GRADUATE LETTERS

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It is a pleasure to think of the opportunities that lie before the student of physics at the Institute. Twenty years ago Course VIII was highly developed, and offered unusual advantages. But since that time the addition of many new subjects, the constant revision and improvement of the instruction to keep pace with the remarkable progress of science, the purchase of a rich collection of instruments and apparatus, the increased facilities for work in related fields: these and other changes have placed the Department of Physics on the highest plane, and produced a course admirably adapted for the education of teachers and investigators. As an investigator in science I have been especially struck with the spirit of recearch which permeates the laboratory. In spite of their heavy duties of instruction, the members of the Department is some way secure time for research, so that the visitor finds himself in the presence of the living and growing science—not in a museum where the works of the past are gathered together for exhibition. Every facility is at hand: the excellent and varied courses of instruction, logically arranged in the sequence which long experience has shown to be best adapted to the students' needs; the extensive laboratories, supplied with an immense equipement of the best apparatus; a great physical library; and the aid and encouragement of a large corps of the ablest instructors.

But the prospective student of physics should not forget that the pursuit of pure science rarely or never brings large financial reward. The salaries of teachers and investigators are much lower, on the average, than those received by engineers. I doubt, however, whether the engineer is more richly repaid than the scientific investigator. The pleasure of exploring an unknown country, and climbing from time to time some elevation which commands a new and unexpected view, is hardly to be equalled. If a student combine energy and tenacity of purpose with ability and enthusiastic devotion to science, he may well be content to exchange the possibility of a large salary for the unique satisfaction afforded by a life or research.

G. E. HALE.

The Course VIII. of today and of fifteen years ago are two very different things, but they both give the student a good preparation for the study of pure mathematics in that, besides the drill courses in the elements (through the calculus) they provide a considerable amount of instruction in the applications and also a satisfactory amount of advanced and pure mathematics. The systematization of the instruction in theoretical physics appears to me an exceedingly important advance in rendering the course more efficient, not only for the physicist, but also for the pure mathematician.

It should be remembered that a large percentage of those who make pure mathematics their career, become necessarily teachers in schools of engineering. For this reason it has always seemed to me that besides the theoretical mechanics now given in Course VIII., there should also be included some of the applied mechanics of Course II., in order that the student may know at first hand the problems of the engineer and the methods used in their solution. me unfortunate that descriptive geom-

It has, moreover, always seemed to etry has not been required of Course VIII. More than any other subject it develops the power to visualize space relations. and for that reason is not less essential to the mathematician than, for its practical applications, it is to the engineer.

As to the advanced courses offered in mathematics, it is sufficient to say that their value for the student of pure mathematics is limited only by the amount of intensive work he can put on them. Such a student should remember, however, that the theory of functions of a real variable and of a complex variable underlie all his future work, and that after reaching a sufficient maturity he cannot give too much attention to them.

CHARLES N. HASKINS,
Dartmouth College.

It gives me pleasure to testify as to the preparation that Course VIII. gives for the work of a college teacher and graduate student.

In the first place, fortunately the amount of time given to Physics and the closely allied subjects is sufficient to give a reasonably thorough grounding in the principles of the science and some of their technical applications and the essentials of accurate, intelligent scientific observation. In the drill in precision of measurements and the use of all sorts of instruments and of various methods for measuring the same quantity, a critical judgment is acquired that is invaluable to the research student and teacher.

Course VIII., very wisely I think, places especial importance upon the subjugation of the technical applications to their theoretical foundation.

Unfortunately many technical schools and some universities, alas, do not realize the importance of the pure science. This answers for the training of the mediocre engineers, but it does not give the broad foundation in mathematics and science that an original, great engineer requires. I wish the most capable students at the Institute of Technology would combine Course VIII. with the more specialized engineering courses. The result could not fail to be a happy one.

As a preparation for research work the training offered by Course VIII. is admirable. The technique of accurate experimentation is acquired, and a sound foundation for more advanced work in any direction.

If one observes the trend of research in the biological and psychological sciences, as well as in astronomy, chemistry and geology, he will note how much the instruments and methods of Physics have been introduced into the methods for advancing knowledge in all these sciences. The more I observe the advances in education and science, the more I am convinced that Course VIII. offers an ideal preparation in many lines of work.

MARGARET E. MALTBY.

In response to a request for a letter dealing with the preparation which Course VIII. gives for patent work, I would state that the general subject of patent work is such a broad one that it has to be considered from several points of view.

In the first place we may divide patent work into three classes:—that which relates to the examination of applications for patents by the employees of the United States Patent Office; that which relates to the preparation and prosecution of applications by patent attorneys or solicitors; that which relates to the prosecution or defence of patent suits in the courts. The above will indicate in a general way the comprehensiveness of the subject; but each one of the subdivisions will embrace numerous classes of work.

In order to be appointed an assistant examiner in the Patent Office it is necessary that the applicant pass a rigid examination based upon the following general subjects: physics, chemistry, mathematics, technics, mechanical drawings, French or German.

The subject of technics covers the general field of mechanics, mechanic arts, industrial arts and processes, and applied chemistry. Under the subject of "mechanical drawing," the applicant is given copies of drawings of machinery similar to those which appear as a part of the specification of a patent and is required to fully describe the construction and operation of the machine. Only the name or use of the machine is disclosed.

In view of the above requirements it will be apparent that Course VIII. will furnish adequate preparation for the examination. The subject of technics is a broad one and it may well be that the applicant will have to study some subjects not included in the curriculum of Course VIII. A good text-book will however furnish sufficient information on any of the subjects.

As to the value of Course VIII. for work in the Patent Office, it depends almost entirely upon the class of work to which a man is assigned. If for instance it becomes his duty to examine applications for electrical or optical devices or those relating to chemistry, his training in Course VIII. may be espe-

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