cess rest. If one goes into business to make money he will seek, if possible, an unlimited opportunity. If one enters upon an intellectual career he desires the opportunity to achieve the highest success of which he is mentally capable. He wishes to be limited by nothing save his own ability and industry. A physicist has just this opportunity. He need not wait for business to grow or clients to appear. He can study and contribute to the most important and fundamental problems in physics of the day. He can, if his researches are published, attain without difficulty nation-wide recognition for what he has accomplished. As a consequence he can not avoid chances of advancement appropriate to his ability. His light is upon a hill and can not be hid.

The purpose of this paper is to present to interested students facts without persuasive enthusiasm, and hence to attract to physics as a career only those whose ability and intellectual ambitions can turn a plain statement of facts into an appeal.

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A COURSE IN GENERAL SCIENCE

IT may be reasonably conjectured that at every university in the United States the elementary courses in science are overcrowded. Complaints take various forms: Instructors have no time for research; students can not be interested or even taken care of; weak but industrious students fail in large numbers.

Under the circumstances it might well seem that a possible remedy for the situation has been overlooked. Have we not made the teaching of the individual sciences too much of a fetich? Can not something be said for the giving of a course in general science?

Objections in quantity come to mind. But most of them reduce to one of three points. No instructor knows enough to teach a worthwhile course in science in all its major branches. If such a person were found, the chief values of science teaching would be lost in what would necessarily be a lecture course. In any event, one more "snap" would be added to a curriculum which at least theoretically opposes easy courses.

Yet one may doubt whether, if there were a demand for lecturers on general science, supply would not follow. The writer has found a considerable number of students drifting through non-scientific "majors," yet taking for diversion a creditable quantity of differing sciences. Certainly these students could not teach any one science, even in an institution of reputable high school grade. Very often they are only mildly attracted by the experimental side of the sciences. So much may be granted. But, incidentally, they are usually far more interesting talkers and writers than us professed and lettered scientists; they might develop into very effective teachers of general science, if there were any inducement.

Doubtless the first set of such teachers, if not those of a later date, would make gross errors. It is too early to pretend to know what should be included in a course in general science. Possibly it might have running through it the basic idea of explaining evolution in its many forms from the Rutherfordian theory of radioactivity to the development of man from *Pithecanthropus*. But suppose the worst. Suppose a man who taught general science, and who knew nothing to speak of about electrons and explained valence with utter disregard of the newer chemistry; who gave his students in astronomy and geology La Place instead of Moulton and Barrell; who did not know that the thallophytes are a very miscellaneous group of plants, lumped together because none of them are bryophytes, pteridophytes or spermatophytes; who—but finish the heinous list for yourself, if you are a physicist, biologist, etc. Under our present system there seem to be some *Sigma Ksis* who discourse well on benzene rings and think chromosomes are plants; who can bound every ore deposit in America and blithely call whales fishes. Isn't it possible we have out-Huxleyed Huxley in our desire to flee from Greek and Latin? Which is worse: To have, as we do have, groups of young scientists who are really only organic-chemists or statistical geneticists or other ists, or to have scientists with a trifle less of specialties and an ABC knowledge of the fields of their fellows?

Besides, the confessedly inferior knowledge of this hypothetical teacher of general science is meant only for that vast group of students who can be attracted to science as a study of the laws of astronomy, chemistry, physics, but who revolt from the laboratory notebook and the minutiae of topographic maps. One great benefit of the suggested course would be the freeing of the enthusiastic laboratory teacher from the incubus of indifferent students—though there is hope that a stimulating approach to modern "organized knowledge" would lead some of the indifferent to further purposeful experimental work. Just as the true laboratory teacher would be relieved and perhaps even be enabled to do research, so would the student genuinely interested in science from the outset find himself among a small group of congenials who would eschew the general course and elect, these chemistry, those botany, etc. Surely, too, since the present courses in elementary this or that could then move far more rapidly, the chemist could find time for botany, the economic geologist time for biology, the mineralogist time for astronomy.

One may doubt, moreover, whether "the chief values of science" would be any more lost than at present.

One new value would be gained. Were all the freshmen who now dawdle through chemistry, biology or botany to return to their villages with an inspiring idea of evolution, in a short time there would be no such specimens of *Titanotherium modernum* as W. J. Bryan. A number, even of the "flappers," would, I believe, come to see the fascination in learning of hydrogen stars, cathode rays, the great seed-bearing fern-like trees of the Carboniferous, etc. It is not the facts of science unrolled as that marvelous tapestry we call evolution that the freshmen revolt from. They revolt from chemical formulas, from stains, from botanical slides of algae—all meaningless to them. If we can interest them in chemistry only by chemistry spelling-matches, we are worse than the Arnoldites whom Huxley fought so valiantly.

Reduced to the last analysis, our own love for the scientific method[1] is, I think, our feeling that we can win truth only by "exact definition, by the nicest" manipulation of instruments, by, in short, driving from our habits of thinking and doing everything that is vague and slovenly. No one need marvel that we shudder at freshman modes of thought and manipulation. But in our *vast, overcrowded* classes, can we even faintly hope to make over those who are frankly disdainful of periodic tables and the minerals in monzonite porphyry, hope to make them think and act as our ideals urge us to think and act? I know a most conscientious teacher of chemistry whose students at the end of a year blithely lay reagent stoppers on desks anything but clean—if no one is looking. Who trusts fragile apparatus in the hands of the average student? If all the students were failed whose quiz papers are but "memory gems," how many seats would be vacant after the first quarter? Why do we use that empty label called the "condition grade"? In other words, does our great run of students ever come to define science as we define it? And, if we do not teach these students *respect* for the scientific method, why pretend to, when we might, let us hope, lead them to grasp the fundamentals of each of the sciences through a properly managed lecture course.

"A properly managed lecture course." Such a course need not be a "cinch." That is the blunt answer to the third objection. For one thing, the working of purposeful problems and individual visits to a "hall of experiments and specimens" might be required.

Some to whom I have talked would not oppose the idea of a course in general science, were each science given by its own specialist. Logically, such lecturing would imply the use of heads of departments. Of course, not many heads are of the type of the learned geologist who spends the first three weeks in his elementary geology in forcing students to pretend to recognize models of scalenohedrons and their ilk, because the peculiarly poor text-book he uses opens with crystallography; or of the type of the chemist who wished elementary chemistry to be elective and who, since his desire was overruled, revengefully makes the course a thing of terror. Yet it is very true that, save for striking exceptions, heads of departments do not like to be censured (or censored), and that each year they become more and more ill-fitted to reach the freshman mind. The teachers of a course in general science should be the target of much criticism, should be enthusiastic, and should, above all, be subject to removal upon well-grounded complaints from their students.

Perhaps, indeed, all professors should be subject to retention or fall with much more reference to student judgment than at present. Undoubtedly, teachers of general science should.

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[1] One interesting phase of the entire question is raised by such facts as these: In a great trans-Mississippi university, geology is not allowed as a "laboratory science," though the usual laboratory work is an integral feature of the course. A thousand miles west, in another high-grade state university, students are given "science credit" for a year's work divided between physiography, climatology, and the geography of North America. The "laboratory" work, aside from slight field trips, consists of the arithmetical and graphical solution of problems, the looking up of names, etc.

SCIENTIFIC EVENTS

HERMANN M. BIGGS

DR. SIMON FLEXNER, chairman of the New York State Public Health Council, has made public a resolution adopted by the council at a recent meeting in New York in honor of the memory of the late Dr. Hermann M. Biggs, state commissioner of health and chairman of the Public Health Council from the time of its organization in 1914 until his death last June. Besides Dr. Flexner the other members of the council as at present constituted include Dr. Matthias Nicoll, Jr., state commissioner of health; Mr. Homer Folks, secretary of the State Charities Aid Association; Professor H. N. Ogden, of Cornell University; Dr. Jacob Goldberg, of Buffalo; Dr. T. Mitchell Prudden, of New York, and Dr. Stanton P. Hull, of Petersburg. The resolution follows:

The Public Health Council of the State of New York, at its first meeting after the death of its late chairman, Dr. Hermann M. Biggs, desires to spread upon its records the following minute:

The relations between the Public Health Council of the State of New York and Dr. Biggs were somewhat