now thought that as a group they may be as frequent as the amino acid disorders. Prompt intervention is particularly important in this complex group of diseases. However, I found the figures dealing with branched-chain metabolism rather difficult to follow and felt the section dealing with the dicarboxylic acidurias in general poorly covered. Disorders of purine and pyrimidine metabolism were well presented, but on the glycogen storage diseases, histopathological features of biopsy samples which may provide initial diagnoses could have been presented more fully. Also, I would not agree that diagnosis of Type III glycogenosis should be confirmed by enzyme assay of fibroblasts or leucocytes. In some patients the deficiency may not be expressed in these cells; liver as well as muscle should be used. The problem of different classifications of defects affecting the phosphorylase system is highlighted, although confusions are perpetuated here with the *X*-linked phosphorylase b kinase deficiencies in man and mouse. It is the liver enzyme in man but the muscle enzyme in mouse. On the subject of animals I was intrigued to learn that the level of blood catalase activity in normal ducks is similar to that in Japanese homozygotes for acatalasaemia. Although no specific reference supports this statement it does none the less illustrate the extent to which the authors must have researched this volume. I would not however accept that the hair changes in Menkes' patients are similar to those in copper-deficient sheep and chickens (wool and feathers).

Despite a variety of minor typographical errors, including the apparent omission of Fig. 8.8 (p. 353) and purine nucleoside phosphorylase from the index, my overall impression was that this is a very useful book which probably achieves its aims. Although it is not cheap I am sure it would be referred to regularly by all engaged in the diagnosis, study and management of inherited metabolic disease, and I would recommend it as such. As a final comment and to assist in such referral I would have preferred the use of McKusick numbers throughout.

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Gene Manipulation in Fungi. Edited by J. W. BENNETT and LINDA L. LASURE. Orlando: Academic Press. 558 pages. Cloth £65, Paper £35. ISBN 0 12 088640 5.

This book is the outcome of a meeting held in South Bend, Indiana. In one way its subject matter is more wide ranging than its title would suggest – 'gene manipulation' here is a very broad church including conventional genetic analysis, biochemical genetics and computer simulations as well as developments in cloning, transformation and sequencing that have become synonymous with manipulation in its narrow sense. On the other hand, 'fungi' in the title refers mostly to the analysis of the well-characterized ascomycetes Saccharomyces, Aspergillus and Neurospora, although there is one chapter on Mucor, another on fungal human pathogens, and sections of others are devoted to Podospora and Uromyces.

The book consists of twenty-one chapters and two appendices and is divided into four main parts. Part I, curiously entitled 'Historical Perspectives: Mutants to Models', contains only one article on historical developments. Other chapters are devoted to molecular taxonomy, mitochondrial genomes and computer simulation studies. The rapid progress made in developing *Saccharomyces cerevisiae* as a system for wide-ranging genetic analysis justifies the decision to devote Part II entirely to this species. The development of efficient transformation procedures and directed mutagenesis are two outstanding attributes which have greatly facilitated genetic analysis in yeast. Our understanding of the mating type system, the structure of yeast centromeres and the development of methods for studying heterologous gene expression are just three examples of recent progress. This section, however, is disappointing in that there is too much overlap between chapters 5 and 6. Part III – 'Molds' has 7 chapters on Aspergillus and Neurospora and is particularly interesting and useful. I was impressed by the amount of previously unpublished information contained in this section, which conveys to the reader the accurate impression that these reviews are up to date and authoritative. The efforts which are being made to obtain an efficient transformation system and the analysis of the regulation of gene expression are just two aspects of gene manipulation which are fully discussed. Part IV is concerned with applications to particular problems such as fungal pathogenicity to plants and humans, industrial fermentations, and morphogenesis and dimorphism in Mucor. This section illustrates very clearly the great potential of some of the experimental systems. For example, in the process of infecting a leaf the rust fungus *Uromyces appendiculatus* differentiates an appressorium when the germ tube reaches a stoma. This differentiation step occurs at 'stomata' of polystyrene replicas of the leaf surface. The prospect of being able to analyse experimentally how an external, tactile stimulus at the hyphal tip is transmitted to the nucleus where differential gene action ensues is an exciting one. The impact of genetic manipulation on systems like this one makes fungal morphogenesis a progressive area of research at the present time.

Taken as a whole this is a stimulating and commendable book. It is an excellent reference source, some of the chapters having extensive bibliographies. For example, the chapter on 'Fungal Mitochondrial Genomes' has 217 references, while that on 'Primary Metabolism and Industrial Fermentations' cites 353 sources. I was glad to see that this book is published in a

less expensive paperback edition. The foresight of the publishers in doing this will mean that libraries in the United Kingdom, suffering as they are from chronic underfunding in science and education, may be able to contemplate buying a book which will be a valuable addition to library bookshelves.

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Environmental Health Criteria, 46, *Guidelines for the Study of Genetic Effects in Human Populations*. 126 pages. Sw.fr. 12. ISBN 92 4 150186 5.

Environmental Health Criteria, 47. *Summary Report on the Evaluation of Short-term Tests for Carcinogens* (*Collaborative Study on* in vitro *Tests*). 77 pages. Sw.fr. 9. ISBN 92 4 154187 3.

The International Programme on Chemical Safety, under the sponsorship of WHO, ILO and UNEP, is developing a series of authoritative documents called Environmental Health Criteria. As the number of titles is approaching a half hundred, a change in profile begins to appear, in that instead of treating single substances, recent papers analyse subjects of wider implications and greater complexity. Two of the latest are of interest to geneticists, presenting a *Summary Report on the Evaluation of Short-term Tests for Carcinogens* (*Collaborative Study on* in vitro *Tests*), and *Guidelines for the Study of Genetic Effects in Human Populations*.

Ever since the first demonstration by Auerbach and Robson some forty years ago of the mutagenic effects of chemicals, there has been a dichotomous development of the field, but with internal feedback, between on the one hand the search for 'bigger and better' mutagens and detection systems, and on the other studies of relevance, validity and quantification in the use of a steadily growing number of test systems applied to an ever wider array of chemicals. The need for standardized databases and integrated evaluations have led to handbooks of testing of great value, and to a number of national and international sets of recommendations on what and how to test, mainly to identify and control carcinogens, but also with a view to protect man against heritable genetic damage.

The present *Summary Report* (Environmental Health Criterion 47) presents a condensate of data emanating from a major international collaboration, involving some 60 investigators contributing nearly 90 sets of assays of 8 recognized carcinogens known to be 'difficult' in short-term tests. This large study, organized primarily by Fred De Serres (NIEH) and John Ashby (ICI) is in many ways an extension of earlier efforts aimed at validation and evaluation of test systems. The present report is praiseworthy both in drawing together the essentials of the results of the collaborative effort, and in drawing a number of conclusions which are rather firmer and more informative than has been the case in earlier attempts.

The main conclusion, in very few words, are (a) that the Ames test stands up as the most informative single test, (b) that a chromosomal aberration test appears as the most useful additional test, and (c) that cell transformation tests appear as highly promising but with snags remaining. These statements constitute the message as I think regulators and other non-testers would pick it up. This does not give justice to the caveats and complexities presented and discussed in the Summary Report, and even more extensively in the 'big green book' (Ashby *et al.* 1985) of which this Report is the summarizing first chapter. Here is drawn together the essence of a mass of data and useful information which every specialist will want to study in detail.

After this essentially positive review, it seems in order to mention that there are points that may be criticized. Being basically a part of a larger report on testing, the approach and attitude of the report makes it a tester's book on tests, leading to a somewhat introvert quality in the text. More surprisingly, especially for a WHO publication, it seems that the language is not always up to standard. In particular, in a publication aimed at the shifting terrain between science and lawmaking one would expect more carefully formulated statements. The first sentence of the summarizing points of the Conclusion reads: 'Significant differences exist among individual investigators conducting nominally identical assays.' This seems a rather superfluous statement, unless the intended message is that there are important differences in the ways the assays were performed. Other similar examples may be found. One other case that might be mentioned is the use of the word 'genotoxin', which appears to be a non-defined novelty. Toxins are in general referred to in relation to their origin, not their target, and have as such an established meaning. The present adoption in one sense seems practical, but should be defined and defended/explained, perhaps in a section on terminology, which is missing.

Turning next to the Guidelines (Environmental Health Criterion 46), this is the result of the deliberations of an international group of experts, chaired by J. R. Miller (Osaka) and reviews methodology and endpoints useful in the measurement of genetic damage in human populations. With given agents, mutations are to be expected in all living creatures, but the demonstration of induced heritable damage in humans has proved very difficult. The search for methods and criteria which might allow a secure identification and quantification of the effects of a genetic insult has taken great efforts with little yield of hard data. Even in populations exposed to extreme loads of known mutagens, as in Hiroshima and Nagasaki, it has been impossible to demonstrate unequivocally that the following generation is marked by the parental experience.

The report reviews with great care a wide array of