disciplines will be drawn into this area of work, and there is now a real need for literature with a broad compass, but of a sufficiently detailed nature, to provide a source of background reading. The practical side of this publication is illustrated by the prominence given to a detailed description of the bioassay programme developed at the National Cancer Institute, Bethesda, Md. This occupies one fifth of the book, and deals with the concepts lying behind the process of making judgements which, although of a scientific nature, are inevitably of considerable economic and political importance. Analytical procedures have a key role in studies of materials contaminating the environment; and their importance is well illustrated by the inclusion of two chapters giving selected examples. One demonstrates the resolving power of high-pressure liquid chromatography and the other contains a useful historical account in which the crude procedures first used for the isolation of a chemical carcinogen are contrasted with the development of the sensitive analytical techniques which facilitated an appraisal of the extent to which DDT had permeated the environment. By the inclusion of adjacent chapters, one on Occupational Carcinogenesis and the other on Non-occupational Environmental Cancer, the relative simplicity of the former is sharply contrasted with the enormous complexity of the latter, where multiple risk factors, allowing the interplay of effects ranging from inhibition to synergism, are most probably the norm. Specific carcinogenic hazards are considered under individual chapter headings. These include a survey of Inorganic Agents and one of the Organohalogens, which embraces the alkylating agents and deals with the halogen-containing insecticides and fungicides. The oncogenicity and sources of selected natural products are considered under separate headings, e.g. the Cycads, the epidemiology of aflatoxin carcinogenesis and the mycotoxins including other plant carcinogens. They are well-referenced, mini-monographs on the individual topics. The scene is finally brought to an end with some reflections based on 40 years' experience with "art of bioassay". In these closing thoughts we are adjured, in the face of "our limited information and our even more limited wisdom", simply to do our best. Was it ever different!

P. J. O'CONNOR

Carcinogenicity Testing: Principles and Problems. (Proceedings of a Symposium held at the Royal College of Physicians, London. 2 December 1977). Eds A. D. DAYAN and R. W. BRIMBLECOME. Lancaster: MTP Press. 128 pp. £8.95 net.

Thirteen contributors from industrial, academic and legislative fields discussed carcinogenicity testing and its theoretical and practical implications in some detail at this symposium. This book contains edited versions of the talks of the invited speakers and a summary of the discussion of each paper, presented in the form of a commentary, at the end of each contribution. Overall, the papers present a very balanced view of the current status of carcinogenicity testing. The many problems involved in extrapolating results of animal tests to man are well explored, together with the overall cost of carcinogenicity testing and the problems involved in benefit-risk assessment. R. L. Carter, in discussing a pathologist's view of long-term tests for carcinogenicity, made the point that the standard carcinogenesis assay will normally detect compounds which increase the risk to tumour development by 3% or more, but that there was no animal test suitable for detecting weak carcinogens. The numbers of animals that would have to be used to detect a significant increase in tumour frequency after exposure to weak carcinogens was discussed by Salsburg. His analysis indicated that increasing the numbers of animals per group results in little improvement in efficiency of the tests until the numbers become unmanageably large; > 1000 per group are needed to detect a 0.2% additional probability of a tumour with 90% certainty if background incidence is 0.1%. In discussing the predictive value of conventional carcinogenicity studies, several questions were posed by Stevenson et al., and 2 basic assumptions were challenged: (1) That it is feasible to regard all chemicals as either carcinogens or non-carcinogens; (2) That we can arrive at unequivocal conclusions about hazard on the basis of animal tests. The general conclusion about animal tests was that, as such, they are not as exact as is commonly supposed. The recommended approach was a combination of animal tests with some in vitro test. Mammalian short-term tests were reviewed by Bridges and Fry with emphasis on principles and problems in assessing their predictability, since few
chemicals are, in the authors’ words, pure black (i.e. carcinogenic under all circumstances) or pure white (i.e. invariably non-carcinogenic) which makes the selection of suitable compounds for standardization extremely difficult. Similar problems of course exist in validation of bacterial short-term tests, discussed by Green, who also emphasized the relatively arbitrary distinction between carcinogens and non-carcinogens. He predicted that the high sensitivity of bacterial short-term tests was likely to help break down this distinction and place the emphasis more on risk evaluation. Basic biochemical mechanisms of carcinogenicity were discussed by Connors, who also dealt with the problems of extrapolation of test results to man. A particular problem are those chemicals which can only be shown to be positive in short-term screening tests with highly sensitive methods. Two different approaches can be taken with respect to such compounds; either they should always be treated as carcinogens, or it can be assumed that under normal conditions of exposure, the chances of such compounds binding to any significant extent to a target molecule are so remote that they will not be hazardous. The economics of carcinogenicity testing was reviewed by Conning, with emphasis on the effort and cost of screening individuals exposed to potentially hazardous chemicals and the cost to industry of testing individual compounds. The problems faced by regulatory authorities in interpreting and implementing results from carcinogenicity testing of medicinal and other products were discussed in terms of relative risk and benefit, and the difficulties involved in making such assessments were emphasized. Overall, the volume covers well the scientific, sociological and economic problems involved in carcinogenicity testing. The individual contributions have been well edited and the illustrations are of a high standard. There is a useful bibliography at the end of each paper and an index for the whole volume. It should be of interest to toxicologists, both in industry and in the academic field, to anyone who is concerned with the regulation of public exposure to environmental chemicals. It presents the problems and prospects, in this rapidly expanding field, in a particularly well-balanced way.

M. Fox

B and T Cells in Immune Recognition. Eds F. LOOR and G. E. ROELANTS (1977). New York, London: John Wiley. 504 pp. £18.50 net.

Cellular immunology, as one of the foremost biomedical sciences, has undergone phenomenal expansion during the past decade. Texts which present the more recent developments in a coherent and readily assimilable form are therefore to be welcomed. This volume aims just that aim. The editors have assembled a series of review essays by a most distinguished panel of contributors, covering most of the major areas of cellular immunology.

The lymphocyte possesses a degree of heterogeneity not matched by any other cell type. The study of this diversity requires discussion of the early ontogeny of the lymphocytes, and of the organs in which they differentiate, under the influence of specific differentiation antigens or hormones. This information, together with that relating to migration patterns, lifespan and turnover of tissue cells and the regulatory influence of macrophages, is cogently presented in Chapters 1 to 6.

Chapter 7 (by Schreier and Nordin) is unique in being the only contribution with original data. It is concerned with the evaluation of in vitro models of immune responsiveness, and draws the conclusion that the utmost caution is required in attempting to understand in vivo phenomena via in vitro assay systems.

Several chapters (8–14) are devoted to the behaviour of lymphocytes when cultured in vitro in response to antigens and allogeneic lymphocytes, and in their maturation to antibody-secreting cells or to cells that can kill appropriate target cells. In all these responses, one is confronted with phenomena of mutual co-operation and suppression among lymphocytes. Many of these appear to depend on signals and receptors that are determined by genes in the major histocompatibility region of the genome—a region distinct from those which determine antibody specificity. The clarification of the relationship between these 2 sets of structural genes lies at the heart of the current efforts towards basic immunological understanding, since both appear to determine and restrict the recognition repertoire available to the immune system of the host.