mation presented is too detailed for the general reader and unnecessary or not detailed enough for the professional.

Minor defects include lack of sufficiently detailed maps, of illustrations showing representatives of the various groups discussed in the physical anthropology chapter, and of drawings of the various bead types referred to in the discussion of California and the Great Basin and too sparse a use of references.

In spite of its faults the book is to be recommended as the first major attempt to present a prehistory of the Far West. It is a pioneer effort.

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Ganglionic Cells

SIF Cells. Structure and Function of the Small, Intensely Fluorescent Sympathetic Cells. OLAVI ERÄNKÖ, Ed. National Institutes of Health, Bethesda, Md., 1976 (available from the Superintendent of Documents, Washington, D.C.). xiv, 260 pp., illus. $6.50. Fogarty International Center Proceedings, No. 30. DHEW Publication No. (NIH) 76-942.

Toward the end of the last century, histologists recognized that some sympathetic ganglia contain—in addition to large autonomic neurons—small cells that resemble chromaffin cells of the adrenal medulla. In the early 1960's, using the new method of demonstrating catecholamines in tissues by formaldehyde-induced fluorescence, Eränkö and Härkönen noted that the superior cervical ganglion of the rat contained some cells that had extremely bright fluorescence but were smaller than autonomic neurons. In 1965 they named such cells "small intensely fluorescent" (SIF) cells. Studies subsequently showed that SIF cells had ultrastructural features characteristic of both neurons and adrenal medullary cells and in many ganglia were much more numerous than could have been predicted from earlier studies of chromaffin cells. The preliminary morphological observations, interpreted in the light of existing neurophysiological evidence, led to the suggestion that SIF cells are interneurons that modulate neuronal activity in sympathetic ganglia.

This book results from a meeting held at the National Institutes of Health in February 1975, when Eränkö was a scholar-in-residence at the Fogarty International Center, and it reveals the sizable amount of interest that SIF cells attracted during the 10-year period leading up to the meeting. The collection of 20 papers shows the diversity of morphological, cytochemical, neurophysiological, and biochemical approaches that have been used to study SIF cells. Perhaps most important, the book lends further support to the idea that SIF cells comprise several different types of small, catecholamine-containing cells. For example, biochemical and histochemical studies show that some SIF cells synthesize and store dopamine and others make norepinephrine or possibly epinephrine. Furthermore, the book illustrates that SIF cells are present—though variable in number—in the superior cervical ganglia of many species and in the ganglia of pelvic viscera. However, the extensive distribution of SIF cells is not fully described in the book. There is no mention that SIF cells have been described in several parasympathetic and sensory ganglia—key observations that document the association of SIF cells with a variety of types of neurons. Reference is made to similarities between SIF cells and the principal glomus cells of the carotid body and paraganglia, but the reader is not made certain of the morphological criteria that cells must satisfy to be classified as SIF cells. In this regard, the chapters on aminergic neurons in the brain are excellent reviews of fascinating work, but their relation to the main subject of the book is unclear.

Compelling evidence that some SIF cells modulate the activity of sympathetic neurons is presented in neurophysiological, pharmacological, and biochemical studies of sympathetic ganglia. The data suggest that dopamine released by SIF cells produces long-lasting postsynaptic potentials in ganglion cells. An interneuronal function, attributed to SIF cells that are innervated by preganglionic nerves and in turn innervate sympathetic neurons, is consistent with these observations. However, ultrastructural evidence cited in the book indicates that not all SIF cells have this pattern of innervation. Some resemble neurosecretory cells because they have a synaptic input but no synaptic output. Others, such as the SIF-cell-like glomus cells of the carotid body, probably have a sensory innervation. Questions about innervation will persist until the synaptic connections of SIF cells in various locations have been adequately assessed by quantitative morphological studies of an experimental nature.

The chapters are well illustrated with light, fluorescence, and electron micrographs, many of which are technically excellent, but the mediocre quality of reproduction of the half-tone prints reflects efforts to limit costs. The inclusion of an overall summary distinguishing the issues that are resolved from those that are still controversial would have been helpful to readers not familiar with the field. The book is logically organized and clearly written and provides convenient access to a large quantity of data on SIF cells.

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Biological Gerontology

Cellular Ageing. Concepts and Mechanisms. RICHARD G. CUTLER, Ed. In two parts. Part 1. General Concepts; Mechanisms 1, Fidelity of Information Flow. vi, 218 pp. Paper, $46.25. Part 2. Mechanisms 2, Translation, Transcription and Structural Properties. vi, 130 pp., Paper $30.50. Karger, Basel, 1976. Interdisciplinary Topics in Gerontology, vols. 9 and 10.

Although there are numerous studies dealing with the changes in biological properties that occur during aging, there is, as yet, no synthesis of the principles governing these changes. Further complications arise from difficulties in determining which observations are relevant and reliable. For example, only recently has it been generally recognized that the variables peculiar to the model system used must be rigidly controlled. Mean and maximum life-spans must be determined for each population used, and pathological changes in aging cells and tissues must be continually monitored. Otherwise the results obtained may be uninterpretable.

Perhaps one of the most fundamental questions in biological gerontology is whether the aging of the organism is due to the cumulative effect of the aging of individual cells. The editor of this treatise has set out to address this question by bringing together the views of 33 authors, expressed in 21 chapters.

The first section of part 1 covers a number of fundamental subjects and is an excellent introduction to the field. Especially good are chapters by Sohol and Sacher that deal with the kinetics and the thermodynamics of aging, respectively. Other interesting chapters deal with genetics and molecular aspects of aging. Two chapters by Adelman and Finch caution workers to examine critically what appear to be cellular changes, for

such changes may be secondary effects of humoral changes; the fact that humoral changes are ultimately cellular in nature is never mentioned. This section on general concepts is concluded with an overly long chapter by the editor on the nature of aging. Although the chapters in the section are generally of first quality, one wonders about their arrangement. For example, the chapter by Cutler could very well have been the opening chapter for part 1 and might have been followed by the related contributions of Sacher and Sohol. Conspicuous by its absence is a chapter dealing with the fundamental nature of cell aging and the relation between aging, differentiation, and the life-span of cells in vivo and in vitro.

The second section of part 1, dealing with the fidelity of information flow, contains two excellent chapters on mutation frequencies and DNA repair by Hart and Trosko. These chapters set forth the nature and types of DNA repair as well as the role of mutagenesis in aging. The authors speculate broadly (and bravely) on the relation between DNA repair, mutagenesis, carcinogenesis, and aging.

The last two chapters of part 1 and the first three of part 2 deal exclusively with evidence bearing on the notion that aging is caused by errors. The authors discuss evidence for and against error theories, drawing on models as varied as human cell cultures and mosquitoes. These chapters are followed by ones that review the literature on ultrastructural changes with age and the relationship between the life-span of fibroblasts in vitro and the age of the donor from which they were derived. Two chapters on transcription, one on enzyme changes, and one on cell renewal and cell loss during aging complete the volume. Here again it is difficult to fathom what the editor perceives the relationship between chapters to be.

Overall, the chapters are somewhat uneven both in length (ranging from 6 to 51 pages) and in conceptual development. Some are straightforward literature reviews while others are reports of research. Both volumes contain many typographical errors. The lack of a clear rationale for the selection and arrangement of chapters suggests the lack of a coherent body of knowledge. In that sense, the editor has missed his mark. On the other hand, most of the current information and central topics in biological aging research are to be found in these two volumes.

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Advances and Technical Standards in Neurosurgery. Vol. 4. H. Krayenbühl and eight others, Eds. Springer-Verlag, New York, 1977. xii, 156 pp., illus. $31.70. *To order this book circle No. 389 on Readers' Service Card*

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Analyse des Variables Régionalisées. Traitement du Signal en Sciences de la Terre. André Guillaume. Doin, Paris, 1977. vi, 180 pp., illus. Paper, 130 F.

Aspects of Signal Processing. Proceedings of a NATO Advanced Study Institute, Portovenere, La Spezia, Italy, Aug. 1976. G. Tacconi, Ed. Reidel, Boston, 1977. Two volumes, illus. xxvi + pp. 1–400, and xii + pp. 401–788. $66. NATO Advanced Study Institutes Series C, vol. 33.

Basic Biology. Richard A. Goldsby. Harper's College Press (Harper and Row), New York, 1977. x, 500 pp., illus. $12.95. Study Guide. Paper, $4.95.

Behaviourism and the Limits of Scientific Method. Brian D. Mackenzie. Humanities Press, Atlantic Highlands, N.J., 1977. xiv, 194 pp. $11.50. International Library of Philosophy and Scientific Method.

Biochemical Methods in Medical Genetics. Sally Kelly. Thomas, Springfield, Ill., 1977. xii, 346 pp., illus. $17.50.

Biochemistry of Membrane Transport. Proceedings of a symposium, Zurich, July 1976. G. Semenza and E. Carafoli, Eds. Springer-Verlag, New York, 1977. xx, 672 pp., illus. $42.70. Proceedings in Life Sciences. *To order this book circle No. 390 on Readers' Service Card*

A Biogeographical Analysis of the Chihuahuan Desert through Its Herpetofauna. David J. Morafka. Junk, The Hague, 1977. viii, 314 pp., illus. Dfl. 95. Biogeographica, vol. 9.

Bioinorganic Chemistry—II. Papers from a symposium, New York, Apr. 1976. Kenneth N. Raymond, Ed. American Chemical Society, Washington, D.C., 1977. viii, 448 pp., illus. $14.50. Advances in Chemistry Series, 162. *To order this book circle No. 396 on Readers' Service Card*

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Blood pH, Gases, and Electrolytes. Proceedings of a workshop, Gaithersburg, Md., July 1975. Richard A. Durst, Ed. National Bureau of Standards, Washington, D.C., 1977 (available from the Superintendent of Documents, Washington, D.C.). x, 350 pp., illus. Paper, $4.75. NBS Special Publication 450.

Cancer Biology. IV, Differentiation and Carcinogenesis. Papers from a meeting, Aspen, Colo., Aug. 1976. Carmia Borek, Cecilia M. Fenoglio, and Donald West King, Eds. Stratton, New York, 1977. xvi, 324 pp., illus. Paper, $24.50. Advances in Pathobiology, 6.

Case Studies in Medical Physiology. Robert S. Alexander. Little, Brown, Boston, 1977. viii, 170 pp. Paper, $6.95.

Casework in Context. A Basis for Practice. D. E. F. Tilbury. Pergamon, New York, 1977. x, 338 pp. $16. Social Work Series. Pergamon International Library. *To order this book circle No. 392 on Readers' Service Card*

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Clay Colloid Chemistry. For Clay Technologists, Geologists, and Soil Scientists. H. van Olphen. Wiley-Interscience, New York, ed. 2, 1977. xviii, 318 pp., illus. $21.50.

Climate, Water and Agriculture in the Tropics. I. J. Jackson. Longman, New York, 1977. xii, 248 pp., illus. Cloth, $16.50; paper, $8.50. *To order this book circle No. 397 on Readers' Service Card*

Clinical Chemistry and Chemical Toxicology of Metals. Proceedings of a symposium, Monte Carlo, Mar. 1977. Stanley S. Brown, Ed. Elsevier/North Holland, New York, 1977. xii, 398 pp., illus. $39.25. Developments in Toxicology and Environmental Science, vol. 1.

CNO Isotopes in Astrophysics. Proceedings of a meeting, Grenoble, Aug. 1976. Jean Audouze, Ed. Reidel, Boston, 1977. xiv, 198 pp., illus. $22. Astrophysics and Space Science Library, vol. 67.

Coastal Processes and Resulting Forms of Sediment Accumulations. Currituck Spit, Virginia–North Carolina. Field Trip Guidebook. Victor Goldsmith, Ed. Virginia Institute of Marine Science, Gloucester Point, Va., 1977. Variously paged, illus. Paper, $15. Special Report in Applied Marine Science and Ocean Engineering No. 143.

Concepts and Methods of Biostratigraphy. Erle G. Kauffman and Joseph E. Hazel, Eds. Dowden, Hutchinson and Ross, Stroudsburg, Pa., 1977 (distributor, Halsted [Wiley], New York). xiv, 658 pp., illus. $35.

Concrete Shell Roofs. C. B. Wilby and I. Khwaja. Halsted (Wiley), New York, 1977. xiv, 328 pp., illus. $27.50.

The Courtship of Birds. Hilda Simon. Illustrated by the author. Dodd, Mead, New York, 1977. 190 pp. $12.95.

The Cult of the Wild. Boyce Rensberger. Drawings by Betty Fraser. Anchor/Doubleday, Garden City, N.Y., 1977. viii, 280 pp. $7.95.

Dimensions of Ecology. Jonathan L. Richardson. Oxford University Press, New York, 1977. xiv, 412 pp., illus. $16.

Drugs, Rituals and Altered States of Consciousness. Papers from a symposium, Amsterdam, 1975. Brian M. du Toit, Ed. Balkema, Rotterdam, 1977 (U.S. distributor, International Scholarly Book Services, Forest Grove, Ore.). x, 272 pp., illus. $16.50. *To order this book circle No. 398 on Readers' Service Card*

Echocardiology with Doppler Applications

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