precisely at higher frequency (10^{-3} to 10^{-4}), resulting in deletion of part of the host genome without deletion of the IS element. IS elements are usually polar in both orientations, although some carry a strong promoter that can regulate adjacent structural genes in one of their orientations.

Rapid progress in the identification, mapping, and characterization of IS elements has been made possible by the development of powerful techniques for the analysis of DNA structure, most notably DNA heteroduplex methods and the use of restriction endonucleases. These techniques have shown that multiple copies of IS elements are normal constitutents of the bacterial chromosome and also of extrachromosomal genomes. The location of the IS elements on several bacterial plasmids suggests that they may play a key role in chromosome evolution, a possibility that is discussed in the book by several authors. In several cases identical IS elements in the same orientation have been located at the boundaries between specific blocks of genetic information governing functions such as antibiotic resistance, conjugal transfer, and plasmid replication. This is precisely what would be expected if the IS elements serve as sites for the fusion of two progenitor genomes, each of which originally carried a collection of specific genes and one copy of the IS element, to form a more complex genome specifying all the functions of each partner.

The alarming spread of multiple drug resistance among bacterial pathogens also appears to be a manifestation of the genetic plasticity made possible by DNA insertions. Experiments in several laboratories have shown that most drug-resistance genes on bacterial plasmids are flanked by repetitious DNA sequences, usually in inverted orientation, some of which have been identified as IS elements. The Tn elements thus constituted can be used to study the mechanism of transposition because their insertion into any site on the genome is accompanied by the acquisition of drug resistance. And because drug-sensitive cells must lack Tn elements it is also possible to monitor the lineage of a Tn element once it has been introduced into a bacterial strain, as is not possible with IS elements because of the multiple copies present.

The third and fourth sections of the book provide an interesting comparison of IS elements with more complex elements that insert into prokaryotic genomes. Temperate bacteriophages like μ (section 3) and λ (section 4) can exist as prophages inserted into the bacterial chromosome; after induction, they can excise and undergo autonomous replication prior to being packaged into virus particles. Thus, as a number of the authors note, the study of their life cycles should make possible a more systematic analysis of the mechanism of DNA insertion and excision. The properties of μ are reviewed most comprehensively in papers by Bukhari *et al.*, Toussaint *et al.*, and Chow and Bukhari. When μ inserts into a host chromosome during lysogeny, it integrates at random sites. During the lytic cycle of the phage, μ DNA continuously inserts and excises at many different sites on the host chromosome, acquiring different host DNA sequences at its ends. Why μ behaves in this way is a mystery, but the behavior is certainly reminiscent of the promiscuous insertion of IS elements, albeit at a much higher frequency and under conditions that are more amenable to experimentation. Mu can also mediate the integration of chromosomal genes into plasmids and thus may function in a manner analogous to IS elements in chromosome evolution.

The mechanism of insertion and excision of λ is now known in considerable detail. Although λ has a single highly preferred site for integration, the phage uses a variety of secondary sites when the normal integration site is deleted. There are a number of analogies between λ and IS and Tn elements, but it is not clear whether λ can be considered a Tn element.

There are increasing indications that repetitious DNA segments and Tn elements may also mediate the control of gene expression and chromosome interactions in eukaryotes. These possibilities are discussed briefly in the seven papers in section 5. For over 25 years, controlling elements having many of the characteristics of Tn elements have been hypothesized to explain differences in gene expression in maize. More recently, related models have been invoked to explain unstable phenotypes in *Drosophila* and mating-type interconversions in yeast. Analysis of the DNA from a number of eukaryotes and their viruses has also revealed the existence of inverted repetitious sequences.

The characterization of IS and Tn elements has led to the development of new methodologies that should be of broad applicability in the study of genetic rearrangements. A number of the techniques are described in section 6. The final 185 pages of the book contain four appendixes that provide detailed information about the genetic and physical structure and properties of IS elements, bacterial plasmids, and a number of temperate bacteriophages as well as a list of the restriction endonucleases and their recognition sites that were known at the time of publication.

The selection and organization of the contributions to the volume are commendable. Although there are a large number of contributors, the style of the papers is remarkably uniform. Most papers end with a concise presentation of their principal conclusions. The book should remain a unique and important contribution for years to come.

ROBERT H. ROWND
Laboratory of Molecular Biology and *Department of Biochemistry, University of Wisconsin, Madison 53706*

Books Received

Aquakultur in der dritten Welt. Ludwig Nägel. Deutsche Gesellschaft für Technische Zusammenarbeit, Eschborn, Germany, 1977. 108 pp., illus. Paper.

Auxology. Human Growth in Health and Disorder. Proceedings of a congress. L. Gedda and P. Parisi, Eds. Academic Press, New York, 1978. x, 320 pp., illus. $22. Proceedings of the Serono Symposia, vol. 13.

Behavior in the Complex Environment. Siegfried Streufert and Susan C. Streufert. Winston, Washington, D.C., and Halsted (Wiley), New York, 1978. x, 316 pp., illus. $18.75. Scripta Series in Personality and Social Psychology.

Biochemical Mechanisms of Paraquat Toxicity. Proceedings of a symposium, Iowa City, June 1976. Anne Pomeroy Autor, Ed. Academic Press, New York, 1977. x, 240 pp., illus. $12.50.

Cytology of Non-Gynaecological Sites. G. Riotton and W. M. Christopherson in collaboration with R. Lunt. World Health Organization, Geneva, 1977 (U.S. distributor, WHO Publications Centre USA, Albany, N.Y.). 62 pp. + plates. $147.50. International Histological Classification of Tumours, No. 17.

Development and Plasticity of the Brain. An Introduction. R. D. Lund. Oxford University Press, New York, 1978. x, 370 pp., illus. Cloth, $14.95; paper, $7.95.

Essays in Neurochemistry and Neuropharmacology. Vol. 3. M. B. H. Youdim, D. F. Sharman, W. Lovenberg, and J. R. Lagnado, Eds. Wiley-Interscience, New York, 1978. xii, 228 pp., illus. $26.50.

Fixed Effects Analysis of Variance. Lloyd Fisher and John McDonald. Academic Press, New York, 1978. xiv, 178 pp. $16. Probability and Mathematical Statistics.

Food Processing and Nutrition. Arnold E. Bender. Academic Press, New York, 1978. viii, 224 pp. $15.25. Food Science and Technology.

Guide to Biological Terms in Melanesian Pidgin. Martin Simon. Wau Ecology Institute, Wau, Papua New Guinea, 1977 (U.S. distributor, Bishop Museum Press, Honolulu). iv, 116 pp., illus. Paper, $4. Wau Ecology Institute Handbook No. 3.

Handbook of Common New Guinea Beetles. J. L. Gressitt and R. W. Hornabrook. Wau Ecology Institute, Wau, Papua New Guinea,

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BOOKS RECEIVED

(Continued from page 352)

1977 (U.S. distributor, Bishop Museum Press, Honolulu). viii, 88 pp., illus. Paper, $4.50. Wau Ecology Institute Handbook No. 2.

Industrial and Environmental Xenobiotics. In vitro versus in vivo Biotransformation and Toxicity. Proceedings of a conference, Prague, Sept. 1977. James R. Fouts and Ivan Gut, Eds. Excerpta Medica, Amsterdam, 1978 (U.S. distributor, Elsevier, New York). xviii, 346 pp., illus. $57. International Congress Series 440.

Jacques Lacan. Anika Lemaire. Mardaga, Brussels, ed. 2, 1977. 382 pp. Paper, 430 BF. Psychologie et Sciences Humaines.

Laboratory Handbook of Paper and Thin-Layer Chromatography. Jiří Gasparič and Jaroslav Churáček. Translated from the Czech by Želimír Procházka. R. A. Chalmers, Transl. Ed. Horwood, Chichester, England, and Halsted (Wiley), New York, 1978. 362 pp., illus. $42.50. Ellis Horwood Series in Analytical Chemistry.

Manpower and Immigration Policies in the United States. National Commission for Manpower Policy, Washington, D.C., 1978. vi, 276 pp. Paper. National Commission for Manpower Policy Special Report No. 20.

The Mathematics of the Energy Crisis. R. Gagliardi with a section by J. E. Pournelle. Intergalactic Publishing Company, Westmont, N.J., 1978. viii, 72 pp., illus. Paper, $6.96.

Numerical Methods in Offshore Engineering. Papers from a symposium, Swansea, U.K., Jan. 1977. Wiley-Interscience, New York, 1978. xii, 582 pp., illus. $48. Wiley Series in Numerical Methods in Engineering.

Organic and Biological Chemistry. John R. Holum. Wiley, New York, 1978. xxiv, 494 pp., illus. $14.95.

PCT, Spin and Statistics, and All That. R. F. Streater and A. S. Wightman. Benjamin Advanced Book Program, Reading, Mass., ed. 2, 1978. x, 208 pp., illus. Paper, $14.50. Mathematical Physics Monograph Series.

Pentachlorophenol. Chemistry, Pharmacology, and Environmental Toxicology. Proceedings of a symposium, Pensacola, Fla., June 1977. K. Ranga Rao, Ed. Plenum, New York, 1978. xiv, 402 pp., illus. $37.50. Environmental Science Research, vol. 12.

Percepción y Cultura. Un Enfoque Ecológico. Carmen Viqueira. Centro de Investigaciones Superiores, Tlalpan, Mexico, 1977. 320 pp., illus. Paper. Ediciones de las Casa Chata, 4.

Psychodynamics of Drug Dependence. Jack D. Blaine and Demetrios A. Julius, Eds. Alcohol, Drug Abuse and Mental Health Administration, Rockville, Md., 1977 (available from the Superintendent of Documents, Washington, D.C.). xii, 188 pp. $2.75 National Institute on Drug Abuse Research Monograph 12.

Radiation Effects. ESR and ENDOR Analysis. Harold C. Box. Academic Press, New York, 1977. viii, 280 pp., illus. $24.50.

Rainbows, Halos, and Other Wonders. Light and Color in the Atmosphere. Kenneth Heuer. Dodd, Mead, New York, 1978. 110 pp., illus. $5.95.

Regional Impacts of Rising Energy Prices. William H. Miernyk, Frank Giarratani, and Charles F. Socher. Ballinger (Lippincott), Cambridge, Mass., 1978. xviii, 138 pp., illus. $15.50.

Research in Sociology of Knowledge, Sciences and Art. An Annual Compilation of Research. Vol. 1. Robert Alun Jones, Ed. JAI Press, Greenwich, Conn., 1978. viii, 290 pp. $12.50; to institutions, $25.

Simulation Modelling of Environmental Problems. François N. Frenkiel and David W. Goodall, Eds. Published for the Scientific Committee on Problems of the Environment of ICSU by Wiley, New York, 1978. xvi, 112 pp. Paper, $11. SCOPE 9.

Singlet Oxygen. Reactions with Organic Compounds and Polymers. Papers from a conference, Stockholm, Sept. 1976. B. Rånby and J. F. Rabek, Eds. Wiley-Interscience, New York, 1978. x, 332 pp., illus. $37.

Solar Power and Fuels. Proceedings of a conference, London, Canada, Aug. 1976. James R. Bolton, Ed. Academic Press, New York, 1977. xvi, 254 pp., illus. $13.50.

Spores VII. Papers from a conference, Madison, Wis., Oct. 1977. Glenn Chambliss and James C. Vary, Eds. American Society for Microbiology, Washington, D.C., 1978. x, 354 pp., illus. $20.

Statistics. David Freedman, Robert Pisani, and Roger Purves. Norton, New York, 1978. xvi, 506 pp., illus. + appendices. $13.95.

Structural Analysis. A Unified Classical and Matrix Approach. A Ghali and A. M. Neville. Chapman and Hall, London, and Halsted (Wiley), New York, ed. 2, 1978. xxiv, 780 pp., illus. Paper, $19.95.

Whence and Wherefore. The Cosmological Destiny of Man Scientifically and Philosophically Considered. Zev Zahavy. Barnes, Cranbury, N.J., and Yoseloff, London, 1978. 178 pp. $7.50.