

the *Electron*" appeared in the *Proceedings* in 1928. In the same decade, the *Biological Reviews* were first published, and this has since become one of the society's most important enterprises.

Among Cambridge people, the Philosophical Library is probably the best known contribution to the life of the university—its provision of periodicals for all members of the university, as well as Fellows of the society, has filled a valuable service throughout its existence, and since 1967 it has been known as the Scientific Periodicals Library. It now obtains about 1,100 journals in exchange for its own publications.

Celebrations of what the society is calling its sesquicentenary are to include the presentation of honorary degrees by the university, a series of special lectures and a dinner in St Catherine's College on November 3. Some time during the festivities, new plans will be announced to expand the activities of the society. With a financial situation that is better than ever before and the continuation of widely respected meetings and publications, the next 150 years are likely to be as fruitful as the last.

#### RESEARCH PLANNING

### What is it Worth?

THE fourth of the science policy studies produced under the aegis of the Council for Scientific Policy is the most obscure yet. The subject is *An Attempt to Quantify the Economic Benefits of Scientific Research* (HMSO, 4s). Professor Harry Johnson of the London School of Economics, the member of the council who has superintended the study, acknowledges in his introduction that "it is by no means the case that the sole justification for fundamental research is utilitarian". What the authors of the study, Mr I. C. R. Byatt and Dr A. V. Cohen, have done is to suggest a number of studies which could be made of the ways in which the economic success of what are called "science-based industries" might be traced back to certain discoveries in fundamental science. According to Professor Johnson, the notion that a part of this "ambitious" plan should be undertaken has been accepted by the Council for Scientific Policy, although there is as yet no news of the industries likely first of all to be favoured by the study.

The study starts with a long and somewhat wooden list of the potential benefits of what the authors call "curiosity-oriented research". Trained manpower is at one end of the scale, and culture at the other, but the study is mainly concerned to quantify the possible value of delayed industrial applications of scientific research, "the absorption into the infrastructure of science, and the subsequent industrial application, of a whole host of apparently minor discoveries", the awareness of developments in other countries which research programmes can provide and the way in which scientific research equips people to "look for the possible commercial developments of scientific discoveries". In passing, however, the study does trample on the feelings of those who argue that science is culturally important—the authors say that because the British government spends only £24 million a year on the support of the Arts, it would be "difficult to justify" the spending of more than £5 million a year on the cultural objectives of science "in view of the smaller number of people able to enjoy science as a

cultural activity". Whether it will be possible to throw more light on this problem by comparing the audiences for broadcasts of musical concerts and science programmes, as the study somewhat wistfully suggests, is another matter.

The chief preoccupation of the study is to put a numerical value on the benefits of research to industry in general and individual industries in particular. Quite properly, it works entirely in terms of costs and cash benefits discounted to some standard date. The argument is that the value of the scientific discoveries underlying a particular industry can be measured by the difference between the discounted sum of world sales in the industry and the discounted sum of all the associated costs—running costs, capital investment, market research and applied research. The object of the formalism is to make it possible to write down the partial differential coefficients by means of which are calculated the marginal changes brought about by variations of the level of expenditure on scientific research, but the usefulness of the procedure is to a very large extent undermined by casual references such as that to the need for including social costs and benefits—thin ice for most people. If it is also reckoned that a properly discounted estimate of the value of scientific research is likely often to be the difference between two very large numbers, it seems most probable that the Council for Scientific Policy will have to sponsor a great many of the retrospective studies specified in outline before the Treasury would allow it to use the generalizations which emerged as argument in an annual scramble for the research budget.

#### ENGINEERING

### Cooperation in Electronics

THE annual report of the Institution of Electronic and Radio Engineers (*Proc. IERE*, October 1969) reflects the growing cooperation between institutions and other organizations concerned to make the best use of British potential in electronic engineering.

One of the main problems is establishing common qualifications for different grades of engineer, and the Council for Engineering Institutions has succeeded in doing this for professional engineers. From next year individual institutions will stop setting their own examinations and all chartered engineers will be registered by the Council for Engineering Institutions.

The next step is to establish a register for other grades of engineers—possibly technician engineers and engineering technicians—and the CEI has a working party looking into this now.

In line with its policy of wide-ranging cooperation the IERE has joined with the Institute of Physics and the Physical Society, the Institute of Mathematics and its Applications, and the Institution of Electrical Engineers in forming a Standing Committee of Kindred Societies. Its chief function seems to be to organize common meetings and conferences and to focus attention on borderline subjects. The IERE and the IEE have been closely cooperating for some years in fields such as medical and biological engineering, computers and a project to develop a British information retrieval system. Both institutions have, however, decided firmly in favour of remaining separate organizations.

In research and development, the National Electronics Council is responsible for ensuring efficient