It is worth noting that Bregman's ideas stretch beyond the sphere of human perception to the world of all animals who perceive acoustic information. Although a few behavioral scientists have recently begun to address animals' perception of complex auditory information, no one has yet approached the problem from Bregman's point of view.

Bregman has written a major book, a unique and important contribution to the rapidly expanding field of complex auditory perception. This is a big, rich, and fulfilling piece of work that deserves the wide audience it is sure to attract.

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Molecular Gerontology

Molecular Biology of Aging. CALEB E. FINCH and THOMAS E. JOHNSON, Eds. Wiley-Liss, New York, 1990. xviii, 430 pp., illus. $110. UCLA Symposia on Molecular and Cellular Biology, vol. 123. From a colloquium, Santa Fe, NM, March 1989.

The promise that complex biological processes may be understood—at least in broad outline—at a molecular or biochemical level has begun to be fulfilled for some areas of biology. Thus, the molecular biology of development and cancer are tangible and viable fields, although still in their infancy. In other areas, the promise is as yet mostly unrealized, but the hope that molecular biology will soon help penetrate the mysteries of brain function or aging, for example, is stronger than ever.

Readers expecting to find in the present volume molecular paradigms for organismal or cellular aging will be largely disappointed, however. The book is more a testimony to hope in the power of molecular biology than a documentation of its achievements in aging research.

The book covers a diverse range of topics in genetics, biochemistry, and cell biology as they relate to aging in intact organisms or cultured cells. The diversity of topics reflects the pleiotropic effects of aging—even when studied in simple cell culture systems. There are chapters on the genetics of life-span in yeast, nematodes, insects, and mice; the incidence and repair of radiation-induced and oxidative damage to DNA, proteins, and cell membranes; the control of DNA replication and cell proliferation; selective and programmed cell death; and the control of general and specific gene expression. Even with such a broad range of topics, the book falls short of being really comprehensive. For the knowledgeable reader, however, most of the chapters will serve as accessible and concise introductions or updates.

In most of the book's 27 chapters, the authors clearly relate their data to organismal or cellular aging, if not directly through experimental design, then indirectly through often (but not always) lucid discussions. There are a few chapters that clearly show the successful and promising use of molecular biology to study aging. The best of these is a chapter that describes the cloning of a gene that extends the lifespan of the nematode *Caenorhabditis elegans*. A few other chapters describe preliminary data on how cloning and a genetically malleable organism can be used to isolate similar candidate genes.

The majority of the chapters describe studies in which a molecular biological approach is apparent, but only in a very preliminary form. Some of these chapters are certainly stimulating, but a molecular framework for understanding the age-related phenomenon under study must often be teased out by the reader. For example, there are studies describing age-associated alterations in the mRNA levels for several genes, some of which—such as those involved in the stress response or in protection from oxidative damage—are good candidates for playing important roles in aging. However, few studies have gone beyond simple measurements of mRNA abundance. On the other hand, there are chapters describing novel ways to measure the accumulation of mutations in intact organisms or the use of transgenic animals to study transcriptional control, but none report results of these techniques applied to aging organisms or cells. The value in many of these chapters lies not so much in their content as in the implications of the approach and the data for directions for future research. And recent studies from these authors and other laboratories suggest that the data in some of these chapters are indeed interesting springboards for more molecular analyses.

Finally, there are several chapters that describe studies that are either derivative in nature, outdated, or of marginal relevance to organismal or cellular aging. A more vigorous use of editorial veto power would have yielded a book of more uniform quality and interest.

If this book has a dearth of chapters on novel genes, their introduction into cells or organisms, the identification of age-specific regulatory DNA sequences or nucleic acid binding proteins, and other hallmarks of the arrival of molecular biology to a field, it reflects the situation of molecular aging research. Important steps have clearly been taken, and if the molecular biology of aging

advances as fast as, for example, the molecular biology of cancer, one may expect this book to be out of date very soon. On the other hand, the assumption that molecular biology will unravel the mysteries of aging as rapidly as it has the mysteries of cancer may be naive. For the time being, this book should give investigators both within and outside the field of basic aging research some interesting systems and molecular hints to think about.

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Ferroelectrics for Optics

Physics and Chemistry of Crystalline Lithium Niobate. A. M. PROKHOROV and YU S. KUZ'MINOV. Hilger, New York, 1990. xx, 377 pp., illus. $130. Hilger Series on Optics and Optoelectronics. Translated from the Russian by T. M. Pyankova and O. A. Zilbert.

Lithium niobate is a unique material whose varied optoelectronic properties have found use in a wide variety of important applications, including surface acoustic wave devices (widely used in television sets), optical deflectors, tunable optical filters, laser modulators, Q-switches, and transducers. This material was first synthesized 25 years ago and has been the subject of numerous scientific and engineering studies ever since. It has a complicated crystal structure, which is responsible both for its unusual properties and for many of the difficulties in preparing device-quality single crystals.

The first comprehensive review of the chemistry and physics of lithium niobate was written in 1978 by A. Rauber (in *Current Topics in Materials Science*, vol. 1; North-Holland) and has been an indispensable reference source for workers in the field. It is surprising, considering the continually increasing commercial market for this material, that a more up-to-date review has not been written until now, and this book by Prokhorov and Kuz'minov (both of the U.S.S.R. Academy of Sciences) is very welcome indeed.

A range of topics is covered, including the physical and chemical properties of $LiNbO_3$; methods for making single crystals; defects; domain structure; optical inhomogeneities; and electrical, optical, electro-optical, nonlinear, photoelectric, and photorefractive properties. The subjects covered are treated in great depth for the most part, but the book is not fully comprehensive, as it leaves out the fields of integrated optics (in which $LiNbO_3$ is an important substrate material), acousto-optic properties and applications, and related optical materials. This book is filled with interesting facts and information that will be of use to both materials and device researchers. Many of the known property data on $LiNbO_3$ have been collected here, which makes this a useful reference book.

The translation employs some terminology that is not conventional in English, such as "overcooling" for "undercooling" or "supercooling," and in places the wording is obscure. The authors present a steady stream of facts that often does not lead anywhere. I also found some inconsistencies; for example, in the chapter on crystal growth the authors report that multidomain crystals form if the melt contains impurities, but in the chapter on domains they say that other factors cause domain formation and do not mention the purity issue. Few recent references are included, the authors rely heavily on work from the late '60s and early '70s that many workers would now consider obsolete, and some detailed work on defect structure, for example, is missing. The discussion of crystal growth is based on current Soviet technology, and some of the methods given for improving crystal quality appear to be system-specific and thus may not be generally useful.

In spite of these problems, if you are interested in $LiNbO_3$, its applications, or electro-optic or ferroelectric materials in general, this will be a very valuable book to have on your library shelf.

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Books Received

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Basic Chemical Thermodynamics. E. Brian Smith. 4th ed. Clarendon (Oxford University Press), New York, 1990. xvi, 166 pp., illus. $45; paper, $22.95. Oxford Chemistry Series, 35.

Basic Facts for Basic Science. Radovan Zak. Raven, New York, 1990. xii, 258 pp., illus. Paper, $29.50.

Basic Toxicology. Fundamentals, Target Organs, and Risk Assessment. Frank C. Lau. 2nd ed. Hemisphere (Taylor and Francis), New York, 1991. xiv, 361 pp., illus. $59.50; paper, $36.50.

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