

doing ordinary academic work should have the same freedom as other citizens, if individual liberty is to be preserved.

Sir Henry Dale described the progressive restrictions which have been imposed on the freedom of science in the last fifty years, in consequence of its increasing military importance. He said that the ideal of complete freedom should be strenuously maintained, and that in the present difficult circumstances the boundary between the free and the secret knowledge should be kept as sharp as possible. One of the most distressing features of the present time, he said, is that scientific men in some countries are required not merely to conform to a political orthodoxy but also to uphold specific scientific doctrines for political rather than scientific reasons. A notorious instance is the genetics controversy in the U.S.S.R., in which the opponents of Lysenko, in particular Vavilov, have been dismissed from their posts or disappeared. Where scientific men are bound in their professional views by political considerations, scientific co-operation is obviously impossible.

Dr. E. H. Burhop considered that the type of interference with individual freedom represented by the Thomas Committee on Un-American Activities is a serious danger in the Western world. The conference ended with a lengthy discussion, devoted largely to the points raised by Sir Henry Dale on scientific freedom in the U.S.S.R. and on the merits of Soviet genetics.

H. R. ALLAN

## THE PLACE OF BIOLOGY IN A CURRICULUM\*

By PROF. H. GRAHAM CANNON, F.R.S.

**I**n the teaching of biology there are two sharply defined aspects: there is the study of the structure of organisms correlated with their functioning, leading to knowledge of human physiology and the relation of man to the animal and plant kingdom. This may be looked on as a factual aspect while, on the other hand, there is the study of evolution and all that it implies and involves. This may be regarded as a cultural aspect.

To take the factual aspect first. If there is one thing more than any other with which a child is intimately associated it is with its own body. Its body should become its immediate concern, and all school children, whatever other subjects they may study, should be taught to understand in a simple manner its mechanism and structure. But this is far from being the case, for we still live in an age of extraordinary prudery in which it is improper to discuss anatomical and functional details. This is brought out only too clearly when it is realized that there are no words in ordinary use to describe such natural processes as defaecation or micturition, and as regards the parts of the body, there are no names in ordinary use for the external genital organs. Any words there may be are considered completely vulgar. Now a general elementary study of the human body taken as an ordinary subject for study, quite apart from the educative value that the child derives from knowing what happens inside its own body when, say, a meal is taken, or when a schoolboy collapses exhausted after a hundred yards sprint—quite apart from this, the mere fact of taking this sort of study

\* Part of an address at a joint session of Sections D and L of the British Association meeting at Brighton on September 14.

along with his history or his language or his science would make him feel that here is something quite ordinary and not in any way exceptional. He will then feel free to discuss biological things, things about himself, in an open manner, just as he would without hesitation discuss a problem of mechanics or history. In many schools it is the custom to have a visiting teacher, often a doctor, who appears spasmodically to give short courses of lectures to the older students on what is sometimes called 'personal hygiene'; but this is all wrong. He comes to talk to the students about sex, and that is where the harm is done. Why should sex be singled out like this? Why separate the gut from the genital system? We professional biologists do not, and neither do university biological students. It is this separation of the problem of the human body from the other subjects of study that tends to reinforce the Victorian prudery that we have inherited and to retain those awkward complexes resulting from suppressions which are the curse of adolescent education.

Now as regards biology as a cultural subject, this is the aspect that I consider of such value to the student who is to specialize on the Arts side. All syllabuses, whether good or bad, start from the 'lower' or structurally simple and lead up to the 'higher' or complex advanced types. If this evolutionary story is properly dealt with, not as a series of separate steps but rather as a gradual unfolding from simple beginnings of the complex organisations that we see at the top of the tree, then a student derives a new conception of life as a whole. He realizes that it is not only animals and plants that have evolved, but also all other things such as food and clothes, houses and motor-cars and, more important still, mental and social activities. Civilization, in fact, that he sees around him, he realizes is something that has gradually evolved and which he has inherited. The effect of this broad outlook on his other subjects cannot be over-estimated. How often is a student at school learning a language made to understand that that language has evolved? Or, worse still, how often is the school-child, working at some narrowly circumscribed period of history for the School Certificate examination, impressed with the fact that history is the evolution of mankind?

These, then, are the two main reasons why I consider biology should be a subject taught throughout the school and to all types of children. It is considered proper by all educationists that certain fundamental subjects such as arithmetic and English form an absolutely necessary part of any school curriculum. Has not the time arrived when it is just as important that the school-child, or the adult, for that matter, should know how his own body and his own society work as that he should know how to calculate compound interest or speak the king's English?

The views I have put forward are nothing more than ideal views. So long as schools are tied down and cramped in their style by having to conform to syllabuses of matriculation boards or standards of university scholarships, it is clear that it is not possible to devote the necessary time and teaching manpower to deal with biology as I have indicated. In 'modern' schools, however, where public examinations are not the determining factor in the teaching curriculum, there is some hope that a broad treatment of biology may be possible.

There is another and most important direction in which valuable biological teaching can be carried out, and that is in adult education. What I have said of

the value of a biological outlook to the school-child applies *a fortiori* to the adult. But here again, extra-mural university teaching is largely bound up with the Workers' Educational Association. This excellent educational organisation, however, is hampered by the constitutional custom that the adult students *ask* for whatever classes they feel they want. As a result, adult education has come to be looked on as largely a development of the Faculty of Arts. The grown-ups ask for subjects such as psychology and economics, that naturally appear to them to bear directly upon their own lives. They do not realize that the subjects they choose are, as often as not, far beyond their mental capacity; in fact, as some of us think, they are beyond the capacity of the ordinary undergraduate. If they could be encouraged to study in a simple and broad manner the elements of biology, then a great step forward could be made in education generally.

## CHROMATOGRAPHY FOR GENERAL CHEMICAL ANALYSIS

ORIGINALLY used for coloured substances chromatography has been extended to deal with a wide range of colourless materials, by the use of suitable coloured derivatives or of indicators. Sugars and related substances form an important class of this kind, for which chromatography has proved to be a powerful analytical tool, particularly within the last ten years.

Messrs. Binkley and Wolfram\* have themselves made important contributions to the subject, and their pamphlet appears at an appropriate time, when work in this field is expanding so rapidly; it provides carbohydrate investigators with an up-to-date historical review and practical details of the techniques involved. The first section of this pamphlet gives a simple general description of the adsorption chromatogram, with various details, such as selection of adsorbents, construction and operation of the chromatogram and location of zones after development. The second section provides a comprehensive review of the literature up to the end of 1947. Most of this section deals, of course, with adsorption chromatography, since it is only very recently that partition chromatography, particularly on paper, has been applied to the sugars. The third section describes with experimental details some of the applications of chromatography to sugars; for example, resolution and quantitative estimation of mixtures, purification, control in the production of technical sugar products and end-group assay.

Similar in size and presentation, "Introductory Notes on Chromatography"† covers a much wider field, including vitamins, alkaloids, chlorophylls, carotenoids, vegetable and mineral oils, amino-acids, inorganic ions and many other substances. Some of the applications are given detailed treatment in order to illustrate methods suitable for use in analogous cases. A useful list of references is given, most of which occur within the last ten years, and, as in the case of the first pamphlet, most of the chromatography described is of the adsorption type. This pamphlet succeeds in condensing a great deal of

information into its forty pages and will be found useful as an introduction to the well-known textbooks on chromatography.

Workers in both academic and industrial fields will find information of value in these two pamphlets, which are clearly written and attractively produced. Those who have not already adopted chromatographic techniques will be encouraged to do so after reading them. Chromatography may well prove to be indispensable in many investigations.

During the past year, the range of separations has been greatly widened by the partition chromatogram and by chromatograms which are neither clearly adsorption nor partition. Among recent advances in chromatography may be mentioned the use of dinitrophenyl derivatives of amino-acids and peptides, the use of radioactive isotopes, and the employment of new kinds of supporting media or modifications of existing media in partition chromatograms for the purpose of dealing with non-aqueous solvent systems. The present period is thus one of rapid development, and it is therefore desirable that information on the most recent advances in chromatography should be made available from time to time and with little delay. Perhaps this information might be issued in the form of pamphlets similar to those reviewed here.

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## NEW CHEMICAL LABORATORIES AT UNIVERSITY COLLEGE, DUBLIN

By PROF. T. S. WHEELER

THE honours degree courses in science in University College, Dublin, have recently been extended by one year so as to require four years of post-matriculation work. After three years, the student sits for a general degree examination in three subjects, and if he passes and attains an honours level in a subject is admitted to the honours school in that subject. A number of students, however, who wish to become chemists pass the general degree examination at a level in chemistry insufficient to qualify for admission to the honours school. For those and for other students, who though qualified for honours study feel attracted towards industrial chemistry, there has been instituted a course which extends over one year and leads to a diploma in chemical technology. To provide accommodation for the two types of fourth-year students two new chemical laboratories have been opened (see *Nature*, November 13, p. 768), the Ryan Laboratory for honours degree students and the Nolan Laboratory for those taking chemical technology.

The Ryan Laboratory commemorates the late Prof. Hugh Ryan, who was professor of chemistry in the College during 1899-1931 and who initiated honours degree teaching there. The laboratory has a floor area of 460 sq. ft. and will accommodate up to ten students; as formal lectures to honours candidates are limited to five per week, a large proportion of the students' time is spent in the laboratory. There is no specialization between the three main branches of chemistry in the fourth year, and in the Ryan Laboratory normal advanced work in inorganic and organic chemistry is carried out; practical physical chemistry is done in a special laboratory. Emphasis is

\* "Chromatography of Sugars and Related Substances," by W. W. Binkley and M. L. Wolfram. (Scientific Report Series No. 10. Sugar Research Foundation, Inc., New York.)

† "Introductory Notes on Chromatography." (British Drug Houses, Ltd., Poole.)