The casual reader, however, who approaches this volume for the purpose of obtaining an overall view of a rather diversified field with a multitude of both potential and realized technological applications may experience some difficulty in trying to put things in perspective. Although some attempt has been made to collect similar topics into adjacent chapters, the arrangement is rather haphazard and lacking in logical continuity. In addition, as with so many symposium volumes, many topics are discussed but each segment tends to be too narrow and specialized. There is no general review article to tie the subjects together. Reference lists have been left to the individual authors to provide, and the result is a narrow and subjective selection with a great deal of overlap.

There are at present only two other books dealing with electronic tunneling, one of them restricted to superconducting junctions. Duke's *Tunneling in Solids*, a supplement to the classic Seitz and Turnbull series *Solid State Physics*, presents the entire subject of tunneling between two electrodes in a systematic, well-organized, and thorough manner while emphasizing the spectroscopic aspects and applications. It is somewhat more theoretical and up-to-date and contains a fanatically comprehensive list of references, but often lacks the particular flavor imparted by an author who is reviewing his own work. Those who are interested primarily in superconducting tunneling or the Josephson effect should also consult the several relevant sections of Parks's *Treatise on Superconductivity*, in which a more cohesive treatment of these specialized topics is presented in much greater depth.

In summary, this book, though flawed, is a unique introduction to tunneling phenomena for those who are unfamiliar with recent developments and an interesting bit of memorabilia for those who have been contributing in past years. For those who are currently engaged in research, however, Duke or Parks will be indispensable; Burstein and Lundqvist probably will not be. If you cannot afford all three books, shop carefully before purchasing; the value of each depends on the knowledge of the user.

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Tetrapyrrole Biosynthesis

Porphyrins and Related Compounds. A symposium, London, April 1968. T. W. GOODWIN, Ed. Academic Press, New York, 1968. x + 176 pp., illus. $6.75. Biochemical Society Symposium No. 28.

The moderate price, coherence, and high quality of the Biochemical Society symposium volumes, published under the competent and experienced editorship of T. W. Goodwin, make them well suited for use in graduate courses, and they constitute a good source of topics for those inevitable tribal rites of graduate education—cumulative and oral examinations. This symposium honored Claude Rimington, a pioneer and long-time leader in the field of porphyrin metabolism. A few well-known workers who have been contributors to symposia and monographs in this field in the past are regrettably missing from this volume. However, another pioneer, David Shemin, makes a presentation on his recent and elegant elucidation of the mechanism of action of aminolevulinic acid dehydratase.

The title *Porphyrins and Related Compounds* might have included the word "biosynthesis," since 8 of the 12 papers are directly concerned with the nature and regulation of tetrapyrrole biosynthetic pathways in plants, animals, and microbes. A representative mix of approaches and organisms is maintained, ranging from experimental porphyria in mammals to chlorophyll formation in photosynthetic bacteria. Three of the papers cover some highly pertinent advances in the organic chemistry of tetrapyrroles as natural product structures. The functional roles of tetrapyrroles were a minor concern of this symposium; photosynthetically oriented investigators are represented by one paper on in vivo forms of chlorophyll, and electron transport is not discussed at all. Many of the papers go beyond the expected discussion of some high points of recent work by pointing out key unsolved problems in tetrapyrrole formation, some of which have evaded the probings of more than one laboratory for some years. The enzyme that incorporates magnesium into protoporphyrin remains undemonstrated; the mechanism of prophobilinogen condensation has not yet been verified; knowledge of the formation of the carbocyclic ring in chlorophylls is sketchy; some organic structural features remain in doubt in the chlorophylls (chlorophyll c and *Chlorobium* chlorophyll 660); and so on.

The emphasis in current work on tetrapyrrole biosynthesis has turned, as it has in other areas of biochemistry, from structures and pathways to mechanisms and regulation. Workers at the physiological end of the professional spectrum are wrestling with regulatory aspects of porphyrin biosynthesis expressed clinically in the form of porphyrias. The origins of these disorders lie both in genes and in chemical insults (for example, from lead or drugs) generally appearing as porphyrinurias (excretion of excess metabolites). It is intriguing that lead poisoning mimics acute intermittent porphyria, a genetic lesion. The porphyrinurias are probably only one expression of a more general disturbance of metabolism, and their study is particularly important in our pilled and polluted society.

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A Heteromorphic Process

Planarian Regeneration. H. V. BRØNDSTED. Pergamon, New York, 1969. viii + 280 pp. + plates. $13.50. International Series of Monographs in Pure and Applied Biology: Zoology, vol. 42.

Brøndsted's monograph draws together nearly 200 years (1774–1966) of literature on regeneration in planaria and will therefore be invaluable to all students of regeneration and development. Brøndsted senses the end of one long era of study in which the basic questions have been posed and the start of a new era in which these questions may be answered with modern tools and techniques. The scalpel will now yield to the ultracentrifuge and the electron microscope.

The regenerative processes were studied at one time or another by Darwin, Faraday, and Harvey, but it was not until T. H. Morgan and C. M. Child entered the scene that a firm basis for further fruitful investigation was established. Many questions posed by early investigators are largely unanswered, especially when considered in modern terms: Drapernauld (1800–01) writes that it can be asked of the psychologists in which half of a longitudinally

divided planarian the soul, or mind ("l'âme"), exists after cutting.

Brøndsted is a believer in "neoblasts," allegedly totipotent or pluripotent embryonic reserve cells existing in the parenchyma, which have been reported to migrate to the wound site and form the blastema. He dismisses arguments against neoblasts, despite their highly controversial status. This is unfortunate, because studies completed after his literature survey support the alternative process of dedifferentiation, proliferation, and redifferentiation to form the blastema cells and subsequent differentiated structures. In analogous fashion, he rejects Child's theory of axial physiological gradients in favor of Wolff's inhibitor theory. A somewhat less restricted interpretation of Child's theory, not his experiments, coupled with recently published data makes the theory at least as acceptable as, if not preferable to, Wolff's.

This book presents the questions, the controversies, and the appropriate background for future investigations on regeneration in planaria and the inherent problems of polarity, patterns of differentiation, and stability of phenotype.

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Mammalian Fibers

Hair Growth. Proceedings of a symposium, Beaverton, Ore., 1967. WILLIAM MONTAGNA and RICHARD L. DOBSON, Eds. Pergamon, New York, 1969. xxii + 586 pp. + plates. $21.50. Oregon Regional Primate Research Center Publication No. 277. Advances in Biology of Skin, vol. 9.

This volume contains the bulk of recent knowledge and thought on control mechanisms affecting hair morphology and hair growth. When compared with other texts on this subject published in recent years it reveals some change in focus of research, particularly extension of interest to several mammalian species including nonhuman primates. Nearly half of its 35 chapters deal with observations on man.

While new knowledge concerning hair growth has been developed during the past decade, this information has failed to yield any evident substantial advance in identification of the physiological influences that regulate the growth of hair in any species—this despite the fact that an array of diverse experimental conditions can markedly affect the ability of a hair follicle to produce hair. Most of these experimentally imposed conditions inhibit rather than stimulate hair growth, a fact reflecting the normal high mitotic and synthetic events within the hair follicle that are operative only under optimum circumstances. This high activity explains the reported finding that nutritional deficiencies provoke distinct morphologic defects in the hair fiber which can be used as a measure of nutritional health.

The hair follicle remains a superb model of growth and differentiation, an isolated system that continually flaunts its normal cyclic patterns of growth, involution, and regeneration. This volume testifies that the follicle has successfully kept secret against the forays of those who have tried to discover them the essential ingredients of its regulatory forces.

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Medical Genetics

Human Afflictions and Chromosomal Aberrations. RAYMOND TURPIN and JÉRÔME LEJEUNE. Translated from the French edition (Paris, 1965). Pergamon, New York, 1969. xii + 392 pp., illus. $21. International Series of Monographs in Pure and Applied Biology: Modern Trends in Physiological Sciences, vol. 32.

This book is a heroic attempt to summarize the explosive field of human cytogenetics, a task the authors accomplish with clarity and by a methodological approach satisfying to the historically oriented scientist.

The historical chapter is informative. In it European work is extensively reviewed and significant contributions are attributed to individuals not widely recognized by English-speaking reviewers. The systematic documentation of progressive observations and theories is continued in the chapter on techniques. This historical approach gives a dateless quality to the book, making it a valuable acquisition for novice and expert alike and partially compensating for the lack of revision since 1965.

The discussion of chromosomal grouping (karyotype) and the variations within measurements of the human somatic complement are the result of extensive research by the authors and present an original topographical method. The quality of reproduction in the illustrations is excellent and allows the reader to evaluate the authors' proposal to identify individual chromosomal pairs numerically, an ability not universally professed by cytogeneticists. This chapter is handicapped by the lack of autoradiographic data and of reference to the standardized nomenclature more recently adopted, however.

The chapter on autosomal anomalies and sex chromosomal errors is reflective of the authors' involvement in medical genetics. For example, the term "mongolism" is deliberately replaced by "trisomy 21." The authors then progressively document the theoretical prediction, by Waardenburg in 1932 and others, of the chromosomal etiology now so widely known. It is of interest that the frequent chromosomal aberrations and numerical anomalies were well known and described by 1965.

The clinical significance of translocations and genetic counseling of families is stressed in addition to the association of deletion markers and aneuploidy frequently found in malignancies. Caution is expressed and appears warranted in expressing finite risk or attributing causal relationships in either case.

The final sections review developmental sexual defects, mosaicism, twin zygosity, and possible chromosomal linkage of biochemical markers.

The great advantages of this book lie in its historical approach, its thoroughness (over 1800 references to 1964), and the personal approach and theories it presents of two founding scientists in medical cytogenetics.

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Books Received

Advances in Child Development and Behavior. Vol. 4. Lewis P. Lipsett and Hayne W. Reese, Eds. Academic Press, New York, 1969. xiv + 338 pp., illus. $13.50.

Advances in Veterinary Science and Comparative Medicine. Vol. 13. C. A. Brandly and Charles E. Cornelius, Eds. Academic Press, New York, 1969. xviii + 422 pp., illus. $18.50.

Adventures in Discovery. Tom Purdom, Ed. Doubleday, Garden City, N.Y., 1969. x + 182 pp., illus. $4.95.

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