

cularly those of northern Nigeria where he was a soil surveyor, emphasizes the importance of parent material, and states that there is no adequate assessment of deep weathering and colluviation effects. He is pessimistic about the increasing use of artificial fertilizers and considers they will extend the problem of soil erosion. R. P. Moss's discussion of the ecological background to land use studies seems to me unnecessarily involved. A diagram illustrating the nutrient cycle (after Nye and Greenland) suffers from a change of scale and relative displacement of the two halves.

W. B. Morgan summarizes the main features of peasant agriculture and produces a useful map (Fig. 9. I) showing the main food crops grown. M. B. Gleave and H. P. White, dealing with population density and agricultural systems, are critical of W. Allan's approach to the subject in *The African Husbandman*, regarding it as too static and scarcely applicable to West Africa. In demonstrating the effects of administrative policies on agricultural patterns, J. A. Hellen neglects to mention the case of Buganda. His experience of southern Africa leads him to see settlement schemes and government inspired peasant farming as the keys to further transition in the agricultural landscape, a view that would not, I think, be shared by other contributors to this volume.

The case studies illustrate to varying degrees themes developed in the earlier parts. Among them, A. Young gives a clearcut account of a natural resource survey in Malawi. D. R. F. Taylor contributes an up to date assessment of land consolidation and the results of the Swynnerton plan on Kikuyuland, and G. Kay brings out the part played by government action in explaining spatial variations of agricultural productivity in Zambia. The book concludes with a most useful appendix which succinctly describes the characteristics of the major soil groups in Africa.

In sum, this wide ranging but well balanced volume penetrates more deeply than more comprehensive geographical texts on Africa and brings together in a convenient form recent findings from diverse sources.

A. T. GROVE

## INVESTIGATING MACROMOLECULES

### Physical Methods in Macromolecular Chemistry

Vol. 1. Edited by Benjamin Carroll. Pp. x+385. (Dekker: New York and London, June 1969.) \$17.75.

This is the first volume to appear in a series planned to provide research workers with information on the newer physical and physicochemical methods of investigating the structures of both synthetic and naturally occurring macromolecules. The intention is not to give extensive experimental or instrumental details, but rather to outline the possibilities and limitations of a particular approach. This is done by giving an adequate theoretical background, followed by an evaluation of the more recent literature in each area. Some attempt is also made to suggest future lines of development.

Six topics are included in this book and are treated almost exclusively from the viewpoint of synthetic polymers. Although this does not mean that the biochemically inclined will not be helped by the information provided, it is to be hoped that later volumes will redress the balance in favour of biological macromolecules. The articles vary considerably in length, and two together constitute one half of the whole book. There is an excellent account by Rosoff on polymer surfaces and surface films, which are indeed, as the preface puts it, treated in depth. The theory and, in outline, the methods by which the size, conformation and orientation of synthetic macromolecules may be investigated are described, and numerous references to both the basic and the recent literature are quoted. Of almost equal length is the description of

fluorescence techniques for polymer solutions by Laurence. At the moment this is a very active area of research, but although there have been other recent excellent reviews of the field, for example, that by Brand and Witholt in *Methods in Enzymology XI*, necessarily covering some of the same ground, the article by Laurence has a distinctive approach which makes it a valuable contribution. A thorough introduction to fluorescence polarization, described in terms of Jablonski's emission anisotropy and including time-resolution methods, is given together with aspects of fluorescence spectroscopy and energy transfer. Results of applications of these methods to proteins, nucleic acids and synthetic polymers, and an extensive reference section, complete the chapter. The uses of internal reflexion spectroscopy in polymer analysis and structural determination are described by Barr and Flournoy: this general method has interesting biological potential, and the instrumentation and experimental techniques are given at some length.

The characterization of polymers and polymer solutions by electrical conductivity measurement is discussed by Forster. The circuitry and electrode design for both d.c. and dielectric dispersion measurements are outlined. The manifold effects of electromagnetic radiation and particles on polymers are detailed by Feng and Freeman. The whole spectrum of energy sources is considered, together with the investigation of transient intermediates and permanent modifications. There remains a short but useful section by Cheung on the measurement of the molecular weights of insoluble polymers. Here one might assume that there is not much activity in this field, because no reference less than five years old is cited.

Taken as a whole, this first volume shows great promise for the series. It is well written, clearly printed, and will undoubtedly be very useful to both present and prospective biophysicists and physical chemists.

F. W. J. TEALE

## TUNNELLING SCHOOL

### Tunnelling Phenomena in Solids

Lectures presented at the 1967 NATO Advanced Study Institute at Risø, Denmark. Edited by Elias Burstein and Stig Lundqvist. Pp. x+579. (Plenum Press: New York, 1969.) \$35.

This is a report on a summer school held in Risø in June 1967 to introduce would-be researchers to the several aspects of tunnelling and leave them with a feeling of the current directions of progress.

If the object of a school is to take a subject from elementary beginnings through to the current problems in a logical and continuous way, then this clearly cannot be achieved by having thirty-two people giving one or two lectures each, and this is the chief failure of the course. There are compensations for having many authors, however, and one is that topics are viewed from several directions, which is important in a subject that has mushroomed in the past ten years, as, inevitably, developments have taken place from divers starting points and there has not been time to unify the different approaches. This situation makes life very difficult for somebody entering the subject and it is in bringing together within one volume the variations in approach that the strength of this book lies.

The contributors are all people who have worked recently either experimentally or theoretically in tunnelling although they do not necessarily contribute in the field of their main research studies. The initial chapters treat tunnelling in a general way. They are rather disconnected although many of the chapters are individually very good and give clear insight into problems and techniques which have tended to be glossed over in the literature.

The chapters on  $p$ - $n$  tunnel junctions form a coherent