bolism in the excretions and secretions of workpeople as indices of exposure that may be compared to agreed standards or criteria. A help in what to choose may be found in the section discussing the metabolism of xenobiotics. Paraquat and related bipyridyls are summarized in their toxicology and this is an up-to-date review of a most interesting class of compounds used extensively as herbicides. The authors state that they are representative of some hundreds of compounds showing the effort to which industry is forced when seeking the most efficacious.

The industrial medical officer should be aware of the availability of the Bulletin in medical libraries. Also, he should continue to maintain a high index of suspicion with regard to exposure and effect for, as the introductory section states, the incidences of natural diseases in working populations may, in retrospective analysis, be positively associated with exposures to industrial chemicals which were not overtly and immediately injurious.

C. G. HUNTER

Occupational Health. Hazards of the Work Environment. By May R. Mayers (Pp. 567; illustrated; 160s.) Edinburgh: E. & S. Livingstone. 1969.

Inevitably one looks at a new book with a title such as this in the hope that at last a comprehensive and authoritative treatise on the subject has appeared. To some extent this hope is fulfilled, but approval of this as a textbook must be qualified, at least the approval of those who are engaged in teaching the subject. This is not to withhold praise from the merits of the book for general reading even by the experienced; indeed, the author claims no more than to present the subject 'on several levels so as to bring the concept within the reach of readers not medically qualified'.

It may be that by attempting to reach too wide a circle of readers she has made some parts too simple for the medical or scientific reader and some too difficult for the uninitiated. This does not lessen its value. The book should be read by all who aspire to a knowledge of the subject. For the student, especially the post-graduate student, it is of great value and is the nearest to a comprehensive textbook that he has available. To be complete, a textbook on occupational health would have to cover so many fields so exhaustively that it would be too big and possibly too expensive for anyone except the specialist or teacher, and would certainly be beyond the knowledge and experience of any one author. The most one could expect is that it would give a good outline of the subject and indicate where further reading can be pursued. Dr. Mayers succeeds well in both these aims. She gives relevant references at the end of each chapter, and at the back of the book there is an extensive bibliography, not confined to the references, of some 1,200 items, which reflects the width of the subject and the virtuosity of the author in condensing so much, so well, within the covers of her book.

The insistence on health rather than sickness or disease is refreshing, but the British reader will find the repeated use of the word 'homeostasis' irritating, all the more so perhaps because he cannot produce a better single word to convey the concept of good physical and mental

health, adjustment to environment and happiness. One applauds her view that a medical understanding of an industrial disease will not be acquired by checking the physical signs and laboratory findings listed in the text, but in trying to understand the dynamics of the situation. One takes exception to some statements; for example, that the carcinogenicity of benzidine is still controversial and that annual cystoscopic examinations should be done on workers exposed to bladder carcinogens. One looks in vain for any mention of lung function tests in the assessment of industrial pulmonary disease or of a critical appreciation of the value of lead levels in blood or urine in the supervision of lead workers. One would have liked more on organic and mercury lead poisonings. Feminists may cavil at only one page on women workers whilst there are two pages on alcoholism in industry. The subject of sickness absence is well summed up in a page and a half, but no mention is made of self certification. Is this not topical in the United States? The sections on conservation of hearing and vision are admirably concise and instructive. That on the evaluation of the industrial environment gives an excellent, detailed account of how to look at a plant *de novo* and, while it is of special value for those starting in occupational medicine, it is well worth the attention of the experienced.

The book is well and clearly written and is well presented in good type. I do not like to mention misprints in a review, and in any case this book is commendably free of them. There is, however, one which gave me great delight – maybe it will be allowed to survive in subsequent editions. It reads that in frequent absences of short duration 'sympathetic counselling by the industrial physician (or) the industrial nurse . . . may help to clear up this type of situation'!

The medical reader will soon learn to skip the oversimplifications ('The ear is composed of three parts: the external, middle and inner ears'). The student will find enough to give him an outline and an understanding of the subject. The more serious seeker after knowledge will find much to engross him and guidelines to inform him where to pursue his deeper reading.

The only real fault I can find with Dr. Mayers is that she did not produce this book years ago. It fills a gap which has been yawning for too long.

T. S. SCOTT

Underwater Medicine. 3rd ed. By Stanley Miles. (Pp. 363; 69 figs; 75s.) London: Staples Press. 1969.

Although this book is concerned primarily with the hazards of diving and swimming, it provides an excellent introduction to the physiological problems of any work at raised atmospheric pressure in water, or in caissons or tunnels. The appearance of a third edition of this book, which was first published in 1962, is a tribute to its value as well as reflecting the continued interest in the subject. Deep sea diving, particularly in connection with oil rigs, and subaqua or scuba diving for sport or in civil engineering or sea farming, have all become more common and seem likely to increase still more. Thus in future it is more likely that medical practitioners will have to deal with the emergencies and complications of underwater

activities both occupational and non-occupational. Nor are doctors practising in coastal areas the only ones who may be faced with diving accidents or a patient with the bends, as subaqua clubs may use inland waters and divers may be brought off an oil rig by helicopter and have travelled a considerable distance before having an attack of decompression sickness.

The author points out that the growth of underwater operations has been relatively slow compared with climbing and space travel, but his explanation that this is due to an instinctive and subconscious distrust of the sea derived from man's primitive origins is unconvincing. If man distrusts the sea it is surely because he has sound practical reasons for doing so. The hazards of the ocean are familiar and real for seafaring people. The descriptions of underwater accidents underline the need for strict training and discipline for subaqua enthusiasts in order to avoid errors which can so easily be fatal. This is essential reading for anyone concerned with the health and safety of a subaqua group especially as there is a tendency for them to go to greater depths than hitherto.

Decompression sickness in subaqua swimmers is always a possibility and it raises the problem of the general availability of compression chambers for emergency treatment. A list of such facilities available in Britain would be a useful appendix for the next edition. The chapters on the physiological effects of nitrogen, oxygen and carbon dioxide at raised ambient pressures summarize present knowledge clearly.

Work in compressed air in caissons or tunnels may be carried out anywhere in the British Isles. Doctors who are involved in the care of compressed air workers will find this book useful and particularly the section on decompression, although it deals mainly with divers. For the problems peculiar to caisson and tunnel workers it will be necessary to seek information elsewhere but the reference list is helpful here. There are useful lists of references for further reading at the end of each chapter.

R. I. MCCALLUM

Principles for the Testing and Evaluation of Drugs for Carcinogenicity. Report of a W.H.O. Scientific Group. (World Health Organization Technical Report Series No. 426. (Pp. 26; 4s.) Geneva: W.H.O. 1969.

Evaluation of the carcinogenic potential of a drug forms an important part of its safety evaluation. The test procedures adopted and the principles employed in assessing the results vary considerably and often lead to contradictory conclusions. A W.H.O. Scientific Group has reviewed in some detail the methods of testing commonly employed in animals. The Group also considered the relevance to man of demonstrating a true carcinogenic effect in animals. In its comments on the evaluation of results, attention is directed particularly to the controversial problem of sarcoma induction as an index of carcinogenic activity.

In the Group's view, long-term tests are essential for carcinogenicity testing, short-term tests, *in vitro* or *in vivo*, still being insufficiently developed to serve as an alternative. Among the general requirements for a valid carcinogenicity test, the identity and purity of the test material and a knowledge of its route of metabolism in

the test animals are of primary importance. The latter is especially valuable for a final evaluation of the carcinogenic hazard. Regarding the suitability of animal species, the Group considers that rodents (rats, mice and hamsters) are generally acceptable provided pathogen-controlled strains are used to ensure a sufficiently long survival. The dog is recommended for testing suspected bladder carcinogens of the aromatic amine group and the monkey is recommended for studying the carcinogenicity of certain hormone preparations. The use of newborn animals is not encouraged on the grounds that there is no clear indication that they are preferable to adults of the same species. Fish (trout) and birds are not recommended. Animal husbandry is not neglected and the Group makes a plea for the use of defined diets free of natural carcinogens, pesticide residues and food additives.

Turning to routes of administration the group emphasizes the need to administer the test compound by the route of intended clinical administration and to select a dose level that will ensure an adequate tissue concentration. Testing by the oral route meets these requirements in a substantial proportion of cases, but many drugs are given by subcutaneous injection, and the report pays particular attention to sarcoma induction in rats and mice by repeated subcutaneous injection. It is pointed out that local sarcoma induction by implantation of solids is determined by physical properties such as shape, size, smoothness of surface and whether or not the implant softens at body temperature. In the case of substances administered by repeated injection, the physical properties of injected solutions, such as hypertonicity, pH and surface activity, may play an important role in determining the onset of malignancy, while the injection of large doses in relation to the body weight of the animal may create other physical effects of which sarcoma production is the ultimate outcome. In such cases the local tumours do not reflect any chemical carcinogenic potential the test compound may possess. Chemical carcinogenesis is manifested by tumours of other tissues, including those remote from the injection site.

An important comment by the Scientific Group deserves to be quoted in full:

'Recognition of the part that may be played by the physical properties of a substance in the production of local sarcomas in the rat and mouse renders it difficult to interpret the significance of the induction of such tumours, especially if the substance is not carcinogenic when tested by other routes of administration. Detailed study of the nature and evolution of local tissue changes at the site of injection and of the mechanism by which they arise may help to resolve the problem.'

Another important aspect in evaluating results of carcinogenicity testing is the dose-response relationship. The Group considers that demonstration of such a relationship should be taken fully into account in the final assessment.

Should drugs that cause cancer in animals be allowed for administration to patients? Understandably, the Group is cautious in providing an answer. If a drug is to be used for short periods only, the risk involved may be justified; if the drug is one intended for prolonged administration, its use should be approached with greater caution. In the case of substances that produce local