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Everyday Science as a University Subject

A RECENT issue of the *Cambridge University Reporter* contains a new schedule for Part I of the General Examination for the ordinary Bachelor of Arts degree. A subject now included for the first time is entitled "Everyday Science", the syllabus of which ranges from gravitation through invisible radiations, mammalian anatomy and vitamins to epidemics and the control of disease. We imagine that there will be two immediate reactions to this innovation. On one hand, there will be a cry that smattering is to replace scientific training, and on the other there will be approval of an attempt to give the plain citizen-to-be a more or less adequate comprehension of the physical world in which he lives.

Fortunately we are no longer without data upon which to form a judgment. Everyday science has been taught and examined in schools for some years, and has been a subject of examination for younger and older candidates in several examinations conducted by the Civil Service Commission. Without dogma on what is still largely a matter of controversy, it may be stated that experience seems to show that (1) everyday science is very suitable for young children, that is, children from 10 to 13 years of age, (2) it is less adapted to the mental state of boys and girls of from 13 to 16, and (3) that it is extremely valuable for adolescents of 16–19 who are not specialising in science as their main subject. In the last class, however, it is noticeable that the best results are obtained with those individuals who have received some formal training in science in their School Certificate years.

The University of Cambridge is thus probably well advised in the step it has taken. Many undergraduates who attempt the ordinary degree have hitherto been compelled to study a mere dilution of 'tripos science', which, we fear, has often proved of very little value to them, inasmuch as the professional qualification it carries is of no very high order, while it is of too academic a character to bear any close relation to their daily lives. The new subject promises not merely to be interesting and attractive in itself, but also to be eminently fitted for those who, while not scientific investigators, must yet play active parts in a world very largely moulded by scientific thought and controlled by scientific invention. We shall await with careful attention the results of the Cambridge experiment.

It is worth while to inquire into the possible effects upon science teaching in schools of this official status conferred upon a comparatively new subject. Everyday science is still regarded by many teachers as a mere pretender, a backboneless weakling masquerading in the strength of the scientific panoply. That it may easily become invertebrate few will deny, but that it is necessarily so we believe to be a serious error of opinion. As a part of a general education, science may be justified by appeal to the self-same values that apply to those subjects described in a narrow sense as humane. If a study of literature may foster the love of beauty, truth and goodness, so may the study of science: beauty in Nature and in the mind of man, truth in observation and deduction, goodness in the service performed by science and in the light it throws on man's motives, emotions and ideals. That formal science lays principal emphasis on truth merely serves to counterbalance the greater emphasis laid on other values by other subjects; but it has an important bearing upon the question of teaching everyday science in schools Those who decry everyday science as a school subject are usually among the stoutest supporters of formal science; in other words, they attach paramount importance to the 'truth' value so characteristic of science, and are apt to forget or minimise its content of beauty and goodness.

We feel that the justification—and the opportunity—of everyday science in schools lies in its power to broaden the vision and widen the sympathy of pupils without repelling them by the classically cold formality that few can fully appreciate. Some core of formality it must certainly retain, if it is still to be science, but its orientation should be different from that of the usual schemes in chemistry or physics, botany or zoology. Extensive rather than intensive, it should pay more attention to the results of science than to the theory of science; to a broad appreciation of a few simple instances of scientific method than to a detailed technique; to the history of science than to niceties of contemporary work; and to the contacts of science with common experience than to the recondite problems of the laboratory.

It is for this reason that we cannot yet find full satisfaction in any of the numerous books on general elementary science that have recently become so numerous. A book on everyday science, however accurate in detail or impeccable in style, cannot be regarded as successful if it consists merely of interwoven abridgments of the various science courses taught, for example, in preparation for the School Certificate. To fulfil its purpose, its whole genius must be different; and it is no doubt partly from this cause that to write such a book appears to offer exceptional difficulty. Lack of suitable books in turn entails a reluctance of teachers to embark upon an everyday science programme, and a scepticism as to its efficacy; to which must be added the unquestionable fact that many, perhaps most, science teachers are accustomed to teach only one, or possibly two, of the principal branches of science and consequently feel diffident of undertaking a course of work that requires a sound, if elementary, knowledge of science as a whole.

The Cambridge plan may serve to improve the situation in several ways. First, it will mean that experienced university teachers must concentrate their attention upon the elaboration of suitable material; second, it will necessitate the thorough exploration of possible methods of treatment; third, it will probably lead to considerable advance in the calibre of everyday science textbooks; and fourth, it will in time provide the educational world with teachers who know, from personal experience, how the subject may be taught. But—and the reservation is an important one—the beneficial results that we expect to follow cannot attain their maximum unless and until everyday science is also made a subject for Part I of the Natural Sciences Tripos. It may appear the most abominable of heresies to suggest that an honours degree in science should be obtainable in "general science", but we are convinced that, at least up to the School Certificate stage, a teacher who had graduated in everyday science would be of inestimable value on the science staff of a school; and from this and every other point of view it seems a pity that the possibility of obtaining such a degree should be limited to those who presumably are not up to honours standard. We are, of course, aware that an undergraduate may, under present regulations, take as many as four or five subjects in his tripos, but that circumstance does not meet the real requirements. Everyday science involves far more than even five subjects, and the tripos course in any one subject at present involves far more than an honours course in everyday science would need.

If the University of Cambridge will take its courage in both hands, and give an honours

degree in natural sciences upon everyday science, we believe that it will deserve well of the country and will eventually effect a very great improvement in the intellectual outlook of the whole nation.

There remains the question of the suitability of everyday science for pupils of 13 to 16 years of age. For them, we think, it would be difficult to improve upon the kind of work already taught, namely a somewhat formal course of physics, chemistry or biology. The years from 13 to 16 are those in which the discipline of scientific thought is most readily acquired, and it seems probable that more benefit is ultimately derived by the average boy and girl from a training in such discipline than from the wider acquaintance with scientific facts given by a course in everyday science. We should, however, like to see less prominence awarded to scientific theory, and regard it as advisable even in these critical years to segregate the more from the less intelligent and to inspire the latter with everyday science rather than confuse them with the more exacting individual subjects.

The G.O.M. of Applied Entomology

Fighting the Insects, the Story of an Entomologist: Telling of the Life and Experiences of the Writer. By L. O. Howard. Pp. xvii+333. (New York: The Macmillan Co., 1933.) 12*s.* 6*d.* net.

HOWARD ended fifty-three and a half years' service "under Uncle Sam" on June 30, 1931. All of this was passed in the Bureau of Entomology, at first as assistant under Comstock and later under Riley, then chief of the Bureau in 1894 and principal entomologist in 1927.

It was when Howard was an assistant that the Bureau attained popularity by a big coup, the introduction of an Australian ladybird into the citrus orchards of California. These were threatened, even to complete extinction, by the fluted scale a bug that carries its eggs in a dense scaly mass of wax, impermeable to liquids. This scale was originally a native of Australia, where it was supposed to be kept in check by a parasitic fly. Entomologists were sent to Australia to collect these, but they found also the carnivorous ladybird larvæ. Both were shipped and in less than a year all threat of damage by the scales was over, perhaps the most spectacular and rapid instance of 'natural control' in the history of economic work. What Howard's part was in this is not stated, but his first big published research had been on the parasites of the Coccidæ.

It is clear that at this period Howard was peculiarly active, as his help was frequently acknowledged by his chief, in whose name all the research and other publications of the Bureau were issued. As soon as he became chief, Howard altered this, ordaining that each research be published under the responsibility of the actual worker, with the result that the best class of American biologists competed for his service.

Howard's life is largely that of the "History of Applied Entomology", which is also the title of an earlier book published in 1930. He started in 1894 as chief of Bureau with an appropriation of thirty thousand dollars and he developed his operations so that the Bureau's ordinary budget amounted in 1927 to three million dollars with special additional appropriations each year, one of which was a grant of four and a quarter million dollars for an attempt to eradicate the Mediterranean fruit fly from Florida. By tact, Howard avoided State jealousy and soon came to control the largest single agricultural area inhabited by men of the same language and aims. At least two-thirds of the agricultural crops of the United States and of their insect pests proved to be of foreign origin. This necessitated an extension of the operations of the Bureau all over Europe and to a lesser degree in other continents. Wherever a destructive insect was indigenous, it seemed to be kept in some sort of control by parasites, frequently larval stages of other insects. Europe especially was combed for these natural enemies, and a machinery was created for their collection for transhipment to the United States. Thus skilled experts were maintained in eastern Europe to rear and send promising parasites. An example in the other direction is the parasitic fly which controls the American blight of apple orchards—this a present to Europe from the Bureau.

Howard travelled everywhere in the States; if a bad outbreak of any insect occurred, he was usually the first visitor, for he had to plan the defence. In Europe he was known in every country, conducting negotiations for co-operation with his Bureau or advising as to plant growth or quarantine. He loved all congresses, especially international, and he was always welcomed for his geniality and honoured for his scientific researches, which, in spite of his multifarious businesses, he maintained at a high level; his 'common sense', the extra sense required for economic science, was