but it would have added considerably to the value of the book for those who are unfamiliar with the local sources of information. One also regrets that Labrador and Newfoundland were not included within its field, because our American public needs guidance there as well as elsewhere in British America.

Considering the book as a whole, it must be considered a very valuable summary and contribution to the literature on American wild life conservation. The sane and judicial method of presentation carries with it a confidence that will do much for the cause. We regret the loss of such an able leader as Dr. Hewitt and hope that a new one will be found to continue this excellent work.

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LABORATORY APPARATUS AND METHODS

THE LABORATORY AND DEMONSTRATION PROBLEM OF MODERN PHYSICS

SOME of the more recently developed fields of physics, constituting what some writers call "modern physics," appear to offer some problems relative to laboratory practice more or less peculiar to the subject-matter involved and distinct from those of general courses. Certainly, the content and methods of these courses show far greater variation among the universities than the older courses which have become more or less standardized. In view of this it appeared worth while to ascertain by means of a questionnaire sent out to a number of the larger universities just what is the trend of present practices along this line. Information from about twenty-five laboratories was thus secured, and last year the material thus obtained was supplemented by personal visits to a few laboratories and through contact with physicists at meetings.

It would appear that, so far as lecture work along these lines is concerned, practically every university is giving definite attention to the newer fields of the subject of physics. A few merely include a number of lectures along such lines in their general courses. Many offer separate courses which often include what might be called the whole field, under some such title as "Modern physics," "Electron theory," etc., and deal with the subject in a very generalized way, but nevertheless in a way designed to meet the needs and interests of the arts students. The larger universities, however, are now offering a number of more or less clearly differentiated courses in this general field, some being offered yearly but many less frequently and depending upon the demand. Such schools usually have one or two courses of the above mentioned general type which are open to the undergraduate student. Their other courses are more or less mathematical in nature and are open to only those advanced undergraduates or graduates specializing in physics. Physics club meetings frequently serve to bridge the gap between these two groups of students and to foster an interest in the present progress of the science. In the general modern physics course for undergraduates the enrollment is usually good, one university reporting a class of seventy, but the number enrolling in the advanced courses is, as might be expected, usually small.

The laboratory practice, however, in connection with such courses is far less uniform, both in respect to what is actually done, and what those offering the courses think should be done. Of the schools reporting courses along these lines slightly more than half reported laboratory work as a part of the course, and the time given to this work is usually one afternoon a week. In one case four or five laboratory experiments were given, but no regular laboratory period was scheduled. In a number of schools a few experiments along the lines here discussed are worked into other courses. In schools offering no individual work, a number of lecture demonstration experiments are given.

The nature of the laboratory work varies widely, and in a manner dependent upon the training and dominant interests of the instructor. Experiments intended for undergraduates are somewhat qualitative and no doubt may continue so. For more advanced students the work frequently consists in repeating some of the more classical experiments, or in making observations with apparatus previously assembled by research students. In only a few cases were typed instruction sheets submitted to illustrate the nature of the work done; generally it was indicated that the work was as yet merely in the formative stage. In spite of this, however, it would appear that, through the personal exchange of ideas and the publication of manuals, experiments along these lines are rapidly working towards something like a uniformity that will make a student's laboratory course in modern physics mean something definite in the way of his training.

The subject-matter of the experiments reported would indicate that not all the chief phases of the present developments lend themselves easily to laboratory studies by the student, although the gradual elimination of the difficulties must widen the scope of the work attempted. Among the studies attempted, the following partial list will serve to indicate the scope and nature of the work:

"Discharge in air at low pressures," "Variation of force with distance between electrodes," "Study of Braun tube (in modified form)," "Cathode rays (including e/m determinations)," "Canal rays and Dop-

pler effects," "Studies of quadrant electrometers," "Calibrations of electroscopes," "Ionization currents," "Properties of ionized gases," "Mobility of ions," "Formation of clouds by expansions," "Conductivity of flames," "Comparison of ionizing agents," "Thermionic currents," "Studies with three-electrode vacuum tubes," "Photo-electric currents," "Brownian movements," "X-ray tubes," "X-ray photography," "X-ray spectra," "Ionizing potentials;" and a group of experiments in the field of radio-activity such as "Range of Alpha particles and stopping power of aluminum by scintillation method," "Absorption of Beta particles," "Absorption of Gamma rays," "Rate of decay of thorium emanation," "Determination of e/m for Beta rays by magnetic deflection," and others similar to those suggested in Makower and Geiger's book or in Crowther's.

In some instances additional work is given along the line of glass-blowing and other physical manipulations and in rendering assistance to research students.

Considerable doubt seems to exist as to the advisability of offering, particularly to undergraduate students, laboratory work in courses along the lines here discussed; in fact, all recognize the inherent difficulties. Certainly, the laboratory work does not at present lend itself to the routine methods commonly employed in other courses nor to the supervision of student assistants. More than one laboratory period for a single experiment is usually required—partly on account of the special technique involved. The nature of the apparatus is such that duplicate sets are hardly to be expected in most cases, and a mistake by one group of students may upset the program of experiments and involve a replacement of expensive or difficultly made apparatus. To guard against such occurrences the instructor must personally give more time to supervision than his time may well permit. In view of all this one may easily understand the following quotations from the replies received:

We have tried them on our graduate students as laboratory experiments and find they require entirely too much time for the returns.

In my opinion the subjects are not suitable for elementary laboratory work.

My experience so far with the laboratory work has not been encouraging, I hope to arrive at a solution of the difficulty this term.

This laboratory work is very satisfactory but requires much time on the part of the student and the teacher, nevertheless it is a very helpful course.

However, most of the replies indicate great interest in the problem and, like the last quoted, favor the laboratory work where time and equipment permit in spite of the difficulties.

I think the course amply justifies the slight additional labor of looking after apparatus, because of the growing importance of a knowledge of . . . .

We find the laboratory work satisfactory as far as it goes, but our time is entirely too limited.

I am in favor of it . . . .

The writer of the latter statement strongly advocates permanent set-ups for some of the more important recent experimental contributions to modern physics.

The present writer firmly believes in giving due emphasis to the experimental phases of modern physics. Many of the problems lend themselves to student laboratory work, and the problem of offering such work will grow easier as apparatus companies develop new and simplified equipment and as manuals descriptive of experiments are published. Even where time and facilities do not permit individual laboratory work the need may be largely met by giving greater emphasis to the lecture demonstration. Too often it is assumed that after a student has finished a few general courses in physics he has no further need of experimental evidence, as he is then able to visualize clearly everything from the printed page. A common practice is to run through in a single day in a general course a "whole show" of electron phenomena and to imagine the student has followed the whole demonstration intelligently, and therefore needs little more of apparatus in later courses. May it be suggested, then, that the student in these special courses may find the field just as new to him and probably further removed from his experience as his general course was to him, and consequently demonstration and laboratory work, appropriately selected and abbreviated, may easily be just as important, from both the instructional and inspirational standpoints, and function in the same way as in his general courses. A more advanced student may be better equipped, but his mental processes are not greatly changed.

Basing his judgment on his own experience, first as a student and later as an instructor, the present writer is quite convinced that more attention to this question might contribute to even greater interest on the part of the student in the recently developed and fascinating fields of physics.

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ENDO AGAR AS AFFECTED BY PEPTONE

FOR several years considerable difficulty has been experienced in bacteriological laboratories in making Endo agar. The plates, after being poured with the sterile, decolorized medium and then inoculated with organisms of the colon group, would become, after incubation, a deep pink color which diffused over the entire plate and, at least partially, masks the characteristic reaction of the organisms being studied. This trouble has been attributed to various causes such as