboratory. Indeed these inventions of his are still used in laboratories for demonstration purposes. While we may think, then, that the foundation of laboratories was reserved to our day, there is abundant evidence for their existence at the University of Alexandria. We shall return to this subject a little later, when the evidence from other departments has been presented, and then it will be clear, I think, that the laboratory methods were favorite modes of teaching at the University of Alexandria and were in use in nearly all departments of science both for research and for demonstration purposes.

The work of the other great teacher at Alexandria which was to influence mankind next to that of Euclid, was not destined to withstand the critical study of succeeding generations, though it served for some 1,500 years as the basis of their thinking in astronomy. This was the work of Ptolemy, the great professor of astronomy at Alexandria of the first century after Christ. It is easy for us now to see the absurdity of Ptolemy's system. It is even hard for us to understand how men could have accepted it. It must not be forgotten, however, that it solved all the astronomical problems of fifteen centuries and that it even enabled men, by its application, to foretell events in the heavens, and scientific prophecy is sometimes claimed to be the highest test of the truth of a system of scientific thought. Even so late as 1620 Francis Bacon refused to accept Copernicanism, already before the world for more than a century, because it did not, as it seemed to him, solve all the difficulties, while Ptolemy's system did. As great an astronomer as Tycho Brahe living in the century after Copernicus still clung to Ptolemy's teaching. It must not be forgotten that when Galileo restated Copernicanism, the reason for the rejection of his teaching by all the astronomers of Europe almost without exception, was that his reasons were not conclusive. They preferred to hold on to the old which had been so satisfying than to accept the new which seemed dubious. Their wisdom in this will be best appreciated from the fact that none of Galileo's reasons maintained themselves.

Though his system has been rejected, still Ptolemy must be

looked up to as one of the great teachers of mankind and his work the "Almagest" as one of the great contributions to human knowledge. The fact that he represented a climax of astronomical development at Alexandria some four centuries after the foundation of that university, serves to show how much that first modern university occupied itself for all the centuries of its highest prestige, with physical science as well as with mathematics. Astronomy, physics, especially hydrostatics and mechanics, were all wonderfully developed. Generations of professors had given themselves to research and to the publication of important works quite as in the modern time, and Alexandria may well claim the right to be placed beside any university for what it accomplished in physical science, and rank high if not highest in the list of great research institutions adding new knowledge to old, leading men across the borderland of the unknown in science and furnishing that precious incentive to growing youth to occupy itself with the scientific problems of the world around it.

The most important part of the scientific work of the University of Alexandria to my mind remains to be spoken of, and that is the medical department. It is a well-known law in the history of medicine that, whenever medical schools are attached to universities in such a way that students who come to the medical department have been thoroughly trained by preliminary studies and have such standards of scholarship as obtain in genuine university work, then great progress in medicine and in

medical education is accomplished. This was eminently the case at Alexandria. The departments of the arts, of linguistics and of philosophy were gathered around the great building known in Greek as the Mouseion, a word that has come to us through the Latin under the guise of Museum. This temple of the Muses contained collections of various kinds and near it was situated the great library. Not far away was the Serapeum, or Temple of Serapis, the Goddess of Life, around which were centred the biological sciences, and close by was the medical school. As teachers for this medical school some of the greatest physicians of the time were secured by the first Ptolemy and a great period in medical history began.

The practical wisdom guiding the Ptolemys in the organization of this medical school will be best appreciated from the fact that they took the first step by inviting two distinguished physicians, the products of the two greatest medical schools of the time, to lay the foundations at Alexandria. They were probably the best investigators of their time and they had behind them fine traditions of research, thorough observation and conservative reasoning and theorizing on scientific subjects. Erasistratos was a disciple of Metrodoros, the son-in-law of Aristotle. He had studied for a time under another great teacher, Chrysippos of Cnidos. We are likely to know much more of Cos than of Cnidos because of the reputation in the after time of Hippocrates, whose name is so closely connected with Cos that the two are almost invariably associated, but Cnidos was one of the great university

towns of the later Greek civilization. Eudoxus the astronomer, Ctesias the writer on Persian history, and Sostratos the builder of the great lighthouse, one of the seven wonders of the world, the Pharos at Alexandria, were products of this university. Its medical school was famous when Cos had somewhat declined, and Chrysippos was one of the leading physicians of the world and one of the acknowledged great teachers of medicine when Erasistratos studied under him at Cnidos, and obtained that scientific training and incentive to original research which was to prove so valuable to Alexandria.

His colleague, Herophilos, was quite as distinguished as Erasistratos and owed his training to the rival school of Cos. Whether it was intentional or not to secure these two products of rival schools for the healthy spirit of competition that would come from it, and because they wanted to have at Alexandria the emulation that would naturally be aroused by such a condition, is not known, but there can be no doubt of the wisdom of the choice and of the foresight which dictated it. Herophilos had studied medicine under Praxagoras, one of the best-known successors of Hippocrates. While distinguished as a surgeon he had more influence on medicine than almost any man of his time, except possibly Erasistratos. He was, however, a great anatomist and, above all, a zoologist who, according to tradition, had obtained his knowledge of animals from the most careful zootomy of literally thousands of specimens. His fair fame is blackened by the other tradition that he practised vivisection on human

beings–criminals being turned over to him for that purpose by the Ptolemys, who were deeply interested in his researches. The traditions in this matter, however, serve to confirm the idea of his zeal as an investigator and his ardent labors in medical science. Tertullian declares that he dissected at least 600 living persons. We know that he did much dissection of human cadavers and there is question whether Tertullian's statement was not gross exaggeration due to confusion between dissection and vivisection.

Both of these men did some magnificent work upon the brain. This being the first period in the history of humanity when human beings could be dissected freely, it is not surprising that they should take up brain anatomy with ardent devotion, in the hope to solve some of the many human problems that seemed to centre in this complex organ. Before this anatomy had been learned mainly from animals, and as human beings differ most widely from animals by their brain, naturally, as soon as the opportunity presented itself, anatomists gave themselves to thorough work on this structure where so many discoveries were waiting to be made. After the brain and nervous system the heart was studied, and Erasistratos' description of its valves, of its general structure and even of its physiology, show how much he knew. To know something of the work of these two anatomists is to see at once what is accomplished in a university medical school where medical science, and not the mere practice of medicine alone, is the object of teachers and students. I have

told the story of this in my address before the graduates of the St. Louis Medical University Medical School, and here I shall simply refer you to that.[7]

Of course all these studies at the university could not be conducted without laboratory equipment. Of itself the dissecting room is a laboratory and until very recent years it was the only laboratory that most of the medical schools had. The numerous experiments in vivisection, if they really took place, required special arrangements and could only be conducted in what we now call a laboratory of physiology. This is not idle talk but represents the realities of the situation. Other laboratories there must have been. It would be quite impossible to conceive of a man like Archimedes carrying on his work, especially of the application of mathematical principles to mechanics, of the demonstration of mechanical principles themselves and of the invention of the many interesting machines which he made, without what we call laboratory facilities. The Ptolemys were interested in his work, they supplied him with a place to do it, many of his advanced students at least must have been interested in this work so that, as I see it, there was what we would now call a physical laboratory in connection with his teaching at the University of Alexandria.

What we know about the development of zoology under

[7] The details of what was accomplished in the Medical Department at Alexandria were given to some extent at least in the lecture in Brooklyn, but are omitted here in order to avoid repetitions in the printed copy.

Erasistratos and Herophilos would seem to indicate that there must have been such special facilities for the investigation of zoological problems as we would call a laboratory of physiology. A magnificent collection of plants was made for the university and these were studied and classified, and while we hear nothing of their dissection, there were at least botanical rooms for methodical study, if not botanical laboratories. Ptolemy's work represented the culmination of astronomical information which had been gathered for several centuries. This could only be brought together in what we would now call an observatory and this represents another laboratory of physical science. Our laboratory work, therefore, must have been anticipated to a great extent. We must not forget that our university laboratories are only a couple of generations old altogether and that they represent a very recent development of educational work. It is extremely interesting, therefore, to find them anticipated in germ at least, if not in actuality, at the first modern university of which we have sufficiently complete records to enable us to appreciate just the sort of work that was being done and the ways and modes of its education.

I think that even this comparatively meagre description of the first university of which we have knowledge makes it very clear that Alexandria deserves the name of the First Modern University. It resembled our own in so many ways that I, for one, find it impossible to discover any essential difference between them. At Alexandria they anticipated every phase

of modern university education. Their literature was studied from a scientific standpoint. They devoted themselves to an overwhelming extent to the study of the physical sciences and mathematics, their professors were inventors, developers of practical applications of science, experts to whom appeal was made when important scientific questions had to be settled, and their teaching was done with demonstrations and a laboratory system very like our own. Nothing that I know illustrates better the tendency of human achievement not to represent advance but to occur in cycles than the story of this first modern university. That is why I have tried to tell it to you as an exquisite illustration of How Old the New Is in Education.

MEDIAEVAL SCIENTIFIC UNIVERSITIES

"Qui ad pauca respiciunt faciliter pronuntiant." –AN OLD PHILOSOPHER.

[Those who know little readily pronounce judgment.]

MEDIAEVAL SCIENTIFIC UNIVERSITIES [8]

Probably nothing is more surprising to any one who knows the history of science and of scientific education than the attitude of mind of the present generations, educated as they are mainly along scientific lines, toward the supposed lack of interest of preceding generations in science. Our scholars and professors seem to be almost universally of the opinion that the last few generations are the first who ever devoted themselves seriously to the study of science, or who, indeed, were free enough from superstitions and persuasions and beliefs of many kinds to give themselves up freely to scientific investigation. In the light of what we know or, perhaps I should say, what we are coming to know now with regard to the educational interests of the men of the various times, this would be an amusing, if it were not an amazing, presumption on our part. Over and over again in the world's history men have been interested in science, both in pure science and in applied science, in the culture sciences and in the

[8] The material for this address was originally gathered for a lecture in a course on the History of Education delivered to the Sisters of Charity of Mount St. Vincent's, some 500 in number; teachers in the Catholic public schools of New York City, and for corresponding lectures to the Academy of the Sacred Heart, Kenwood. The address was delivered substantially in its present form at the Catholic Club of Cornell University, under the title "The Relations of the Church to Science."

practical sciences.

Apparently men forget that philosophy is science and ethics is science and metaphysics is scientific and logic is science and there is a science of language. Of course the protest that will be heard at once is that what we now mean by science is physical science. Even taking the word science in this narrower sense, however, how can people forget that our mathematics comes to us from the old Greeks, that old Greek contributions to medicine and, above all, to the scientific side of it still remain valuable, that physical science, pure and applied, developed wonderfully at the University of Alexandria, that there was a beginning of chemistry and the great foundations of astronomy laid in the long ago, and that men evidently were quite as much interested in the problems of nature around them as they have been at any time: Archimedes insisting that if he only had some place to rest his lever he could move the world, inventing the screw pump, fashioning his great burning-mirrors, and a little later Heron inventing the first germ of the turbine engine, while all the time their colleagues and contemporaries were developing the mathematics in connection with them, are studying both pure and applied science. It is simply failure to state in terms of the present what was accomplished in the past, that has permitted people to retain curious notions of the absence of science in antiquity.

Probably most people would be quite ready to concede, and especially after even a brief calling to their attention of some educational facts, that the old Greeks did enjoy a scientific

educational development; it would probably even be admitted that the traditions of science of various kinds from Egypt, from Chaldea, from Babylonia point to previous eras of scientific development. They would probably still insist, however, that there had been a long interval of utter neglect of science lasting nearly 2,000 years and that our interest is properly a resurrection of science-study after a long burial. They do not even hesitate to blame the educational authorities of the interval for their failure to occupy themselves with scientific ideas and are prone to find reasons of various kinds to account for this failure. As the Church was dominant in education during the Middle Ages this makes a ready scapegoat, and so we have heard much of the repression of scientific study by the ecclesiastical authorities, and the determined effort made to keep men from inquiring about the problems of nature around them, because this would lead them to think for themselves and have doubts with regard to faith. Indeed this attitude of mind in the history of science is so usual that it is a commonplace, and men who are supposed to be scholars talk off-handedly of direct Church opposition to science.

There is no doubt at all that the Church was the commanding influence in education during the Middle Ages. Whatever was studied was taken up because the Church authorities were interested in it. Whatever was not studied was absent from the curriculum because of their lack of interest. While study was magnificently encouraged there were many subjects, though not near so many as is often thought, that were repressed. The

Church must certainly be held responsible in every way for the teaching of the Middle Ages, both as regards its extent and its limitations. The charters of the universities were granted by the Popes. The universities themselves usually were cathedral schools which had developed, and to which had become attached various graduate departments. The ecclesiastical authorities were in control of them. The rector of the university was usually the archdeacon of the cathedral or the chancellor of the diocese. The professors at the universities were practically all of them in clerical orders, and the great body of the students were clerics, in the sense that they had assumed at least minor orders and were supposed to be in preparation for a clerical life. This was, indeed, the one sure way to secure exemption from the military duties of the time and to prevent interference of various kinds by the civil power with the leisure necessary for study. No man had any essential rights in the Middle Ages except such as were conferred on him by some organization to which he belonged, and the clerical order was particularly powerful.

Now the interesting phase of the education afforded by these universities under ecclesiastical control with clerical students and professors constituting the large majority of members, with the influence of the religious orders paramount for centuries, is that it was entirely scientific in character and largely occupied with the physical sciences, though the culture sciences formed the basis of it. Huxley, though he is surely the last man of recent times who would be suspected for a moment of exaggerating the

scientific significance of mediaeval education, recognized this fact very well and stated it very emphatically. In his Inaugural Address on Universities Actual and Ideal, delivered as Rector of Aberdeen University after discussing the subject with evident careful preparation, he said:

> "The scholars of the mediaeval universities seem to have studied grammar, logic and rhetoric; arithmetic and geometry; astronomy, theology and music. Thus, their work, however imperfect and faulty, judged by modern lights, it may have been, brought them face to face with all the leading aspects of the many-sided mind of man. For these studies did really contain, at any rate in embryo, sometimes it may be in caricature, what we now call philosophy, mathematical and physical science and art. ***And I doubt if the curriculum of any modern university shows so clear and generous a comprehension of what is meant by culture, as this old Trivium and Quadrivium does."*** (Italics mine.)

Of course Huxley says, "sometimes it may be in caricature." We must not forget, however, that first even Huxley hesitates to say that it is caricature, for he knows how easy it is to be mistaken in our estimation of the true significance of an old-time mode of thought, and then, too, he knew comparatively how little we were sure of the real thoughts and conclusions of these men of the olden time because of defective sympathy and even defective knowledge of their work. Our knowledge in this matter has greatly increased since his time. As a matter of fact,

the more we know about these old masters and the mediaeval universities the less are we likely to think of their work as lacking in seriousness in any sense. The quarter of a century that has elapsed since Huxley so cogently urged this at Aberdeen has brought many facts unknown to us before and has shown us what good work, even in the physical sciences, was accomplished in these old-time universities.

For instance, nothing is more common in the mouths of certain kinds of scholars than the expressions of wonder as to why men did not study nature more assiduously before our time. Here is a magnificent open book full of the most alluring lessons which any one may study for himself, and that somehow it is presumed men neglected down to our time. We are the age of nature students, and preceding times are looked at askance for having neglected the opportunities that lay so invitingly open to them in this subject. It has always been a wonder to me how people dare to talk this way. Our old literatures are full of observations on nature. In my book on "The Popes and Science" I take Dante as a typical product of the universities of the thirteenth century, and show without any difficulty as it seems to me, that there is no poet of the modern time who can draw figures from nature which demand even a detailed knowledge of nature with so much confidence as Dante. He knows the most intimate details about the birds, about many animals, about the ways of flowers, about children, describes some experiments in science, has a wide knowledge of astronomy and in general is familiar

with nature quite as much if not more than any modern writer not ***ex professo*** a naturalist. He describes the metamorphosis of insects, how the ants communicate with one another, knows the secrets of the bees and exhibits wide knowledge of the secrets of bird life.

The presumption that people did not study nature in the olden time is quite unjustified. They did not write long books about trivial subjects of nature-study. They did not conclude that because they were seeing something for the first time, that that was the first time in the world's history it had ever been seen. They were gentle, kindly scholars who assumed that others had eyes and saw too, and as fortunately there was no printing press there was not that hurried rushing into print, with superficial observations and still more superficial conclusions, which has characterized so much of our recent literature of nature-study and that has been so well dubbed "nature faking." Of course we have had faking of the same kind in nearly everything else: we have history faking in our supposed historical romances, science faking in our pseudo-science, science-history faking in our ready presumption that the men of the olden time could not have had our interests, and, above all–may I now say it?–in our cheap conclusion that there must have been some reason for their lack of interest in science, and then the assumption without anything further, that it must have been because of the Church.

Just as soon as there is question of there having been any serious scientific study during the Middle Ages, in the sense

of observations in physical science, investigation of the physical phenomena of nature and the drawing of conclusions from them and the evolving of laws, there are a large number of people who consider themselves very well informed, who will at once object that this must be quite absurd, since at this time Lord Chancellor Bacon had not as yet laid down the great foundations of the physical sciences in his discussion of inductive reasoning. I have already ventured to suggest, in the address on "The First Modern University," how utterly ridiculous any such notion is. I have quoted Lord Macaulay and Huxley as ridiculing those who entertained such an idea. Here I may be permitted to recur to the subject by quotations from the same authorities. I have often found that anything I myself said in this matter was at once considered as quite incredible, since my feelings were entirely too favorable toward the Middle Ages and then my religious affiliations are somehow supposed to unfit me for scientific thinking. Fortunately Macaulay and Huxley have expressed themselves in this matter even more vigorously than I would be likely to, and so I may simply quote them.

As Lord Macaulay wrote in his well-known essay:

> "The vulgar notion about Bacon we take to be this, that he invented a new method of arriving at truth, which method is called induction, and that he detected some fallacy in the syllogistic reasoning which had been in vogue before his time. This notion is as well founded as that of the people who, in the Middle Ages, imagined that Virgil was a

> great conjurer. Many who are far too well informed to talk such extravagant nonsense entertain what we think incorrect notions as to what Bacon really effected in this matter."

Still more apposite is what Professor Huxley has to say. Discoursing on the phenomena of organic nature, after warning his auditors not to suppose that scientific investigation is "some kind of modern black art," he adds: "I say that you might easily gather this impression from the manner in which many persons speak of scientific inquiry, or talk about inductive and deductive philosophy, or the principles of the 'Baconian philosophy.' To hear people talk about the great Chancellor–and a very great man he certainly was–you would think that it was he who had invented science, and that there was no such thing as sound reasoning before the time of Queen Elizabeth.

> "There are many men who, though knowing absolutely nothing of the subject with which they may be dealing, wish nevertheless to damage the author of some view with which they think fit to disagree. What they do is not to go and learn something about the subject; . . . but they abuse the originator of the view they question, in a general manner, and wind up by saying that, 'After all, you know, the principles and method of this author are totally opposed to the canons of the Baconian philosophy.' Then everybody applauds, as a matter of course, and agrees that it must be so."

Lord Bacon himself so little understood true science that he condemned Copernicanism because it failed to solve the

problems of the universe, and condemned Dr. Gilbert, the great founder in Magnetism, whose work was the best exemplification of inductive science of that time. Of course Bacon did not invent science nor its methods. He was only a publicist popularizing them. They had existed in the minds of all logical thinkers from the beginning. His great namesake, Friar Bacon, much better deserves to be thought a pioneer in modern physical science than the chancellor,–and he was a mediaeval university man.

We are prone to think of the old-time universities as classical or literary schools with certain limited post-graduate features, more or less distantly smacking of science. The reason for this is easy to understand. It is because out of such classical and literary colleges our present universities, with their devotion to science, were developed or transformed during the last generation or two. It is to be utterly ignorant of mediaeval education, however, to think that the classical and literary schools are types of university work in the Middle Ages. The original universities of the thirteenth and fourteenth centuries paid no attention to language at all except inasmuch as Latin, the universal language, was studied in order that there might be a common ground of understanding. Latin was not studied at all, however, from its literary side; to style as such the professors in the old mediaeval universities and the writers of the books of the time paid no attention. Indeed it was because of this neglect of style in literature and of the niceties of classical Latin that the university men of recent centuries before our own, so bitterly condemned

the old, mediaeval teachers and were so utterly unsympathetic with their teaching and methods. We, however, have come once more into a time when style means little, indeed, entirely too little, and when the matter is supposed to be everything, and we should have more sympathy with our older forefathers in education who were in the same boat. We have inherited traditions of misunderstanding in this matter, but we should know the reasons for them and then they will disappear.

As a matter of fact, exactly the same thing happened in our modern change of university interests during the latter half of the nineteenth century as happened in the latter half of the fifteenth century in Italy, and in the next century throughout Europe. With the fall of Constantinople the Greeks were sent packing by the Turks and they carried with them into Italy manuscripts of the old Greek authors, examples of old Greek art and the classic spirit of devotion to literature as such. A new educational movement termed the study of the humanities had been making some way in Italy during the preceding half-century before the fall of Constantinople, but now interest in it came with a rush. The clergymen, the nobility, even the women of the time became interested in the New Learning, as it was called. Private schools of various kinds were opened for the study of it, and everybody considered that it was the one thing that people who wanted to keep up to date, smart people, for they have always been with us, should not fail to be familiar with. The humanities became the fashion, just as science became the fashion in the nineteenth

century. Fashion has a wonderfully pervasive power and it runs in cycles in intellectual matters as well as in clothes.

The devotees of the New Learning demanded a place for it in the universities. University faculties perfectly confident, as university faculties always are, that what they had in the curriculum was quite good enough, and conservative enough to think that what had been good enough for their forefathers was surely good enough also for this generation, refused to admit the new studies. For a considerable period, therefore, the humanities had to be pursued in institutions apart from the universities. Indeed it was not until the Jesuits showed how valuable classical studies might be made for developmental purposes and true education that they were admitted into the universities.

Note the similarity with certain events in our own time in all this. Two generations ago the universities refused to admit science. They were training men in their undergraduate departments by means of classical literature. They argued exactly as did the old mediaeval universities with regard to the new learning, that they had no place for science. Science had to be learned, then, in separate institutions for a time. The scientific educational movement made its way, however, until finally it was admitted into the university curricula. Now we are in the midst of an educational period when the classics are losing in favor so rapidly that it seems as though it would not be long before they would be entirely replaced by the sciences, except, in so far as those are concerned who are looking for education in literature

and the classic languages for special purposes.

It will be interesting, then, to trace the story of the old mediaeval universities as far as the science in their curriculum was concerned, because it represents much more closely than we might have imagined, or than is ordinarily thought, the preceding phase of education to the classical period which we have seen go out of fashion to so great an extent in the last two generations. We shall readily find that at least as much time was devoted in the mediaeval universities to the physical sciences as in our own, and that the culture sciences filled up the rest of the curriculum. Philosophy, which occupied so prominent a place in older university life, was not only a culture science, but physical science as well, as indeed the name natural philosophy, which remained almost down to our day, attests.

Physical science was not the sole object of these mediaeval institutions of learning, but they were thoroughly scientific. The main object of the universities in the olden time was to secure such discussion of the problems of man's relation to the universe, to his Creator, to his fellow-creatures and to the material world as would enable him to appreciate his rights and duties and to use his powers. Huxley declared that the trivium and quadrivium, the seven liberal arts studied in the mediaeval universities, probably demonstrate a clearer and more generous comprehension of what is meant by culture than the curriculum of any modern university. Language was learned through grammar, the science of language. Reasoning was learned through logic, the science of

reasoning; the art of expression through rhetoric, a combination of art and science with applications to practical life. Mathematics was studied with a zeal and a success that only those who know the history of mediaeval mathematics can at all appreciate. Cantor, the German historian of mathematics, in hundreds of pages of a large volume, has told the story of the development of mathematics during the centuries before the Renaissance, that is from the thirteenth to the fifteenth, in a way that makes it very clear that the teaching at the universities in this subject was not dry and sterile, but eminently productive, successful in research, and with constant additions to knowledge such as live universities ought to make.

Then there was astronomy, metaphysics, theology, music and law and medicine. The science of law was developed and, above all, great collections of laws made for purposes of scientific study. Of astronomy every one was expected to know much, of medicine we shall have considerable to say hereafter, but in the meantime it is well to recall that these mediaeval centuries maintained a high standard of medical education and brought some wonderful developments in the sciences allied to medicine and above all in their applications to therapeutics. Surgery never reached so high a plane of achievement down to our own time, as during the period when it was studied so faithfully and developed so marvellously at the mediaeval universities. It was inasmuch as a knowledge of physics was needed for the development of metaphysics that the mediaeval schoolmen devoted themselves

to the study of nature. They turned with as much ardor and devotion as did Herbert Spencer in the nineteenth century, to the accumulation of such information with regard to nature as would enable them to draw conclusions, establish general principles and lay firm foundations for reasonings with regard to the creature and the Creator. It is, above all, this phase of mediaeval teaching work, of the schoolmen's ardent interest that is misunderstood, often ignored and only too frequently misrepresented in the modern time.

For instance, in the discussion of the status of matter in the universe the scholastics and notably Thomas Aquinas had come to the conclusion that matter was absolutely indestructible. He even went so far as to say that man could not destroy it, and God would not annihilate it. ***Nihil omnino in nihilum redigetur***--nothing at all will ever be reduced to nothingness, was his dictum as the conclusion of a course of lectures on this subject. He saw the changes in matter all round him that were supposed to be destructive, the burnings, the vaporizations, the solutions, the putrefactions and all the rest, but he knew that these only brought changes in matter and not destruction of the underlying substance. For him, as for all the scholastic philosophers, matter was composed of two principles, as they were called. One of these was prime matter and the other form. To prime matter, one of these, matter or substance owed all its negative qualities, inertia and the like. To form, the dynamic element or principle, it owed all its individuating qualities. Prime matter was the same

in all things. Form was the energy or bundle of energies, the dynamic principle, as we have said, which entering into prime matter, made the different kinds of matter that we speak of.

It is extremely interesting to compare this old scholastic teaching with the modern ideas of the composition of matter and especially the notions which have come to us from researches in physical chemistry in recent years. Our scientists no longer believe that we have some eighty different elements, essentially different kinds of matter, that cannot by any chance or process be changed one into another. We have seen one form of elementary matter changing into another, helium emanations becoming radium, have heard of Professor Ramsay's transmutation of various elements, and have about come to the conclusion that in the radio-active substances we have a wonderful transmuting power. A prominent American professor of chemistry declared not long since that he would like to treat a large quantity of lead ore in order to extract from it all the silver which so constantly occurs in connection with it in the natural state, and then having put the lead ore aside for a score of years, would like to examine it again, confident that he would find traces of silver in it once more, which had developed as a consequence of the radio-activity present in the substance and which is constantly changing lead into silver in small quantities. Newton's declaration, when he saw crystals of gold in connection with copper, that gold had been developed from the copper, seemed very foolish a century ago, but no one would consider it so at the present moment.

Конец ознакомительного фрагмента.