

animal studies and relation to human conditions, the risk assessment problem, and the probable fate of nitrite as a food additive are included.

Nitrosamines are covered by Adrienne E. Rogers in 33 pages with 103 references. Several interesting tables supplement the text. For example, the various nitrosamines present in foods range from a low of 0.1 to 10 in alcoholic beverages, to a high of "up to 3000" $\mu\text{g}/\text{kg}$ in meat cures. The LD_{50} of several nitrosamines are tabulated, and range from 20 mg/kg for *N*-nitrosodimethylamine in rats by i.p. to 2500 mg/kg for *N*-nitrosodibutylamine by s.c. in the European hamster. The influence of species and route of administration of *N*-nitrosodibutylamine carcinogenesis is tabulated, showing significant differences both in route and species of animals used. Several of the dietary and chemical manipulations that alter nitrosamine carcinogenesis are discussed and tabulated. Such items as copper deficiency and disulfiram show significant effects in modifying the incidence of tumors.

Plant toxins, as discussed by A. Robin Mattocks of the Medical Research Council Laboratories in Surrey, England, covers 28 pages, including 221 references. The widespread nature of the problem, the difference in both mode of action and chronic vs. acute effects of ingestion (the usual route of entry), plant carcinogens, such as the pyrrolizidine alkaloids, the bracken (fern) carcinogens, cycasin and related glycosides, tannins, safrole, and miscellaneous carcinogens, and the mutagens, teratogens and fetotoxins, liver toxins, and lung poisons are other topics. Detection and analysis procedures are referenced.

Seafood biotoxins, as treated by John C. Wekell of NOAA and John Liston, University of Washington, covers 44 pages with 178 references. Although known since the Fifth Dynasty of Egypt, the toxic effects of marine animals are still not widely discussed until a major outbreak of a toxic effect. Intoxications from ciguatera, shellfish, puffer fish poisoning (tetrodotoxin or TTX), scombroid poisoning, and other seafoods are noted, and relative toxicity of some substances tabulated.

The book is well indexed, and should be a valued addition to anyone concerned with references to the subjects discussed.

H.H. FAWCETT

HAZOP and HAZAN: Notes on the Identification and Assessment of Hazards, by T.A. Kletz, Institution of Chemical Engineers, Rugby, 1983, ISBN 0-85295-165-5, 81 pages, paperback, £8.00 incl. postage and packing.

The IChemE, under its information exchange scheme, has published this addition to its series of Hazard Workshop Training Modules. The author will be well known to many people for his work in the field of chemical plant safety, particularly during his long career with ICI, from which company he recently retired. This set of notes is presented as an aid to training in the

workshop style, and the author invites anyone to make free use of it for training purposes, the figures and parts of the text being set out so that these parts can easily be transferred to overhead projection transparencies.

HAZOP (Hazard and Operability Studies) and HAZAN (Hazard Analysis) are presented as practical techniques for respectively, the *identification* of hazards and operability problems, and the *quantification* of hazard and safety problems. The emphasis is on the practicalities, and not the philosophy. The author states that the notes are not intended as a handbook for experts, and references F.P. Lees' excellent book *Loss Prevention in the Process Industries* for those who want an extensive treatment. These notes will be useful for the purpose stated, since they illustrate the application with examples, and pitfalls are identified. However, the author's personal stamp will be very evident to those familiar with his earlier publications, for example the "free lunch" frequency as an illustration of the use of a fault tree, and the "belt and braces" example for calculating hazard rate on a system with diversity and redundancy in the protective systems. Nonetheless, for its stated purpose this is a useful set of notes, which can be used to help promote training in this important topic. As Kletz urges, on page 72, "The experts in hazard analysis should train, check, help and encourage [the design engineers]." That is something we can all agree with.

R.F. GRIFFITHS

Energy Risk Assessment, by H. Inhaber, Gordon and Breach Science Publishers, New York, 1982, ISBN 0-677-05980-9, 395 pages incl. index, hardback, \$49.50.

The work published here is essentially a revised version of that which originally appeared in Inhaber's well known Atomic Energy Control Board (of Canada) report *Risk of Energy Production* (1978), which has since gone through several revisions. The work has, since its first appearance, provoked widespread criticism and comment, some of it resulting in highly acrimonious exchanges in the literature and popular press. For those not already familiar with this controversial work, Inhaber's approach to the quantitative risk assessment of energy generation systems uses what has been termed a *risk-accounting methodology*. The overall risk for a system is considered to be composed of contributions from all phases of the programme including pre-construction material acquisition, fuel acquisition and fabrication, plant construction, operation and maintenance, transportation and waste disposal. Decommissioning is dealt with only for the nuclear fuel cycle. The risks are expressed in terms of the occupational and public exposures, including deaths, injuries and morbidities. The eleven systems considered are Coal, Oil, Nuclear, Natural Gas, Hydroelectric, Wind, Methanol, Solar Thermal Electric, Solar Photovoltaic, Solar Space and Water Heating, and Ocean Thermal. The risks