Brown. There is also a brief introductory chapter on the caloric theory, that provides a perspective on the point of view with regard to heat that Rumford so vigorously opposed. There are chapters on the propagation of heat in fluids (Rumford believed that this took place solely through the agency of convection), the production of heat by friction (the famous cannon-boring experiments), thermal expansion, the weight of heat, water as a nonconductor of heat, heat as a mode of motion and radiation. In reading these scientific papers, we marvel at the care and resourcefulness with which he did his experiments as well as the ingenuity he displayed in interpreting his results.

In a final chapter on Rumford's views of the nature of heat, the author takes pains to make clear that when Rumford associated heat with motion he meant *vibratory* motion, more or less regular in character and hence by no means random.

This selection of Rumford's writings will be of great value to historians and teachers of physics, and should clear up some prevalent misconceptions concerning ideas of the nature of heat in the late 1700's and early 1800's.

* * *

The reviewer is Hazard Professor of Physics at Brown University and is currently engaged in a study of the evolution of the concept of energy.

Groups and diagrams

GROUP THEORY AND ELEMENTARY PARTICLES. By Penelope A. Rowlatt. 97 pp. American Elsevier, New York, 1966. $6.00

by Muneer A. Rashid

Interest in Lie-group theory is the natural outcome of the desire to understand the multiplet structure and interactions of the ever growing number of elementary particles. This interest had a boost with the discovery that the group SU(3) can indeed describe the approximate order of these entities. In fact the belief that perhaps the list of elementary particles can be curtailed tremendously by knowing the more elementary ones, has led to several attempts to understand the general structure of representations of semisimple Lie groups. Such understanding would help us select out those groups and representations that are nature's favorites for composite systems at possibly various levels of approximations.

Group Theory and Elementary Particles is addressed to the newcomers in this branch of theoretical physics and tries to summarize results of representation theory on the basis of Dynkin-Schouten diagrams. Proofs are generally omitted, although standard references are quoted. The reviewer very much wished to see some proofs in order to spare the readers having to consult the referred literature all the time. Another omission is the theory of noncompact groups, which is now very much in fashion. Perhaps in a book of this size, it must have been impossible to include a discussion of the infinite-dimensional representations.

Someone who wants to make good use of the book will have to try the examples given at the end of every chapter. The reviewer believes that without doing these examples one would not be in a position to grasp the techniques described in the book.

* * *

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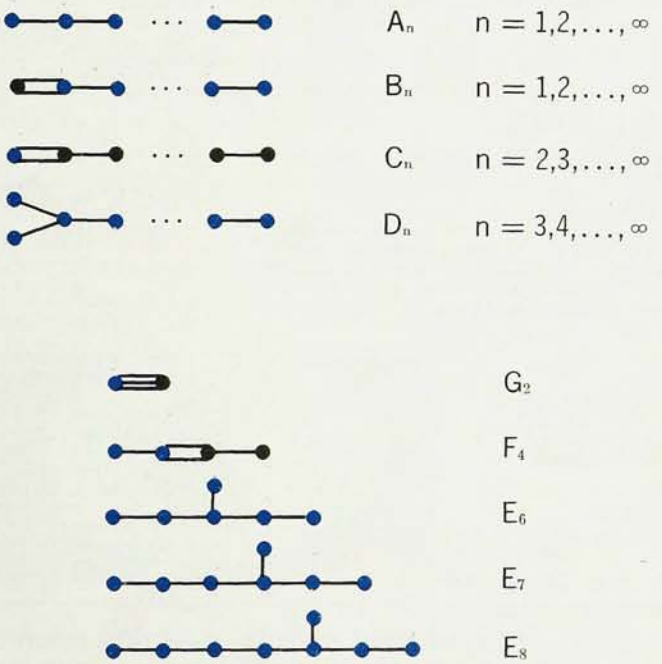

DYNKIN-SCHOUTEN DIAGRAMS classify simple Lie algebras. The first four are infinite series of diagrams; the remainder are exceptional algebras. (From *Group Theory and Elementary Particles.*)

Uncompromisingly anti fields

INTRODUCTION TO STRONG INTERACTIONS. By David Park. 253 pp. W. A. Benjamin, New York, 1966. Cloth $9.00, paper $4.95

by John G. Taylor

This book is a useful addition to the range of intermediate-level books on particle physics. As its title suggests it is not an advanced textbook; nor is it a first step: prerequisites are a semester or two of quantum mechanics and some knowledge of the experimental side of particle physics.

The chapter headings are: (1) Introduction, (2) Quantized Fields, (3) Interactions, (4) Potential Scattering, Bound States and Resonances, (5) Formal Scattering Theory, (6) Relativistic Scattering Amplitudes, (7) Calculation of Scattering Amplitudes, (8) Dispersion Relations, (9) Invariance and Conservation Laws, (10) Symmetries of Strong Interactions, (11) The Eightfold Way. There are also useful exercises at the end of each

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edited by **N. Blakebrough**

A thorough study of the problems associated with the design and operation of industrial biological processes.

Volume 1: 1967, 402 pp., $18.50
Volume 2: March 1968, about 300 pp.

BIOCHEMICAL ENGINEERING

by **Shuichi Aiba, Arthur E. Humphrey,** and **Nancy F. Millis**

"It is the only thorough book on the subject now available, and I believe it will be widely used as a reference source and textbook." —*Science*

1965, 333 pp., $15.00

BIOMEDICAL TELEMETRY

edited by **Cesar A. Caceres**

An integrated account of telemetry as it is used to transmit, monitor, and record accurate medical and biological signals such as the electrocardiogram and encephalogram.

1965, 392 pp., $15.00

BIOPHYSICAL CHEMISTRY, Volume 1

by **John T. Edsall** and **Jeffries Wyman**

"The book gives a very lucid, authoritative, detailed, and thorough account of some of the most important physical principles that are now being used in physical chemical research on biologically important substances, especially in the protein field." —*American Scientist*

1966, 699 pp., $15.50
Volume 2: in preparation

ENERGY FLOW IN BIOLOGY

AN INQUIRY INTO BIOLOGICAL ORGANIZATION AS A PROBLEM IN THERMAL PHYSICS

by **HAROLD J. MOROWITZ**

A comprehensive interpretation of biological organization as a problem in thermal physics. The evolution of molecular order in biology is discussed in terms of thermodynamics, statistical mechanics, and kinetics. The principle of energy flow is applied to a study of the problem of the origin of life and to the present state of terrestrial ecology.

1968, about 200 pp.

FLUORESCENCE ASSAY IN BIOLOGY AND MEDICINE

by **Sidney Udenfriend**

Volume 3 of Molecular Biology

A practical guide to the utilization of fluorescence assay in research.

1962, (with Appendix IV, 1964), 517 pp., $14.00

Second Edition

INTRODUCTION TO MODERN BIOCHEMISTRY

by **Peter Karlson**
Translated by **Charles H. Doering**

Written primarily for an introductory undergraduate course in biochemistry, the book uses a dynamic approach in its presentation of the subject.

1965, 434 pp., $11.00

LIGHT: Physical and Biological Action

by **Howard H. Seliger** and **William D. McElroy**

A volume in the A.E.C. Monograph Series on Radiation Biology and Industrial Hygiene. Prepared under the direction of the American Institute of Biological Sciences for the Division of Technical Information, U.S. Atomic Energy Commission.

An introduction to the present status of photobiology and to the modern "molecular mechanism" approach to the absorption of light by biological systems.

1965, 417 pp., $12.00

MOLECULAR BIOPHYSICS

edited by **Bernard Pullman** and **Mitchel Weissbluth**

Based on lectures presented at the International Summer School in Molecular Biophysics at Squaw Valley, California, and sponsored jointly by NATO and the U.S. Office of Naval Research.

The papers discuss the principal aspects of the state of molecular biophysics from an interdisciplinary viewpoint.

1965, 452 pp., $19.50

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1964, 441 pp., $15.00
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April 1968, about 300 pp.
Volume IV
April 1968, about 350 pp.

PHYSICAL TECHNIQUES IN BIOLOGICAL RESEARCH

Volume 2A: PHYSICAL CHEMICAL TECHNIQUES—Second Edition
edited by **Dan H. Moore**
March 1968, about 370 pp., $16.00
Volume 3A: CELLS AND TISSUES—Second Edition
edited by **Arthur W. Pollister**
1966, 438 pp., $13.50
Volume 3B: CELLS AND TISSUES—Second Edition
edited by **Arthur W. Pollister**
in preparation
Volume 4: SPECIAL METHODS
edited by **William L. Nastuk**
1962, 410 pp., $14.00
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edited by **William L. Nastuk**
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edited by **William L. Nastuk**
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edited by **JOHN H. LAWRENCE** and **JOHN W. GOFMAN**
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ADVANCES IN RADIATION BIOLOGY

edited by **LEROY G. AUGENSTEIN, RONALD MASON and MAX ZELLE**
Volume 2: 1966, 371 pp., $15.00

PROGRESS IN THEORETICAL BIOLOGY

edited by **FRED M. SNELL**
Volume 1: 1967, 228 pp., $10.00

ACADEMIC PRESS NEW YORK AND LONDON
111 FIFTH AVENUE, NEW YORK, N.Y. 10003

chapter; a short index is included.

Whilst the various topics are not studied in much depth the main physical ideas are very clearly explained, and sufficient references are provided for further reading. The book should be very useful to fill in the background understanding needed to be able to appreciate the recent developments in Regge-pole theory (which is very briefly mentioned in the book) and in the analytic properties of S-matrix elements.

The one disadvantage of such a book is that it contains no discussion of the recent advances in strong interactions obtained with current algebras. This wouldn't be bad if the book had been less against field theory and its methods. However the field theory described is that almost of the stone age. It is a pity that such an uncompromising attitude has been taken. Provided the student realizes he is being brainwashed and takes suitable action against it (by reading summer-school lectures on other aspects of strong interaction physics) this book should be of value to him.

* * *

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Scholarly dream book

KEPLER'S SOMNIUM: THE DREAM OR POSTHUMOUS WORK ON LUNAR ASTRONOMY. 255 pp. Trans. by Edward Rosen. U. of Wisconsin Press, Madison, Wisc., 1967. $8.75

by L. Marton

In July 1965, I had the opportunity to review in these columns a translation of Kepler's *Somnium* by Patricia Frueh Kirkwood, with commentaries by John Lear. The announcement of another translation, coming so soon after the first one, surprised me very much and constituted an invitation for a closer look.

Two years ago I lavished quite a bit of praise on the earlier book. Thus the question arises: Was it necessary or useful to have one more translation and how do the two translations compare. Let me start with a bit of statistics: The earlier translation (denoted hereafter as the Lear-Kirkwood book) comprises a total of 182 pages; the new (Rosen) book has 255 pages + xxiii. These subdivide the following way:

	Lear-Kirkwood	*Rosen*
Introduction	79	7
Dream)	84	28
Notes (		118
Appendix (Kepler's)	18	26
Appendixes and bibliography	–	68
Index	–	10

A little explanation is needed for these statistics. The "Dream" and Kepler's "Notes" are printed together on the same pages in Lear and Kirkwood's book, with Kepler's "Notes" appearing as footnotes. Rosen separates them and adds his own footnotes to the "Notes." Thus the interpretive "Introduction" of Lear is reduced from 79 to 7 pages by Rosen. On the other hand, Rosen adds to Kepler's "Geographical Appendix" his own appendixes, which contain a large amount of biographical material. There is no bibliography or index in the Lear-Kirkwood book. That the number of pages in my statistics do not add up correctly is due to a certain number of illustrations, blank pages, etc., in both books.

Further examination shows that the two translations used different Latin texts. Whereas the new Rosen "translation" was made from the copy of the 1634 *Somnium* at Columbia University, for the Lear-Kirkwood translation, "Frisch's *Opera Omnia,* volume VIII, was the source document."

There exist certain characteristic differences between the two translations that go beyond what may be expected from poetic license. A few examples, taken at random illustrate the point.

Lear-Kirkwood. "The calculation of the second motions is no less diverse in the case of motions which they see than it is in the case of motions that we see, and it is much more complicated. For all six planets—Saturn, Jupiter, Mars, Sun, Venus, Mercury—experience, in addition to all the irregularities that are familiar to us, three others, two in longitude—one daily, the other in a cycle of eight and a half years—and the third in latitude, in a cycle of nineteen years. For in the midregions of Privolva the sun is larger when it is their midday than when it is their sunrise, other things being equal, and in Subvolva it is smaller, the dwellers in both areas think that the sun deviates several minutes from the ecliptic in each direction, now toward these and now toward those fixed stars. And these deviations have a pattern that is repeated, as I have said, in nineteen years."

Rosen. "The theory of the second motions is for them no less different from what appears to us, and is much more complicated for them than for us. The reason is that all six planets (Saturn, Jupiter, Mars, Sun, Venus, Mercury) exhibit, besides the many inequalities which they have in common with us, three others for them. Two of these irregularities are in longitude; one is daily, the other has a period of eight and a half years. The third is in latitude, with a period of nineteen years. For the mid-Privolvans have the sun at their noon, other things being equal, bigger than when it rises, and the Subvolvans smaller. Both agree in believing that the sun diverges by some minutes from the ecliptic back and forth now among these fixed stars, now among those. These oscillations return to the original position, as I said, in a period of nineteen years."

Whereas, in the second sentence Lear-Kirkwood uses "experience," a statement of fact, Rosen says "exhibit," a careful statement of observation.

Other differences are due to the way the material is handled. In Note 126