

(Research Laboratory, British Museum) stressed the wider concept of conservation which involved successively preventive treatment, diagnosis of the causes of decay, research in the evaluation of new synthetic materials and scientific examination of the object before attempting treatment. Mr. H. W. M. Hodges (Institute of Archaeology) said that at present there were only two academic training institutions in the world for conservators—in London and in New York. He detailed the training given in London and emphasized that conservation must be based on scientific knowledge. Mr. A. E. Rixon (British Museum

(Natural History)) gave details of useful techniques for dealing with the preservation of fossils.

At the annual general meeting, Dr. Mary Woodall (Birmingham) was elected president for the ensuing year, and an invitation to hold the conference in Brussels in 1962 was accepted with gratitude.

Social events during the week included a civic reception and an annual dinner. At the end of the week organized tours to many of the museums and beauty spots in Devon and North Cornwall brought a memorable conference to a close.

F. S. WALLIS

## DIGITAL COMPUTERS, THEIR USE AND CONTROL

A SYMPOSIUM on "Digital Computers, Their Use and Control" was organized by the Mathematics Department of Queen's College, University of St. Andrews, in collaboration with Standard Telephones and Cables, Ltd., during May 29–June 2. Standard Telephones and Cables, Ltd., provided the use of a *Stantec Zebra* computer for the whole course.

The first day was devoted to talks of a general nature to give a general appreciation of the use of computers. After an address of welcome by the Master of Queen's College, Prof. A. A. Matheson, Dr. R. J. Ord-Smith of Standard Telephones and Cables, Ltd., spoke on computer applications and this was followed by an address by Mr. W. A. Donaldson of Rolls Royce, Glasgow, entitled "Computers in Industry". The morning session was completed by a description of a transportation problem and its solution by Mr. W. A. E. Pillow of Standard Telephones and Cables, Ltd.

In the afternoon the symposium split into two sections. Those who wished to attend the whole course were given a demonstration of *Zebra* programmes and the remainder were given a brief introduction to programming.

The first day was attended by about eighty people of whom about thirty-five were from local industry and commerce and the remainder from the University. On subsequent days, about fifty people attended of whom ten were from outside the University.

The lectures on the remaining days were given largely by Dr. R. J. Ord-Smith and Mr. A. Y. Cooper of Standard Telephones and Cables, Ltd. They covered a comprehensive use of the *Zebra* simple code and an introduction to normal code. A lecture on "The Computer in the University" was given by Dr. A. J. Cole of Queen's College. By the end of the week, all delegates had written and run several programmes.

The members of Queen's College staff are grateful to Standard Telephones and Cables, Ltd., for providing such excellent facilities and in particular for the continued loan of a *Zebra* computer, which, in the week subsequent to the course had been in continual use for 8 hr. a day.

A. J. COLE

J. IBALL

## A NEW APPROACH TO BIOLOGY TEACHING

A CONFERENCE, proposed and financed by the Gulbenkian Foundation, was held in the University of Birmingham during April 10–12, to discuss the biology syllabus for sixth forms, proposed by the Biology Panel of the Gulbenkian Enquiry 1959\*. The conference was attended by seventy-five school-teachers and several lecturers from teacher-training colleges. The majority of the members came from the West Midlands. Several topics were selected from the syllabus and a lecture was given on each.

During his introductory lecture Prof. O. E. Lowenstein pointed out that the University of Birmingham will be offering a new type of biological training in the near future. This will consist of an honours B.Sc. degree in biological sciences. Undergraduates will take a variety of biological courses which will cut across the traditional subject-boundaries and be in closer accord with the trends in modern biology in pure and applied research, in industry, in agriculture, etc. Various subject-combinations will be possible.

\* Copies can be obtained from the Registrar, The University, Birmingham 15.

It is anticipated that fewer students will complete courses of the traditional type leading to a degree in zoology or botany, although it will still be possible to specialize in selected branches of biology, for example, systematic botany, entomology, etc. It is difficult to predict whether other universities will adopt similar schemes; but the wind of change is blowing in this direction and during recent years in many university departments, even within the traditional courses of zoology and botany, the subject-matter has changed dramatically. Already in Birmingham the preliminary (= intermediate) course in biology has ceased to be virtually separate courses in botany and zoology and is now a closely integrated course following the lines recommended in the Gulbenkian Report.

It is against such a background of a rapidly evolving subject that this new approach to biology in sixth forms is presented.

During discussion there emerged considerable agreement on the need for a new approach, both to teaching and to examining, of the type put forward in the Gulbenkian syllabus, although it was recog-

nized that there would be various difficulties in implementing the recommendations of the report. It was suggested that a first step in the right direction would be to persuade the Northern Universities Joint Matriculation Board to set up a pilot scheme to give the new syllabus a 'field trial'. The chairman was instructed to write to the Board and make this proposal. He was also asked to produce a memorandum listing a number of specific difficulties involved in teaching biology and to circulate the memorandum to the Institute of Biology, local education authorities and other bodies who might be interested.

The points which emerged during the discussion were as follows: (1) Lack of exclusive use of biology laboratories by many teachers. This makes adequate preparation for practical work very difficult or impossible. It also makes difficult the keeping of cultures, aquaria, etc. (2) Lack of time for collection of material and preparation for practical work. (3) Lack of technical assistance. (4) Lack of preparation rooms and storage facilities. (5) Lack of transport for collecting and field work. (6) Inade-

quate grants for the purchase of material, books and equipment, such as physiological apparatus, stereoscopic microscopes, phase-contrast microscopes, aquaria, cages, incubators, ovens, refrigerators, deep freezers, etc. These items include essential basic equipment for the proper study of biology. (7) It was recognized that staffing and salary problems might arise if zoology and botany were replaced by a single biology.

It is relevant to all these items that the conference was agreed that teachers of biology require more time for the collection of material and the preparation for practical work than teachers of most, if not all, other subjects. Many teachers at the present time have to 'make do' in the face of considerable difficulties. The adoption of a syllabus like that proposed would increase these difficulties. The problems involved in the day-to-day teaching of biology in schools require objective study. There is no logical foundation for the assumption that every science subject requires the same number of teaching-hours for its presentation.

L. H. FINLAYSON

## SCIENCE AND EDUCATION : THE TEACHERS' POINT OF VIEW

A POLICY Statement, "Science and Education"\*, issued by the Science Masters' Association and the Association of Women Science Teachers, revises the preliminary statement published by the Science Masters' Association in 1957. The Statement is accompanied by separate syllabuses on chemistry, physics and biology for grammar schools compiled by panels of the Science and Education Committee for these subjects and amended in the light of comments received. The Policy Statement now issued concerns mainly grammar schools and represents the first part of the promised report. The second part will include a scheme for the general study of science in the sixth form, and two other panels are concerned with the training of teachers and with new experimental work necessary for teaching modern physical science.

The present 'scientific illiteracy' is attributed partly to a lack of factual knowledge but much more to a lack of understanding of the basic nature and aims of science. Science should be recognized and taught as a major human activity which explores the realm of human experience, maps it methodically but also imaginatively, and, by disciplined speculation, creates a coherent system of knowledge. As a human quest for truth, it is much concerned with basic values and is indeed an active humanity, and it follows that schools have the duty of presenting science as part of our cultural and humanistic heritage, to be taught in harmony with, not in opposition to, the various arts subjects which alone have hitherto been called humanities. The Committee recognizes that an adequate supply of scientists and technologists is needed and believes that its recommendations will help to meet that need, but it stresses the cultural aim because science has not yet been given its proper place in general education.

\* Science Masters' Association and the Association of Women Science Teachers. *Science and Education: A Policy Statement*. Pp. 12. 1s. net. *Chemistry for Grammar Schools*. Pp. 13. 2s. net. *Biology for Grammar Schools*. Pp. 24. 2s. net. *Physics for Grammar Schools*. Pp. 30. 2s. net. The Sections of Part 1 of the Science and Education Report to be read in conjunction with the Policy Statement. (London: John Murray (Publishers), Ltd., 1961.)

It may be apposite in these pages to comment how Sir Richard Gregory, with his passionate belief in the cultural value of science, would have welcomed such a statement from such a source. To ensure that science is a 'core' subject in grammar schools, as English and mathematics now are and as classics used to be, the Committee recommends that *all* pupils should follow a balanced course of science subjects up to the end of their fifth form year, and this course should lie within the range of a group of natural sciences, each of which is concerned with a limited aspect of human experience, though it is essential that this formal course, mainly involving the sciences of biology, chemistry and physics, with some astronomy and geology, if possible, should help pupils to appreciate the wider range of science as a whole. There should be no division into science specialists and arts specialists until beyond this level, though the Committee recommends that subject specialization should be retained in the sixth form but with a reduction of the detailed factual content of the Advanced Level syllabuses for the General Certificate of Education.

Such a reduction should release time for the broader course of science which the Committee recommends should be studied by all pupils in the sixth form, a course which would enable pupils to attain the scientific literacy described as 'numeracy' in the Crowther Report. The implications of these three general recommendations are outlined in the remainder of the Statement which describes, first, the introductory phase covering approximately the first two years of a grammar school course; secondly, an intermediate plan, usually three years up to about sixteen, when the Ordinary Level examination for the General Certificate of Education may be taken; and, thirdly, an advanced (sixth form) plan, offering a course indicated for all students and a course for the science specialists. These are further amplified in the three accompanying sections dealing, respectively, with chemistry, biology and physics, which set forth a syllabus which might appropriately meet