

THE MICHIGAN ALUMNUS

Vol. VI.—MARCH, 1900.—No. 52.

GRADUATE WORK.

A SYMPOSIUM.

There are many and widely different conceptions of what constitutes graduate work. In fact, there is unfortunately no uniformity in the standards of under-graduate courses of study in our colleges and universities. The bachelor's degree may mean much, but frequently means but little. There are numerous legally chartered colleges, empowered to confer degrees, that are by no means of equal grade with the best high schools, and these are turning out hundreds of graduates every year. I do not mean to say that the small college is altogether worthless, but it should be estimated at its true value. Many of them are without the equipment necessary to give liberal courses of study. Some of the universities are so anxious to increase their numbers that they make special bids for the graduates of the smaller colleges and enroll them as graduate students. Many of these so-called graduate students do work of the most elementary character, but in many institutions any work done by a student who has already received a degree is designated graduate study. It is needless to say that this designation is a misnomer, and that the majority of students of this class are by no means prepared to do research work.

According to another conception of this subject it is held that any study in advance of that required in the undergraduate curriculum may be properly designated as graduate work. According to this conception if one reads a classic not ordinarily read in course he is supposed to be doing graduate work. On the same basis, one may be said to be doing graduate work in history when he reads larger volumes and acquaints himself with details not given in the ordinary college text-books. Similar standards have been applied to work in the experimental sciences. While graduate work in this sense is by no means devoid of value, it is not that with which I am at present concerned.

True graduate or research work has for its object the extension of the bounds of positive knowledge. Its problems are unlimited, and the difficulties to be overcome in their solution and the results to be attained are of widely different values. It is useless for one to attempt research work until he has perfectly familiarized himself with the literature of his subject. If others have attempted to solve the same problem, he must be able to go over their records critically and logically. Only the exceptional student can at-

tempt research without the aid of a good teacher,—one who can point out the way and be ready to lend a helping hand when needed. While a research teacher must be one who has carried out original investigations for himself, it does not necessarily follow that the man who has been most successful in his own researches will be the best guide in this line. Great research teachers, like the late Professor Ludwig of Leipsic, are rare. However, men moderately successful in work of this kind may be found in all of our best universities. A good research teacher must have ideas. In the experimental sciences he must be both imaginative and logical. His imagination must picture the unknown, and his reason must guide him as he proceeds from the known to that which has been conceived.

In the second place, a research library is essential to the organization and development of good graduate work. By a research library I mean one containing books in which the original records of investigators may be found. The student who attempts a piece of research without first familiarising himself with all that has been done along that line wanders in the dark and is pretty sure to fall into the ditch. It is not the size of a library that determines whether or not it is adapted to research work. This depends upon the character of the volumes. Our university libraries formerly were filled largely with text-books. These soon cease to have any value at all. At least this is true of most of them. A research library is made up largely of standard journals and monographs. These are the books which have permanent value.

Both the research teacher and his graduate students should have ample time in which to carry out their investigations, and they should be furnished with every equipment necessary. The only ideal research school, established up to the present time, is that of Experimental Medicine at St. Petersburg. Here extensive laboratory buildings have been constructed. They lack nothing in the way of equipment. To these laboratories the best scientific men in Russia have been called. They are furnished with every facility possible and have nothing else to do but devote their whole time to research work.

In this country the conditions prevailing in our universities are not altogether favorable for research. In the first place there are many professorial chairs still held by men who think that the chief duty in the life of a college professor is to drill his students in the text-books. However, these men belong to the past and will soon be replaced by others. I think that the first duty of a university professor is not only to make himself master of the subject which he teaches, but to make contributions to that subject. I have no doubt that the time will come when the laboratories of the great universities of America will turn out original research quite equal to any furnished by the European universities.

Victor C. Vaughan, '75, '78 m.

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The phrase graduate work, properly understood, contains the vital principle of higher education in the United States. Interpreted in the light of what is needed to adjust education to the demands of current life, it provides the directing principle for the future organization and development of a University. The history of education declares that effective instruction has always held in mind the connection between knowledge on the one hand, and the use to be made of knowledge on the other. Whenever formal education, on account of over-development of the scholastic spirit within or of changes in the condition of life without, has ceased to conform to the real needs of the people, enthusiasm for education, by which alone it can achieve great ends, is seriously checked; and while, under such conditions, a system of higher education may perhaps continue, it must content itself with an appeal to the needs of a comparatively narrow class, if, indeed, it does not degenerate to the service of a privileged class.

Such, speaking generally (for one can be neither entirely courteous nor entirely truthful in discussing a broad subject in brief space), was the situation of higher education in this country twenty-five years ago. An American student was then obliged to go to Germany for preparation in any of the lines of professional activity outside the three established professions, and in the case of these professions (the ministry not entirely excepted), the tendency was for professional education to ignore the scholarly side of university instruction.

The turning from so pernicious a tendency took place under the influence of graduate work, and graduate work was successful just as far as it adjusted itself to newly recognized professional needs. The chief outlet for graduate students was for a number of years college, university and laboratory positions; and as long as there continued to be a demand for high-grade instructors, graduate schools flourished and were prosperous. The conclusion of the argument suggested by these brief statements is clear. If graduate work in our universities is to continue its development, it must seek out other needs of the community than the profession of teaching and demonstrate by the superior successes of those whom it trains the importance of careful preparation for all the highly specialized lines of social and industrial activities. This, in my opinion at least, should be the guiding principle in the organization and administration of advanced work. The graduate school should be brought distinctly and avowedly under the influence of the professional idea, but in so doing the conception of professionalism should be as broad and comprehensive as the demands of life.

To go beyond this simple statement would require an extended argument, the object of which would be to show that this view of the case does not ignore the legitimate claims of general education, but rather that it is the only view which can result in a broad diffusion of general education; that it is in harmony with the trend toward specialized service so characteristic of mod-

ern life ; that scholarship, whether represented by attainment of knowledge or power for research, will not be endangered by placing advanced work under the guidance of what is socially practical and useful ; and finally, that this view of advanced work conforms to the end toward which the professional schools, in the University of Michigan at least, are striving. The ideal of university development is that all professional work should be advanced work, and there is no means of so surely arriving at this ideal as a frank recognition of the practical as well as the social end of education.

Henry C. Adams.

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A fundamental misconception of the meaning of research work is too often apparent. Untrained beginners are set at some hackneyed problem which involves little thought on their own part or on that of the proposer, and no knowledge of the general aspects of the subject, the results, even if the ultimate end is accomplished, being of little value to science as a whole—and yet these tyros are told they are, and suppose themselves to be, engaged in original investigation. For this reason, all competent workers should continually reiterate the fact that training of the most careful and conscientious kind, not only in the immediate subject of interest, but also in all of the branches related to it, must always precede any endeavor to enter into new and untried paths. The better the preliminary education the better the results, provided always the worker has the proper capabilities and enthusiasm. If the impulse and spirit is lacking, the attempt to do anything had better be abandoned. No good ever came from compulsion either from without or within.

True research does not occupy itself merely with the observation of a few details which of necessity suggest themselves in conjunction with any subject, but it must also connect the facts which it has established with those observed by others, in such a way that the results will form a portion of the whole structure of science. In other words, the investigator must be able to generalize—or do hack work. Without generalization there would be no sciences, and the present comity existing between kindred disciplines would be absent. Observations, however carefully carried out, are not research, and it is wrong to call the mere observer a research worker.

The logical result of the above argument is that the student, in order to accomplish anything as an original worker must clearly realize the necessity not only of a thorough understanding of his own subject and of the allied branches, but also the importance of a good substratum of general culture. The more a man has used his brain as an apparatus for thinking, the more will he be able to do in research. For this reason the undergraduate should not be too anxious to specialize. Let him, perhaps, during his four years' course, obtain some insight into the underlying facts and theories of his

chosen science, but, of all things, let him beware of neglecting the opportunity of familiarizing himself with the world which surrounds both him and the subject to which he intends to devote himself.

The undergraduate who really means to accomplish something, makes no greater mistake than to suppose himself able to do without graduate work. All beginners are dependent on their teachers, the advanced student should learn to depend upon himself, and this end can only be reached after the necessary preliminary routine is completed.

An undergraduate cannot be expected to master the necessary details of a profession. He must and will be an amateur. If he really loves the subject he has chosen he certainly should be willing and anxious to prepare himself for further development by graduate study. Here, too, the brief time given to obtaining the master's degree is not sufficient for any valuable results in research; nor indeed, if the student has properly used his time during the preliminary period of training, will he be prepared to properly launch himself in the higher fields of original investigation. He had far better devote the interval given to the intermediate degree to acquainting himself with the necessary details of his chosen subject, with its relations to other sciences and to gaining as good an insight as possible into its literature and history. In this way the worker will discover in what portion of the field an original investigation can be carried on, understand its relative importance and comprehend the way in which it is related to the whole structure of which it is to form a part. A man so trained may do something worthy of the doctorate and also worthy of the vast field of scientific thought into which he has entered.

Above all, no one should strive to begin scientific work actuated solely by mercenary considerations. The question is too often asked "where can I apply this to some practical end? How can I make money out of this subject?" No more blighting influence to scientific development can be imagined. It deprives science of the very essence of its existence—the universal comity of knowledge—it changes that which might be for the good of all, into something for the benefit of the individual pocket-book; it retards rather than accelerates growth. The history of each individual case is but a repetition of the universal history of science. A premature attempt to apply what he has acquired to practical ends simply results in robbing the student of his power for further development. It leaves him where he stands for all time to come, and his more studious brethren will soon pass and distance him, regardless of the fact that his immediate pecuniary gain may be greater.

The sciences of today form a body of great generalizations, none of which have come to us through the efforts of one man; they are, on the contrary, a result of gradual growth in each step of which the mental acumen of some investigator, perhaps long since dead, can be seen, and each research of today is built upon some perhaps equally great one of yesterday.

Science is a stern mistress who gives of the best within her only to those

who follow her unflinchingly, however difficult the task, however remote the prospect of pecuniary gain or of self-aggrandizement, their sole hope being that they too may add to mankind's knowledge of truth, so that future generations may profit by the sacrifices of the present. This has been the spirit of the past; it must also be the spirit of the present and of the future. Science is moving onward, swiftly, relentlessly, unflinchingly—no half-hearted followers for her—the weak fall by the wayside, there is no place for those who have not the patience to acquire the necessary knowledge, the strong press forward in fierce rivalry, each striving for the ultimate goal—a perfect human knowledge by which from any given premises the logical conclusion may be drawn with unerring accuracy.

Paul C. Freer.

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Limitations of space preclude the statement of reasons for the few suggestions I have to make in connection with graduate work. But those who are familiar with this aspect of academic teaching will be able, doubtless, to fill the gaps for themselves.

First, then, as to graduate work in general. No student should enter upon advanced work, leading to definite specialization, unless convinced of a "call." He ought to recognize in himself a distinct *métier* or bent towards the line he chooses. It is all humbug, or self-deception of the worst kind, to undertake such study, because it is a nice thing to do, or because it may, conceivably, open up desirable positions to one. Nor can the necessary conviction be the product of a certain vague enthusiasm either for a teacher or for a subject. It must have grown up, slowly but surely, as the result of a gradual process of crystallization taking place throughout an extended period of undergraduate familiarity with the selected topic. "Kirk o' Scotland, right about face, quick march!" as the Highland sergeant said to his men at church parade, "fancy releegions, bide whaur ye are." Graduate work has no room for "fancy releegions"—for mere supposed likes and dislikes. It implies an overmastering interest and a willingness, for the most part unconscious, because integral to the student himself, to make every self-sacrifice in behalf of learning. In a word, it demands consecration. Unless founded deep and sure on proved ability and on tested affinity, attempts to attain the upper reaches of mastery are doomed to end fatally for all concerned, teachers and pupils alike. Therefore I hold it for a stupid error that any professor should press his subject on a student simply because it is *his* subject, just because a certain man professes it. Higher work exists, not for the teacher, but for the student. Moreover, some of our present academic tendencies go to prove that this undesirable process does exercise influence, even although everyone who thinks for a moment must foresee the inevitable consequence. We tend to coddle our graduate students too much, to help them over stiles as if they were selected lame dogs, to stuff them with spoon-meat or other food hardly

fit even for freshmen. As I conceive of the matter, a graduate student is no longer one who requires, first and foremost, to be crammed with facts. Rather, he stands in dire need of stimulus, of principles, of the example that flows from a personality so far finished, one which this very finish transfuses into another character as yet in the gristle of scholarship. Graduate work presupposes comity between teacher and taught. The teacher must possess an ideal of his subject; the pupil must be prepared to appreciate companionship. And the essence of whole matter centers in the ability of the former to infuse his ideal of his subject into the latter; in the preparation of the latter to be thus influenced.

Second, graduate work in particular—as it stands related to philosophy. The several disciplines included under the name philosophy happen to occupy a wholly peculiar position, so far as they may be of interest to students who propose to specialize on advanced lines. “All roads lead to Rome”—and to philosophy. To come at once to the point—this subject has no precise parallel as a *supporting* study. Name almost any department of research you choose, from chemistry to religion, and you will find one or other of the philosophical disciplines exceedingly useful, if not indispensable. The physicist *is*, as the old title runs, a natural philosopher; and there are deep reasons for calling apparatus for the laboratory philosophical instruments, notwithstanding Hegel’s scorn. In literature, classical or modern; in sociology, in jurisprudence, in history; to be brief, in all the human sciences, acquaintance with philosophy in some sort is essential. The man who does not possess the philosophic temper cannot but be terribly handicapped, and, as he grows older, he cannot fail to attempt to remove this limitation, as numerous examples prove. In the natural and biological sciences, the necessity is not so obvious; and I am of opinion that it varies in strength from epoch to epoch. Science has done very well without philosophy for the last fifty years. Nevertheless, during this period, the greatest men *have* been philosophers—Darwin, Helmholtz, Huxley, Romanes, Mach and many others. Furthermore, as problems now stand, we seem to be entering upon a period which is likely to be marked mainly by a very close alliance between scientific workers and philosophers. We have amassed plenty of information, but our insight has not kept pace with our acquisitions. Of course the old stock dogmatisms that used to stand for philosophy, and still stand for it in so many American institutions, are worse than useless; they are so much lumber—indeed they never had any accurate meaning. But philosophy, as understood by men of modern training, by those who are alive to the contemporary status of problems and to the needs of the moment, cannot, as I think, be less useful to the scientist than it is to the humanist. Possibly, it may be even more indispensable to the former, as the stress of the present generation tends.

Finally, in regard to the question of adopting philosophy as a *Haupt-*

fach. If a man be well endowed with this world's goods he may make his own choice with a freedom denied to his less fortunate fellows. On the other hand, the average student, who looks to an academic position for his livelihood, ought not to be recommended to adopt philosophy as his life-work unless he display promise which may justify one in the belief that, some day, he will rise to the highest rung of the ladder. I do not deem it fair to press philosophy as a major upon graduate students in other circumstances. At the same time it may be remarked that, given clear original ability, there is no pursuit now in a more promising condition. At the top there is room and to spare, for, even decently respectable attainments in this subject are a good deal rarer than outsiders might think, basing their judgment, as they must, upon the demeanor of persons who are "professors of philosophy." The contrast between the sophist (he who is wise in his own conceit) and the philosopher (he who loves truth) still remains all too patent. *R. M. Wenley.*

THE HYGIENIC LABORATORY.

Inasmuch as the Laboratory of Hygiene is a somewhat recent addition to the University it may be that a brief statement of its origin and of the work carried on in that department will be of interest to the readers of the ALUMNUS. In this as in other educational problems the University was among the first to recognize the need and value of a well equipped hygienic laboratory. It is a matter of no little pride to the alumni to know that the laboratory was the pioneer of its kind in this country. Since then other universities and states have followed in the footsteps of Michigan, but none have laid a broader and more thorough foundation for work in hygiene.

The hygienic laboratories are relatively modern institutions. A score of years ago only one university—that of Munich—could boast of the possession of such a department. At that time investigations in the domain of hygiene followed along purely physical and chemical lines. For example, the purity of a water was judged wholly by chemical methods; poisonous foods would be tested solely for the presence of metallic and vegetable poisons, and adulterations were looked for by chemical and microscopical means. Epidemic diseases, the most important factor in public health, received only such consideration as could be obtained from a purely epidemiological standpoint. It is not surprising, therefore, that the laboratory instruction during that period, in so far as it was given at all, was largely applied chemistry.

The classical researches of Pasteur and of Koch at about this time brought to light the new science of bacteriology. The realization that germs were man's deadliest enemies gave a wonderful impetus to hygiene inasmuch as health problems could be approached from a very definite and most important standpoint, that of the cause. The establishment of the Hygienic In-

stitute of the University of Berlin in 1885, six years after that of Munich, gave a precedent which was soon followed by other universities. The importance of this new trend of thought may be gathered from the fact that during the next six years nearly every one of the twenty-six German and Austrian universities organized laboratories of hygiene.

The scope and usefulness of a hygienic laboratory is three-fold. It was called into existence by the desire or demand for a knowledge of the hidden facts which bore upon the causation of disease. The first object, therefore, of such an institute is to carry on original investigations whereby the bounds of knowledge will be materially widened. The practical application of known facts in elucidating health problems and in preventing disease constitutes another aim of a hygienic laboratory. The sanitary analysis of water, milk, butter and foods in general; the identification of disease-producing organisms in suspected tuberculosis, diphtheria, typhoid fever and in other affections render such a laboratory useful to the community. The third, and by no means the least important object of a hygienic laboratory, is that of instruction. That department is really useful which combines teaching with original research and in a university it is difficult to conceive how one can be fostered without the other. If Franklin's maxim that "Public health is public wealth" be true, then it is evident that instruction in general hygiene and in bacteriology constitutes an important means to a very desirable end.

It was largely the appreciation of these needs which prompted the Michigan State Board of Health to take the initiative in urging upon the Regents of the University and upon the legislature the request for a state laboratory of hygiene. It was the persistent demand of the Board of Health, in face of no little opposition, which resulted in the establishment of the hygienic department in the University.

The first step in the direction of establishing the hygienic laboratory was taken at a meeting of the State Board of Health in October, 1886, when a resolution was passed to the effect "that the Regents of the University be respectfully requested to consider the advisability of establishing a laboratory of hygiene in which original investigations—chemical, microscopical and biological—shall be carried on, and attention shall be given to the subjects of the analysis of water, the adulteration of food and the practical investigations of other questions in sanitary science." A committee of the State Board, consisting of Professor Henry F. Lyster, Professor V. C. Vaughan and Dr. Henry B. Baker conferred with the Regents of the University with the result that the latter body expressed a willingness to establish a laboratory of hygiene if the necessary means were provided by the legislature.

At a later date the State Board of Health memorialized the legislature to establish a well-equipped laboratory of hygiene at the University. Success eventually crowned the efforts of the Board and a generous appropriation by the legislature of 1887 enabled the Board of Regents to establish in that year

the Department of Hygiene. The erection of a suitable building to be used conjointly with the department of physics, was at once begun, and in the fall of 1888 the new laboratory was ready for occupancy.

Eleven years have passed since the laboratory entered upon its work in its present quarters. During these years the health officers throughout the state have freely drawn upon the services of the laboratory. The control of the purity of a water supply is readily effected by a chemical and bacteriological analysis, and for that reason the demand for such examinations has been very great. When it is remembered that these analyses are made for the mere cost of material it will be seen that the laboratory is truly useful to every part of the state.

In addition to the analysis of water, frequent demands have been made for the examination of poisonous cheese, milk and meats; the detection of adulterations and for divers other chemical analyses. Besides the chemical work, the health officer of any locality in Michigan can avail himself of the facilities of the laboratory for the diagnosis of communicable diseases. Specimens from cases of suspected consumption, diphtheria, typhoid fever and other affections are examined bacteriologically and the work of a local health officer is thus rendered more effective.

From the very beginning laboratory instruction has been given in bacteriology and in sanitary chemistry. A recent compilation, by Professor Ernst of Harvard, of the bacteriology requirements in the prominent schools of the world reveals the fact that Ann Arbor leads the list while Harvard is candidly admitted to be next to the lowest.

The change in the medical department from a three-year to a four-year course resulted in a serious overcrowding of the laboratory. The maximum capacity has been reached for some years and the need for new quarters is more and more imperative. The proposed "Science Hall" when realized will supply a long felt want and will enable the Hygienic Laboratory to maintain the position it has acquired as a research and teaching institute.

F. G. Novy.

THE TRAINING OF CHEMISTS FOR INDUSTRIAL WORK.

EXTRACTS FROM A LETTER WRITTEN BY PROFESSOR WM. M'MURTRIE, PRESIDENT
OF THE AMERICAN CHEMICAL SOCIETY, TO ONE OF THE
TEACHERS OF CHEMISTRY ON THE CAMPUS.

What the industries of today and the near future need, more than all and above all, is well educated—broadly educated men. Industrial chemists in this country, to be successful in the future must first of all be *thorough chemists*. They must know not only the general principles of the science, but they

must also know intimately and thoroughly the great facts and theories underlying it. Abstract knowledge must precede and serve as the ground work of concrete knowledge. Theory must precede practice.

So I would advise *all* students having industrial chemistry in view to study earnestly, theoretical chemistry—both inorganic and organic—and the great reactions upon which the classifications are based; to study deeply thermo-chemistry, electro-chemistry, chemical equilibrium; in fact physical chemistry in its broadest sense. In doing the work incident to this study, analytical chemistry will be followed and acquired and, with its study in this way, will come the feeling of responsibility regarding accuracy of manipulation and result, the need for economy of time in reaching results, the importance of systematic effort in research, and all will be made easier by the broader knowledge which has been acquired. I may illustrate the importance in practical operation of such theoretical knowledge as is here referred to. Last summer I listened in one of the meetings to an elaborate and somewhat theoretical paper in physical chemistry, about which I must confess I know but little, and I went home from the meeting and applied in the works the law developed and illustrated in the paper. It was of great value to me. Again, in another meeting in the discussion of a paper on a manufacturing process, difficulties were brought out which could not be explained or remedied. One who had devoted his time almost wholly to abstract physical chemistry and who was present, arose, declaring that the problem was of easy solution and demonstrated his position by means of differential and integral calculus and the laws of dissociation and osmotic pressures. The details of the demonstration could hardly be followed by all, but the results he arrived at were perfectly plain and showed the importance of such knowledge as his in the everyday experience in great industrial establishments.

No part of the great science of chemistry, therefore, can be neglected by those who expect in this country to become leaders in the chemical industries of the future, and no class of professional men needs broader or more generous education.

When the young men have thus become good chemists—thoroughly educated chemists—I would have them also fairly good engineers. The production and utilization of heat, the generation and transmission of power, the movement and storage of liquids, the handling and pulverization of solids—all these are as important in carrying out reactions in a large way, as is the construction and setting up of apparatus and the treatment of materials analytically and synthetically in the laboratory in a small way. As men are boys grown tall, so the industrial works are the laboratories and their appliances grown large. And to the successful industrial chemist of the future, the practical difference is narrow. Accuracy in manipulation is as important in the works as in the laboratories, but in addition, economy in manipulation must be considered in the former which need not be taken into account in the

latter. Hence the need of the engineer's skill in the former in addition to the chemist's knowledge, and both are essential.

Young men who can do so should therefore avoid hurry in their training. Employers do not want to be teachers. Most frequently they need to be taught. And the best of them want no question regarding the absolute reliability of what is taught them. The law with this regard among the best employers is as absolute as any of the reputed laws of the Medes and Persians, and the young men who go out prepared to meet promptly and accurately the demands of this law will not miss the additional two or three years of work done under the direction of careful and conscientious instructors. I have long felt the importance of what I have said here and have frequently been tempted to say it more elaborately in print. I have felt it particularly when it has been necessary to employ assistants and appreciated it most keenly when I have been able to secure the services of carefully educated men. I shall be glad therefore if these words shall influence even a few to better, broader and more thorough work in the preparation for life in the industries.

Wm. M'Murtrie.

DETROIT HIGH SCHOOL SCHOLARSHIPS.

The calendar of the University makes brief mention of scholarships that have been established at the University of Michigan for the benefit of graduates of the Detroit High Schools. It gives, however, no idea of the method by which they are regulated and maintained and but an inadequate notion of their scope. A more detailed account of this splendid work of the alumni of the Detroit High Schools may furnish encouragement or suggestion to alumni organizations of other institutions which have a similar purpose.

It was in 1891 that the fund from which these scholarships have been created was first inaugurated by the Detroit High School Alumni Association. The purpose of its establishment was "to assist graduates of the Detroit High Schools to secure a college education at the University of Michigan." In 1893 an association for the purpose of controlling this fund was duly incorporated under the laws of the state and known as the Detroit High School Scholarship Fund Association. In the short time that has elapsed since the inception of this Association nineteen students have been sent to the University, nine of whom have already been graduated, while ten are at present pursuing under-graduate work.

Members of the Scholarship Fund Association are of two kinds: Graduates who have paid their annual dues to the Detroit High School Alumni Association become by virtue of such payment *Alumni Members*. All persons, whether graduates or otherwise, may become members by pledging at least \$50.00 to the fund in annual payments of \$10.00 each. Such contribu-