

With such a development in prospect it is obviously important to be reasonably sceptical initially when contemplating the replacement of trusted procedures with new ones, and it is a defect of this book that too much that relates to the accuracy of the newer methods is taken for granted. This is particularly true in the methods section where, for example, the important problem of 'excess excretion', that is, renal escape of the injected labelled substance before an equilibrium distribution between body compartments has been achieved, is not seriously dealt with. Indeed, theoretical treatments throughout are based on a dangerously static point of view which ignores the fact that the living organism is dynamic in a metabolic sense. The fact that the natural processes of excretion and replacement must proceed, often from or into selected compartments, implies that true equilibrium in the sense of a uniform distribution of specific activity of the injected substance is never actually achieved, and this is not discussed. The transfers which result from unavoidable specific activity differences and which affect the accuracy of nearly all isotope dilution procedures in animals can only be satisfactorily allowed for by mathematical procedures based on compartmental models the basic constants of which are now fairly well known. It is to be hoped that a future edition of this book will be enlarged to include a section describing these procedures.

As it stands, the book is an invaluable compendium of clinical information which is clearly presented and logically arranged. A particularly useful feature is to be found in extensive data relating to normal or control subjects. A few statements occur which will not find universal support, such as an early one to the effect that Evans blue may be considered a tracer for albumin "almost identical with radioactive albumin itself". In fact, since the dye exchanges between albumin molecules it gives a misleading impression of the behaviour of the protein.

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SCIENCE IN A LIBERAL EDUCATION

Science in its Context

A Symposium with special reference to Sixth-Form Studies. Edited and introduced by Dr. John Brierley. Pp. vii + 372. (London: Heinemann Educational Books, Ltd., 1964.) 30s. net.

AFTER too long a period during which the vocational claims of science in education were given too great a share of attention, it is now becoming respectable to claim that science should be given a place in the general education of *all* school pupils instead of merely providing preliminary training for the minority who will become professional scientists and technologists. A liberal education must include science as one of its 'core' constituents and the kind of science studied must be of a generally educational, not a narrowly vocational kind. It must be taught as one of the 'humanities', in the best sense of that term.

Efforts are being made to devise suitable courses, equipment and examinations for pupils up to the age of 15-16 years, but those who stay at school longer and take a sixth-form course need to continue to study science as part of their general studies, whether they are taking one or more branches of science in their specialist studies or not. It is still 'science for all' which is required, not 'science for arts sixths'.

Those required to teach sixth-form science of the general study kind need considerable help, in the form of courses of training and appropriate literature and other aids, and Messrs. Heinemann are to be congratulated on

having published what is probably the first full-scale book on this subject, though it follows the booklet *Science in Sixth-Form General Education*, published in 1963 by John Murray for the Association for Science Education. Several hundred copies of a first draft of that were, indeed, circulated in 1961, and it is to that draft version that several references in *Science in its Context* apply.

In *Science in its Context* there is first a commendatory foreword by the president of the Royal Society, Sir Howard Florey, and then an extensive explanatory introduction by the book's editor, a former schoolmaster who is now one of H.M. inspectors of schools. There are then five main sections of contents. The first is concerned with the general setting of sixth-form general studies, within which the envisaged science course must be placed. Lord James of Rusholme discusses the question of science and general education, and his essay is followed by six chapters by heads of schools who discuss the subject of general studies in the context of actual experience in their own schools. This gives a valuable lead to other schools.

The other four sections provide useful material on which teachers could draw when planning the courses they themselves must devise to suit their own particular school circumstances. The book rightly makes no attempt at imposing an 'ideal' course. There is a helpful second section comprising three chapters on scientific method, the application of this in peace and war, and the philosophy of science. The third section concerns "Science and Religion", discussed by a theist and a non-theist so that opinions may be formed on the basis of views presented from two highly-contrasted points of view. Then follows a fourth section on the history of science, aspects of which must be dealt with in the kind of course required, though it should not be just a 'history of science' course. Each of the four chapters in this section is the work of a different author, the first writing on Greek science and the other three, respectively, on the sixteenth and seventeenth centuries, the eighteenth and nineteenth centuries, and the twentieth century. As is the case with most of the chapters of the book, there are reading lists at the end of each of these four chapters, the books listed being grouped under "General History", "Special Aspects" and "Original Works".

It is important in a sixth-form general course to cut across the boundaries between the sciences which may have appeared in the middle school, where present conditions may have caused physics, chemistry and biology to be taught separately by different teachers. Also, the growing points of science are often in the regions where artificially separated sciences meet. Teaching by topics, or themes, is therefore better than teaching by sciences. The last section of this book follows this plan by providing eight chapters, each by a different author, dealing with astronomy, radioactivity and the atomic nucleus, the structure of matter, evolution and human biology, behaviour, conservation of resources, cybernetics, and the development of geological thought and the scientific study of scenery. Some of these overlap some of the "Themes" in the booklet of the Association for Science Education already mentioned, but others are different, so, in this respect as in others, the two publications are complementary.

An appendix on practical work and another on visual aids provide further assistance to teachers. Altogether, the book is very much to be welcomed as a contribution towards the campaign to help everyone in understanding science well enough to appreciate its nature, significance and potentialities. It is a book primarily for those directly involved in education, including those who are training teachers as well as those in the schools themselves, but it can also be commended to the notice of all who feel concern at the lack of common ground between scientists and laymen to-day.

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