related changes in neuronal RNA. Three chapters concern, respectively, enzymes and cellular metabolism, connective tissues, and lipids and pigments, the last of these dealing mostly with basic principles of lipid metabolism while neglecting the literature on lipofuscin of the past five years. A useful compilation of gerontological theories concludes the text.

This volume may reflect the fact that aging is an underdeveloped biological discipline about which little is known. This is regrettable, if true, because the biology of aging should be a subject of prime social and medical significance today. In 1960 it was the concern of a White House conference. In 1967 its status and needs were investigated by a Senate Committee on Aging, and in 1968 the Preliminary Gerontological Research Act was introduced to the Senate. This bill (S. 870) was reintroduced on 4 February 1969. As yet it has received no action, or even any debate.

One consequence of this legislative inactivity is a lack of funds to support biologists and perpetuate interest in research on aging. A modest congressional effort now would help significantly to put such research in the mainstream of contemporary biology.

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Many-Body Effects

Tunneling in Solids. C. B. DUKE. Academic Press, New York, 1969. xii + 356 pp. illus. $16. Solid State Physics, supplement 10.

In this volume the author has undertaken the first systematic and critical review of tunneling in the literature. The theoretical study of electron tunneling between two conducting electrodes separated by an insulating barrier has a long history, dating back to the beginning of quantum mechanics, but, as the author's interesting historical commentary brings out, the experimental realization of conditions under which such tunneling could be observed dates back only ten years to the development of the tunnel diode by Esaki and the metal-oxide metal tunnel junction by Giaever.

The work of Giaever, undertaken to study superconductivity in the metal electrode, revealed what a powerful tool tunneling can be for studying the many-body effects that can occur in solids. It is this use of tunneling that is the main theme of Duke's book. The book divides itself into three main parts. In the first there is a discussion of the one-electron properties of tunneling junctions. One-electron tunneling in all types of junctions is reviewed, and a commendable effort is made to review critically both the experimental and the theoretical literature. With the one-electron properties of tunnel junction placed in perspective, the remaining two sections of the book are devoted to deviations from this behavior —that is, to many-body effects.

In the first of these sections a broad survey of the various manifestations of many-body effects, including barrier excitations, electrode self-energy effects, and superconductivity, is presented. This section may prove rather tough going for the graduate student who has not already had some introduction to tunneling theory, since the formal theory is not really developed until the last part of the book.

In the final section the transfer Hamiltonian approach to tunneling is developed and a critique of its limitations is given. Using this approach Duke introduces temperature-dependent diagrammatic perturbation theory to analyze the various tunneling processes that can occur. I find the treatment unnecessarily heavy at this point, for one is dealing with a linear response situation, for the understanding of which the full machinery of diagrammatic perturbation theory would seem unnecessary.

A number of the difficulties associated with the tunneling Hamiltonian have recently been cleared up, and as a result some of the statements made in this section that depend on ad hoc assumptions about the tunneling matrix elements, particularly as they pertain to electrode self-energy effects, are inaccurate. In addition we now have a clearer idea about the connection between electrode self-energy effects and assisted tunneling than that contained in this book.

Such, however, are the problems of writing in a rapidly developing field. On the whole, the book presents an exhaustive treatment of tunneling, both experimental and theoretical, of a sort that is unavailable in coherent form anywhere else in the literature.

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Assembling Conductors

Solenoid Magnet Design. The Magnetic and Mechanical Aspects of Resistive and Superconducting Systems. D. BRUCE MONTGOMERY. Interscience (Wiley), New York, 1969. xvi + 312 pp., illus. $13.95.

The production of magnetic fields more intense than can be produced by an array of magnetic dipoles requires that the experimenter arrange current-carrying conductors in some configuration about the space in which he wishes to create the field. He is faced with problems of how to arrange the conductors to achieve the optimum field from the current that they carry, how to support them against the forces of the magnetic field created, and how to cool the conductors so that the currents (and magnetic fields) can be sustained. Preferably, practical problems such as these should be handled for the scientist by an industry capable of providing him with "off the shelf" units equal to the best that he could build but enormously cheaper. Such industrial capability does not yet exist, but Montgomery's work will be invaluable in developing it. Meanwhile, the book will be indispensable to those researchers who must build their own equipment.

Montgomery deals with all three problems for air-core solenoids, treating with varying degrees of sophistication: (i) the relationships between coil shapes, current densities, and the resultant magnetic fields; (ii) the problems of cooling the conductors; and (iii) the problems of how to construct the coils so that they can be both supported and cooled. He also deals with the unique problems of superconducting and of pulsed solenoids.

This is the first book to my knowledge which deals in extensive detail with all the aspects of high-field coil design. It is authoritative and well written. No such book, of course, can satisfy the needs or the tastes of every potential reader. Montgomery's does provide very complete (and up-to-date) reference lists for the reader who needs additional material.

The book is design-oriented, and among the 400-odd equations are many indicated approximations suitable for various practical situations. These are supplemented by the 140-odd graphs and figures and numerous tables. The book will be highly valuable to all who must work with intense magnetic fields.

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