

ACTING PRES. NOYES REPORT

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culum of the Course. This initiative has previously rested almost wholly within the single department most closely associated with the Course; but the composite character of our Courses seems to make desirable the closer participation of several departments in the matter; thus, to cite a rather extreme example, the Course in Mining Engineering and Metallurgy includes, in not very far from equal proportions, studies in these two subjects, in chemistry, in geology, and in mechanical engineering; and a well balanced course schedule can probably be best worked out through the joint co-operation of all the departments concerned. The same is true in greater or less degree of almost all our other Courses. Another important result that would be secured by this plan is a larger influence and participation in Faculty Department affairs of professors who are not in charge of departments.

This last consideration is one of great importance not only because of the direct value of the advice and opinions of these men, but also because it is essential to give to them positions of as much influence and responsibility as possible, if teachers and scientists of the first rank are to be secured and retained in our departments. To this end and also for the purpose of increasing the efficiency of our administrative system, I believe it is desirable that the formal organization of our departments—at any rate of the larger and more composite ones—be carried one step further and that there be definitely appointed, upon recommendation of the professor in charge of the department, other professors to take charge of the larger branches of instruction; for example, within the civil engineering department individual professors might be placed in charge of the instruction in structural, hydraulic, railway, and topographical engineering, respectively. As their titles would indicate, such men should deal with the distinctively educational aspects of the work of instruction intrusted to them, and should be held personally responsible for its success. To make such responsibility effective, they should be given the privilege of submitting to the President and Executive Committee, through the professor in charge of the department, recommendations as to the promotion and salaries of their own subordinates.

It is also, I believe, desirable that there be established a more definite system of promotion and salary-payments applicable to all the departments of the Institute. This seems important from many points of view—as a relief to the President and heads of departments in deciding many vexatious personal questions, as a means of securing uniformity of treatment throughout the Institute, and as an aid in improving the character of our staff.

The Registration of Students

The number of students now registered at the Institute is 1461, an increase of 51 over the number attending at the same time last year. This is mainly accounted for by the fact that the first-year class contains 57 more students than it did a year ago, while the three higher classes, taken together, include about the same number of students as last year.

This large increase again raises the much discussed question whether a limitation should be placed upon the number of our students. Upon this matter my own opinion is that it should be the experimental policy of the Institute to receive and provide for all those capable and well prepared students who desire to avail themselves of the opportunities it offers; for only in this way can it attain its full measure of usefulness. It should not be deterred by the educational difficulties involved in the instruction of large numbers of students. The Institute is already a large school; and, if it continues to hold the first place among institutions of its kind, it will inevitably become still larger; for it is not justifiable to raise the standard to the point of demanding extraordinary scholarly attainment, since other qualities than scholarship play an important part in determining the success of a professional or scientific career. The Faculty and staff of instruction must therefore face resolutely the problem of teaching large classes effectively; administrative officers must see that the character and organization of the staff is such as is adapted to this end; and the Corporation and Alumni must aim to secure the resources which will provide sufficient facilities in the way of class-rooms, laboratories, and equipment,

and will make possible the payment of adequate salaries, such as will retain efficient teachers.

This last factor—the financial resources of the institution—is, however, the crucial one in deciding at any given time the question of numbers. While I have expressed the opinion that, looking to the future, our general policy should be to provide for any natural growth of the institution, I wish to emphasize even more strongly the idea that, for the present, until additional accommodations have been provided and until increased funds for this purpose and for current expenses have been secured, it would be a serious mistake to permit the number of students to increase much beyond the present registration; for it would mean that the effectiveness of our teaching would be much impaired. The quality of our work is the first consideration; and the quantity of it must be increased, whether through growth in the size of our classes or through provision for new lines of instruction, only when the funds available are sufficient to enable it to be done without detriment to the work already in progress. Regrettable as it may be from some points of view, it is therefore, I believe, imperative that the Faculty take measures to prevent any further increase in the number of first and second year students through a more rigorous enforcement of scholarship requirements.

The number of new students who have previously attended other colleges has again shown a substantial increase—from 155 last year to 170 this year. Of these students 16 per cent. enter the first year, 28 per cent. the second year, 46 per cent. the third year, and 9 per cent. the fourth year of our undergraduate courses. Of the 230 candidates who received the degree of Bachelor of Science last June, 18 per cent. had previously graduated at some other college, and 14 per cent. more had attended some other institution of collegiate grade for one or more years. There is also a notable increase (from 20 last year to 29 this year) in the number of students pursuing advanced work for the degrees of Master of Science, Doctor of Philosophy, and Doctor of Engineering.

The proportion of Massachusetts students (57.5 per cent.) has somewhat increased over that of last year (55.5 per cent.).

Other interesting statistical information will be found in the report of the Registrar.

Advanced Course of Study

From the standpoint of our general system of instruction the two most important developments of the past year have been the much fuller provision made for advanced courses of study leading to the higher degrees of Master of Science, Doctor of Philosophy, and Doctor of Engineering, and the more definite organization of five-year undergraduate courses leading to the Bachelor's degree. The former courses have been developed by the Faculty along the lines referred to in my last report; and a Bulletin entitled "Advanced Study and Research" has been issued by the Institute, in which these courses are fully described. As this Bulletin has been sent to members of the Corporation, I shall not discuss these advanced courses further.

I wish, however, to call your attention to the new five-year undergraduate courses which have been arranged for. The Faculty has taken this action, in order that students who can afford to spend an additional year may realize that it is highly important to do so, if they wish to secure in full measure the advantages of the combination of liberal education, scientific training, and professional knowledge which the Institute offers.

These courses are of three types. In one of these the student supplements all the required work of one of the regular four-year courses with the equivalent of an extra year of study in language, literature, fine arts, history, economics, and in the fundamental sciences, chemistry, physics, astronomy, geology, and biology. These additional general studies are entirely elective. This plan of study thus provides in large measure for the breadth of scholarship which a college course is designed to supply; but it does this by the methods and in the atmosphere of the scientific school and special emphasis upon general scientific studies as a part of a liberal education. Upon students who complete such a Course is conferred the degree of Bachelor of Science in two departments of study, namely, in General Science, and in the branch of engineering in which the professional work has been completed.

The range of such elective studies of a liberal character which the Institute offers to its students is an extended one; and only in one direction does this side of our work seem to need strengthening. We have, unfortunately, no courses of lectures on philosophy, psychology, and ethics; and I would again bring to your attention the desirability of having a professorship of these important subjects established at the Institute, either through a special endowment or through direct provision for the necessary salary payments through a period of years.

A second type of five-year course makes provision for those students who desire to secure a training in two allied branches of science or engineering, as in electrical and mechanical engineering, mechanical and chemical engineering, mining engineering and geology, etc. Such a combination of knowledge and training is so often required in professional practice that the student who has received it has exceptional opportunities open to him. For the completion of such a Course, the degree of Bachelor of Science in two professional departments of study is awarded.

In a third type of five-year course, provision is made for distributing the work of the last three years of the regular four-year courses over four years without additional requirements, thus reducing the number of subjects required in any term. This arrangement affords the opportunity for more thorough work in each subject by enabling a student to devote more time to outside study and to practice in the laboratories, drawing-rooms, and in the field; and it enables regular standing to be maintained by the slow, thoughtful student, who, though able to understand and perform our work satisfactorily, finds it difficult to do it properly at the rate and under the pressure which our four-year schedules involve.

Requirement of Physical Training

Of the more specific changes that have been made in the courses of instruction the most important is the introduction, upon the recommendation of the Dean, of the requirement that all first-year students attend a course of four lectures on personal hygiene, have the usual anthropometric measurements made upon them at the beginning and at the end of the school year, and take regular exercise in the gymnasium classes or upon the athletic teams throughout a large part of the year. A circular prepared for the use of students in regard to this subject has recently been sent to members of the Corporation for their information. The chief purpose of this requirement, which thus far has worked very satisfactorily, is to impress upon students the necessity of close attention to their health and the importance of physical exercise as a means of maintaining it.

Closer Relations Between Instructors and Students

I am glad to be able to state that a gift received from an anonymous friend has made it possible to extend the plan of individual conferences between the instructors in charge of sections and their students, which was last year provided for in the subjects of first-year English and mathematics, to second-year physics, which is one of our most fundamental subjects and one with which students have much difficulty.

The establishment of close personal relations between instructors and students is a matter of prime importance to the success of the work of instruction. Through the fact that an unusual proportion of our subjects are taught upon the recitation plan to small sections or in the laboratory to individuals rather than by formal lectures to large classes, such relations are already developed at the Institute in a greater degree than at most other large educational institutions. The plan of conferences just referred to supplements the recitation system in a most valuable way. I believe, however, that there exists in some of our important first and second year subjects a further opportunity for accomplishing much in this direction through a different organization of the work. Instead of having, as is now done in some cases, a group of instructors teach in common in the laboratory or drawing-room a whole class of from three to four hundred students, while another group carries on the class-room work in the same subject, and perhaps a third group corrects the written work submitted, much better results would, I am sure, be attained by placing each instructor in full charge of a limited number of students, say sixty or eighty, and having him, with the aid of an assist-

ant when necessary, carry on with those students all the different sides of the work in the subject in question (except the course of experimental lectures, which it is especially uneconomical to repeat). He would thus not only get much more closely acquainted with his students and come to understand their individual difficulties, but he would feel a personal responsibility and pride in the success of those intrusted to him. He has, moreover, a greater variety of work, and avoids the monotony of an undue number of repetitions of the same exercise with a large number of sections. Professor A. E. Burton has called attention in his report submitted herewith upon the Department of Drawing and Descriptive Geometry to the importance of making such a change in the method of instruction in these subjects; and it would, I believe, be equally advantageous in such subjects as chemistry and physics, in which the instruction consists of a combination of lecture, recitation, laboratory, and problem work. The present method of giving such instruction to large classes has grown up in the larger colleges as a result of an assumed need of economy in this direction; for there is some economy of effort in the division of labor between the different sides of a teacher's work, and there is a large economy in the average salary paid when one professor is employed to supervise and to give lectures, and inexperienced or otherwise inefficient instructors and assistants are engaged to do the real teaching. From an educational point of view, however, the method is unsatisfactory; until it is abandoned, the problem of handling large classes will not be adequately solved and large colleges will be at a disadvantage in comparison with small ones. Moreover, though the other plan of individual responsibility involves additional expense, the amount required is not inordinate; for the main work of instruction might well be done by men of intermediate grades receiving (according to their length of service) from \$1000 to \$1800 a year. And it would, I believe, be better to curtail expenditures in almost any other direction than in this one, which is so essential to the efficiency of the teaching of our fundamental subjects.

Requirement of Summer Work

In my previous report I called attention to the important advantages which would result from the transfer to a summer period of some of the required work in the field, laboratory, and drawing-room, as well as to some of the difficulties involved. A committee of the Faculty has studied this matter and has prepared for the consideration of the Faculty a plan providing for the requirement of three and one-half weeks of work in the month of June by all students between the first and the second years. The work included in this summer period would consist of surveying in all those Courses of Study which have this subject, of mechanic arts and descriptive geometry in certain other Courses, and of chemical laboratory in certain others. The time set free in the school year it is proposed to utilize for the introduction, not of any new subjects, but of additional recitations and preparation time into the general courses in chemistry, physics, and English composition, literature, and history. For the transfer of surveying to the summer there are strong reasons of a special character which have been fully set forth by Professor Swain in his reports upon the Civil Engineering Department both this year and in previous years. Professor Swain submits in this year's report a detailed plan for a surveying summer camp to which I would call your attention.

New Subjects of Instruction

A few important subjects of instruction are offered to undergraduates as new optional studies for the first time this year. A series of informal talks upon German life and institutions is being given in the German language by Dr. Hermann Schumacher, who has come to the Institute this term from the Royal Gymnasium of Cologne under the auspices of the Carnegie Foundation for the Advancement of Teaching. A course of lectures on Cosmic Physics, presenting the broad aspects of this subject and the recent advances in it, is to be given to our students through the kindness of Professor Percival Lowell. During the present year the instruction in economic geology has been placed under the charge of Dr. Waldemar Lindgren, an eminent expert in that subject from the United States Geological Survey. A new option upon the subject of steam turbine engineering has been introduced into the Course of Mechanical Engineer-