academic since the publication of Rachel Carson's *Silent Spring*. The lay public is now acutely aware of the hazards attendant on the indiscriminate use of chemical agents.

Many of the hazardous chemicals produce their effects mainly by attacking the genes and chromosomes of the cell. In *The Actions of Chemicals on Dividing Cells* Bengt A. Kihlman surveys the various chemicals that can affect chromosome structure and cell division. The book, however, is more than a survey and consists, in the main, of a synthesis in which Kihlman presents an argument as to how he thinks these various chemicals might act. He tries to show that all the chemicals that affect cell division and chromosome structure do so by attacking DNA. The reasoning often seems quite tenuous, since the various chemicals produce different types of chromosomal effects even when their postulated reactions would lead one to expect them to produce the same aberration. This is only a minor fault, however, since Kihlman is scrupulous about presenting all the data pertaining to a given point. Thus the reader is made aware of the evidence on both sides of any given question and can decide for himself whether or not he agrees with the argument.

In his introduction Kihlman has written a disclaimer regarding his proficiency in English, which is not his native tongue. Either he is too modest or he has had good editors. In any case, would that all English-speaking scientists wrote as well.

The book contains a wealth of information in highly condensed form. In the hands of a scientist interested in the effects of many of these radiomimetic chemicals it is sure to become thumbworn. The only admonition necessary is that the reader should remember that the book presents an argument and an interpretation, albeit by a scientist who has been active in the field, which are by no means universally accepted. In spite of this, the fact that a man of Kihlman's experience presents the argument should prevent us from rejecting it out of hand.

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Principles, Techniques, and Uses of Lasers

The Laser. WILLIAM V. SMITH and PETER P. SOROKIN. McGraw-Hill, New York, 1966. 510 pp., illus. $15.50.

Introduction to Laser Physics. BELA A. LENGYEL. Wiley, New York, 1966. 327 pp., illus. $8.95.

Lasers and Their Applications. KURT R. STEHLING. World, Cleveland, 1966. 123 pp., illus. $6.

Laser Receivers: Devices, Techniques, Systems. MONTE ROSS. Wiley, New York, 1966. 417 pp., illus. $14.95.

A book about quantum electronics, and especially one about lasers, is difficult to write. The field draws on widely different areas in physics, electrical engineering, and chemistry in order to solve the problems of generating and using coherent optical radiation. No single book can be truly comprehensive, nor should it try to be. The authors of *The Laser* have recognized this and have written a true book instead of a bibliographic catalog. This they have done by specializing and by emphasizing problems that have interested them. Thus, although one may feel that the Sm^{++} ion has received attention which is out of proportion, the reward for this is that the physics of this ion is discussed in great detail and physical principles applicable to a wide range of solid-state laser problems are explicated. The book opens with an introduction, which is followed by chapters on resonant optical cavities and gas lasers, solid-state lasers, and amplifiers, Q-switched and Raman lasers. These are followed by three chapters on the physical principles of gas lasers, the spectroscopy of solid-state laser materials (100 pages), and the injection laser. The final chapter is on applications. This is a fine, well-written book which has attempted to treat matters in some depth. I recommend it to all workers in the field and to anyone seeking a nonsuperficial understanding of the field. There are, no doubt, many criticisms that could be made of the treatment of each specialized topic. For instance, I felt that the importance of ion pair relaxation should have been mentioned. The book is not comprehensive for the reason described above, and the reader should realize this, but it represents a very real contribution.

Introduction to Laser Physics appears to have been written for a person with a background equivalent to that of a fourth-year undergraduate or first-year graduate student seeking an introduction to the field. A similar book, *The Laser*, by the same author, was published by Wiley in 1962. A glance at the tables of contents indicates a strong similarity between the two. Further, many passages appear which are identical, word for word, usually near identical figures. The newer book is not, however, simply a rehash of the previous one. It is much larger (311 pages of text as opposed to 125), the discussion appears to have been largely rewritten, and coverage has been expanded whenever necessary. The book begins with background material on radiation and atomic physics and the general description and theory of lasers. The middle third of the book is concerned with types of lasers: solid-state, fluid, and gas. The last third discusses the variation of laser oscillations in space and time, nonlinear phenomena, and applications. However, the coverage of so many topics does lead to problems. I found the discussion of ions in crystals somewhat oversimplified. The inclusion of so many details on laser materials gives the reader little opportunity to discriminate between good and bad systems or knowledge of how to do so. Lengyel's book includes a comprehensive survey of the literature through 1965 which will make it useful to workers in the field as well as to beginners.

Lasers and Their Applications is aimed at the educated layman, preferably with a modicum of technical background. Written in a breezy, newspaper style, the book opens with a description of the history of the laser and its principles of operation. The remainder of the book is devoted to applications, present and future, real and imagined. By and large, the discussion is quite realistic except for the military and space applications, where one feels the bizarre intruding. This is a popular exposition by a man who is not a worker in the field, and it has the common defects of such expositions. Aside from this, it may be useful to someone looking for a popular discussion with an emphasis on applications rather than underlying principles.

Laser Receivers: Devices, Techniques, Systems is concerned with the growing interest in electro-optical communications and radar systems, especially those in which lasers are used. A discussion of noise and infor-

mation theory is followed by discussions of receiving techniques and devices and modulation techniques. The latter part of the book is devoted to background energy considerations, transmission-medium effects, optical components and concepts, and systems. I shall not attempt to pass on the expertise of the discussion. The book appears to be reasonably well written and to present information useful to those concerned with detecting optical signals.

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Cellular Differentiation

Differentiation and Growth of Hemoglobin- and Immunoglobin-Synthesizing Cells. Proceedings of a symposium held in Gatlinburg, Tennessee, April 1966, sponsored by the Biology Division, Oak Ridge National Laboratory. Wistar Institute Press, Philadelphia, 1966. 234 pp., illus. Paper, $4.

This volume provides an up-to-date review of our understanding of immunoglobulin and hemoglobin structures and of the cellular events which lead to their synthesis. It is particularly fortunate that the experiences of workers with both proteins are juxtaposed, for there are many common problems. Immunoglobulins and hemoglobins are both families of proteins whose constituent polypeptide chains are the products of unlinked genetic loci. Variants of the chains result from a series of homologous (apparently closely linked) loci which can in turn be expressed as two or more allelic forms. Common questions regarding their biosynthesis arise with respect to the sequential expression of homologous loci; the partial (hemoglobin) or complete (immunoglobulin) suppression of allelic expression at any one locus; the coordination of the synthesis of polypeptide chains derived from the unlinked loci; the sequence variations which arise in addition to those accountable to the above-mentioned genetic organizations; the critical steps leading to the conversion of a pluripotential progenitor cell to a precursor and mature cell; and, finally, the extent to which this conversion represents an irrevocable commitment.

G. Braunitzer's and M. Murayama's contributions highlight the structural generalizations that can be derived from the hemoglobin data: the gross conformation and function of the molecule are surprisingly tolerant of multiple amino acid exchanges, but even a single substitution critically located (as in the sickle mutation of the β-chain) can have profound effects. In view of these findings, as well as of the heterogeneity of antibodies, M. Koshland's amino acid composition data on antibody populations of differing specificities must be interpreted with caution, and the question of their relevance to the antibody combining sites provoked vigorous discussion. R. Porter presented new results and reviewed older data on the relative importance of the heavy and light chains to the antibody combining site. It is clear that more direct data than those that can be obtained by chain recombination studies are required. It is unfortunate that the important observations of Grey and Mannik [*J. Exp. Med.* **112**, 619 (1965)], Cohen and Gordon [*Immunology* **10**, 549 (1966)], and Roholt, Radzimski, and Pressman [*Science* **147**, 613 (1965)] were not discussed from the perspective of this symposium and that the participants in the symposium skirted entirely the important genetic and biosynthetic implications of having both chains specifically participate in the antibody combining site.

H. Itano and C. Baglioni discussed several aspects of coordinated hemoglobin chain production and possible mechanisms of allelic suppression. Suppression (as discussed in a masterly review of immunogenetics by J. Oudin) is a constant feature of immunoglobulin synthesis. Baglioni attempted in addition to relate the synthesis of hemoglobin to the ontogeny of the erythrocyte, but it is clear that major pieces in this puzzle are still missing. The papers by G. Sainte-Marie, M. M. Simíc, and L. G. Lajtha (on the kinetics of antibody-forming cell production), D. Metcalf and M. Brumby (on the role of the thymus), and J. F. Albright and T. Makinodan (on the rise and fall of pluripotential and paucipotential cells) serve to underline the relative crudeness of the techniques presently available for studying the differentiation of the immunoblast. The lack of homogeneous cell populations and of a system for studying them in vitro seriously handicaps the analysis of immunological differentiation at the biochemical level. The volume (which has also been published as a supplement to the *Journal of Cellular Physiology*) will be of interest to all those concerned with cellular differentiation as well as to those working in the specific areas discussed.

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Animal Biochemistry

A Molecular Approach to Phylogeny. MARCEL FLORKIN. Elsevier, New York, 1966. 184 pp., illus. $13.

Aspects moléculaires de l'adaptation et de la phylogénie. MARCEL FLORKIN. Masson, Paris, 1966. 266 pp., illus. Paper, F. 50.

Marcel Florkin's expensive little book *A Molecular Approach to Phylogeny* deals with some aspects of the comparative biochemistry of animals. The title notwithstanding, it does not deal with the contributions of comparative biochemistry to our knowledge of animal phylogeny. Most of the chapters are reviews of those areas in which Florkin and some of his Belgian colleagues have been working for more than two decades. Florkin's perspective is much the same as it was in his earlier book (*L'évolution biochimique,* Masson, 1944; augmented and translated as *Biochemical Evolution,* Academic Press, 1949). The topics include chitin breakdown, nitrogenous excretory products, insect hemolymph, and protein remnants in fossil shells. Also included in the book are brief discussions of the concepts of biochemical homology and analogy and of the amino acid sequences of proteins from different species. Surprisingly, for a book with a "molecular approach," there is no discussion of comparative work on DNA.

Aspects moléculaires de l'adaptation et de la phylogénie, although similar in approach, is superior because it covers twice as many topics, has better illustrations, and costs less. Research workers in the field of comparative biochemistry of animals are advised to read the French book.

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Correction: In R. E. Norris's review of *The Diatoms of the United States Exclusive of Alaska and Hawaii,* volume 1, by Ruth Patrick and Charles W. Reimer [**153**, 1369 (16 Sept. 1966)], the Introduction, which was signed only by Patrick, was erroneously attributed to Patrick and Reimer.