teryear's primitive notions of hypothalamic "centers" for these functions, revealed by the groping accounts in the 1940 book, form interesting contrasts with current (still groping) accounts of these exquisitely complex control systems. The reviewers (R. D. Myers, J. A. F. Stevencon, and W. P. Koella) have approached their awesome task with due perspective, perspective generated, to a large extent, by the "giant-step" recognition over the preceding decades of the importance of the "limbic system" and "reticular core" in the functioning of the nervous system as a whole. These reviews have managed, at least, to cover the conceptual span between this enlarged concept of brain-cord integration and the delicate and difficult studies which are emerging from the micro (micro-manipulation,-electrode,-pipette) world of single neuron function. They have done more. The authors, by defining trends, have attempted to preview the decades that will succeed their writing. These chapters thus forcefully lead the reader to wonder about the shape of future concepts.

The final chapter in this book (by P. MacLean) is a carefully didactic analysis of emotion and of the parts played by the hypothalamus, limbic system, and other phylogenetically original brain components in what is now called, vaguely enough, "affect." The book thus tries to span the conceptions of the hypothalamus (as a key component of the dominant system of the body) from its origin in primitive forms to its roles in determining the specific behavior patterns that distinguish human personalities. If it does not succeed in explaining these roles, it at least succeeds in stimulating thought about them.

The various subjects reviewed in this volume have, of course, for the most part been reviewed elsewhere, by the same and other authors, and more recently (the latest reference I noted was 1966, and several chapters referred to nothing after 1963). Thus, despite the inclusion of 115 pages of references, the book can serve as little more than an initial source for students attempting to review the literature up to the early 1960's. What the volume does offer, particularly in conjunction with the 1940 compendium on which it was modeled, is an overall picture of developments in this field during roughly a quarter of a century.

The editors deserve special credit for allowing the authors to present their views with minimal restriction, so that not only the facts but the motivating philosophies of the authors are clearly discernible. Young investigators seeking to research the development of current concepts will find these chapters, and the book as a whole, invaluable. Older readers, whose familiarity with at least some of the subjects may go beyond what is written here about them, may gain new insights into a subject in which new insights are sorely needed.

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Subcellular Systems

Lysosomes in Biology and Pathology. J. T. DINGLE and HONOR B. FELL, Eds. North-Holland, Amsterdam, and Interscience (Wiley), New York, 1969. Vol. 1, xxiv, 544 pp., illus., $31; vol. 2, xxiv, 668 pp., illus., $37. Frontiers of Biology, vols. 14A and 14B.

Since the early definition of the lysosome as a "new group of subcellular particles" by de Duve, the concept has undergone rapid evolution. Lysosomes and their enzymes have been recognized as belonging to a complex system which involves most, if not all, subcellular compartments. In the past decade, evidence of the participation of lysosomal enzymes in a broad range of cellular physiological processes and of their role in the pathology of the cell has accumulated at an impressive rate. Numerous review articles by de Duve and associates and other investigators have kept the scientific community amply informed of progress in the field. However, a comprehensive survey of the present knowledge of the subject has been needed. This book greatly contributes to the filling of the need.

The series of articles included in these two extensive volumes close the gap between the brilliant speculations on lysosomal properties begun as early as 1959 by de Duve and what is currently recognized as valuable and established information. This book also heralds the end of the oversimplified concept of lysosomes as "suicidal bags" or waste-disposal entities and characterizes them as a complex system of paramount importance in cellular physiology and pathology. Some of the biological processes in which a role for lysosomal enzymes had been tentatively postulated are now definitely documented in this book, which contains, for example, significant chapters on the participation of acid hydrolases in bone resorption, thyroid-hormone function, neuroendocrine secretion, physiological involution of temporarily hypertrophied structures, and the disposal of transient structures during metamorphosis or in tissue remodeling.

The numerous compounds that exert pharmacological control over lysosomal properties, and their mechanisms of action, receive comprehensive treatment in several chapters. Attention has also been directed to the possible involvement of lysosomes in plant and insect physiology, but the potentials of these systems have scarcely been investigated.

In the field of pathology, various articles in this book compile impressive evidence on the involvement of lysosomal hydrolases in defensive mechanisms against bacterial infection and in the pathogenesis of numerous storage diseases related to genetic alteration of lysosomal enzymes. Discussions of the possible role of these enzymes in viral infection, in the degradation of extracellular structures such as occurs in arthritis, in teratogenesis, and in muscular dystrophy certainly point to new approaches in understanding their underlying pathogenic mechanisms. The chapter on lysosomes and cancer, although highly speculative, undoubtedly represents a fresh approach toward understanding the process of carcinogenesis. This is particularly true of the section examining the possible role of lysosomal hydrolases in significant DNA alterations.

The chapter dealing with the participation of lysosomal enzymes in various types of immunological reactions points to the potentials of this line of research in the elucidation of some crucial aspects of the immune process.

The tantalizing question of whether the enhancement of lysosomal activities in the cell is a primary factor in cellular injury or simply reflects a secondary biochemical change related to tissue alteration is carefully analyzed, but remains unresolved and subject to future investigation. The deep concern with possible control mechanisms of lysosomal function in physiology and pathology clearly expressed by several contributors to this work may very well elucidate this important question in the near future.

The various chapters dealing extensively with methods for the investigation of lysosomes reveal the progress of the

technological machinery required for the investigation of the properties of these highly versatile subcellular structures.

In essence, this book will impress the reader with the importance of a thorough understanding of catabolic processes mediated by lysosomes in the interpretation of numerous cellular physiological and pathological events.

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Neoplasia

The Cancer Problem. A Critical Analysis and Modern Synthesis. ARMIN C. BRAUN. Columbia University Press, New York, 1969. x, 214 pp., illus. $8.50.

Research in cancer for many decades has been guided and even dominated to a considerable degree by the notion that cancer is an expression of altered genetic composition of the precursor cell more or less resembling a somatic mutation. This concept has inevitably led many workers to the consideration that the neoplastic transformation is a series of irreversible changes all leading to an irrevocably altered cell. The factual basis for this generalization is indeed meager, being mainly the ubiquitous experience that the neoplastic expression is transmitted from cell to cell. Obviously, this judgment ignores another possibility—many biological expressions, such as those associated with differentiation of somatic cells, that are transmitted from the parent cell to the progeny as in the case of neoplastic cells may be the consequence of a modulation of a common genome rather than of an alteration in genomic information.

The present exposition of the cancer problem by an expert in plant pathology, especially plant neoplasia, is a clear and welcome challenge to the dogma. This small monograph gives a lucid description of some of the highlights of our present knowledge and concepts concerning the metabolic and molecular basis of cellular behavior in growth and differentiation and how such knowledge may well explain the essence of the neoplastic process. Although the author emphasizes plant systems, he by no means ignores animal systems, including the human. In fact, he makes every effort to show the basic similarities between plant and animal cells with respect to their response to carcinogenic hazards in their respective environments. As described by the author, the ways in which plant systems can be influenced by the various environments, including their ability to revert from obvious neoplastic behavior to normal, are impressive. Yet he stresses that, their greater manipulability notwithstanding, plant cells do show many of the features shown by animal cells during carcinogenesis.

Unfortunately, there are several weaknesses in the exposition. The treatment of carcinogenesis in animals is arbitrary and not very sophisticated. For example, the author repeatedly refers to the "two-stage" hypothesis, when there is no evidence for *two* stages, only for more than one. The omission of any serious consideration of different cell populations during carcinogenesis in several tissue systems is an obvious and regrettable flaw, and the author bases his discussion of chemical carcinogenesis on groups of chemicals for which we have the least information about possible mechanisms (for example, polycyclic aromatic hydrocarbons).

Despite these shortcomings, the book is highly recommended for any serious student of the cancer problem, especially the young but also the veteran investigator. The emphasis on the reversibility of cellular changes in neoplasia and on the need for a much more dynamic approach to understanding cancer is a welcome antidote to the rigid thinking that pervades too much of cancer research today. The continual attempt to relate biological behavior to chemical activities makes the book an especially useful one for the incoming cancer research worker with a strong chemical or biochemical background who would like to begin to appreciate conceptually the biology of neoplasia.

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Geochronological Method

Potassium-Argon Dating. Principles, Techniques and Applications to Geochronology. G. BRENT DALRYMPLE and MARVIN A. LANPHERE. Freeman, San Francisco, 1969. xiv, 258 pp., illus. $7.50.

Many recent books in geochronology are like the camel, which, according to some wag, is a horse put together by a committee; not so this book by Dalrymple and Lanphere. The book grew out of a pamphlet written in response to requests from a number of U.S. Geological Survey geologists who wanted a better understanding of potassium-argon dating. The authors attempted to preserve the simplicity of the original pamphlet while making the book more nearly complete and more useful. As they point out in their preface, the book is not intended to be a scholarly or comprehensive review of potassium-argon dating, but rather an introduction to the principles, techniques, and applications of the method. Nevertheless it succeeds in doing for potassium-argon dating what Willard Libby's book *Radiocarbon Dating* did for that radioactive clock; it provides a balanced and sufficiently comprehensive introduction to the subject for the nonspecialist user of the data. It also contains a substantial amount of practical information that will help earth scientists and anthropologists use potassium-argon dating results to better advantage.

Except for a few errors, the first three chapters present an excellent, simplified review of the physical principles underlying the potassium-argon dating method. However, as anyone can verify by going to the literature of nuclear physics, it simply is not true that "no detailed theories of nuclear structure and radioactivity can yet be developed" (p. 25). Also, the assertion that "in the earth's atmosphere the inert gases are about a thousand times less abundant than they are in the solar system" (p. 21) is a great underestimation; the least depleted of the inert gases, xenon, is over a millionfold less abundant in the earth's atmosphere relative to the solar system, and helium is depleted by a factor exceeding 10^{12}.

Chapter 4 presents a good, conventional description of the ideal potassium-argon clock. I prefer a more general approach, that is, to start with a non-ideal open-system model including an external argon pressure and derive the ideal model as a special case. Extraneous argon is thus explicitly included as a separate term and need not be introduced later, *ad hoc*, as an afterthought. The open-system model would also lead conveniently and without discontinuity to discussion of argon loss (treated in chapter 9 of this book). The net effect of introducing the open-system model is not unnecessary complication but rather simplification and increased continuity.

With the exception of the treatment