

In development-oriented laboratories "It appeared that those PhD's who spent essentially full time in technical work, and therefore little if any time on administration, were less effective than those who spent about three-quarters time." In research-oriented labs, PhD's "... spending only half or three-quarters of their time on strictly research activities were more productive scientifically than those who spent full time."

In general the data seemed to indicate that the scientists performed best when they utilized two or three different skills, and faced both scientific and applied problems in their work. It did not matter whether the work was organized around one or several projects, so long as it called for a mix of activities.

"In almost all groups, the scientists performed less well if they worked only a standard eight-hour day or less. But it did not follow that the longer the hours the better the job done. Generally a nine- or ten-hour day, on the average, gave better results than an 11-hour day..."

Some examples of other interesting questions considered in this book are:

How much actual freedom (in contrast to desire for freedom) goes with high performance? And how do the answers vary in different kinds of labs or for different levels of scientific personnel?

What is the connection, if any, between satisfaction and performance? Are the effective scientists happy? Unhappy? Neither?

Does the scientist's creative potential fall off after reaching its peak in his late 30's? Are there certain conditions under which scientists continue a creative career throughout their life span?

Answers or implications related to such questions as the foregoing are found deeply imbedded in a plethora of charts, tables, and statements of methodology, rationalizations and interrelationships throughout the text. For purposes of analysis the authors have classified respondents into five "primary analysis groups" and established four separate measures of performance. These are charted, correlated and analyzed in combination with individual personal and environ-

mental variables. The resulting narrative requires the careful, full time attention of the reader. A good memory for connecting related factors discussed in other chapters is necessary to properly understand the limits and ramifications of many text discussions.

At this point a proper question would be "Should I read the book?" The answer, as indicated at the beginning of this review, depends on the reader and his motivation. If as an individual you are seriously interested in identifying some of the general behavior patterns that seem to characterize the more productive scientists and engineers, parts of this book are well worth reading. If, as a manager of R&D, you are interested in doing something about organizational patterns and practices associated with high productivity by scientists and engineers, parts of this book that provide a number of possibilities for specific management policies and action will be worthwhile. If you are concerned with whether the social sciences are getting the amount of support they should, you might want to evaluate many of the assumptions and practices

described in this book as to their apparent validity and potential for refinement and improvement.

The amount of detailed information and discussion in *Scientists in Organizations* could not possibly be assimilated in its entirety without a large amount of time and effort. In terms of interest and importance (from the viewpoint of affecting performance), the subject matter of the various chapters is of uneven value. Putting these two facts together, an obvious approach is to read this book in a selective manner, tailored to a specific interest. This approach seems to have been anticipated by the authors who state, "Chapter 1 sets the context for the study. . . . The remaining twelve chapters are reasonably self-contained descriptions of research results. The reader is encouraged to pick and choose among them as he pleases."

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Excursion into the history of the nature of heat

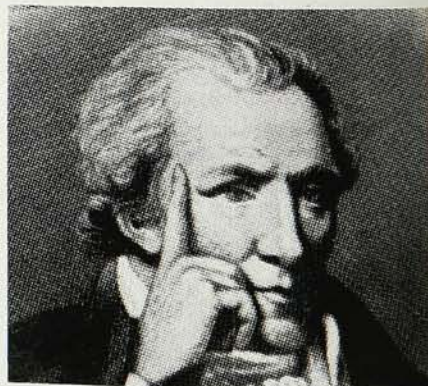
MEN OF PHYSICS: BENJAMIN THOMPSON—COUNT RUMFORD. (Reprint collection). By Sanborn C. Brown. 207 pp. Pergamon Press, Oxford, 1967. Paper \$5.50

by R. Bruce Lindsay

No American interested in the history of science can help being fascinated by the career and accomplishments of Count Rumford. He and Benjamin Franklin are justly considered to have been the most noteworthy American contributors to the development of 18th-century physics. In the light of Benjamin Thompson's achievements in science, we have long since forgiven him his loyalty to the Crown during the War for Independence. Another look at Rumford with special emphasis on his contributions to our understanding of the nature of heat is very welcome, particularly since it comes from the pen of Sanborn Brown, one of the world's leading authorities on the life and work of Rumford.

This book is another in the series

Selected Readings in Physics, a part of the Commonwealth and International Library, intended to provide brief reviews of the scientific work of great physicists, both past and present. Prefaced by a short biographical sketch of Rumford, the bulk of the volume is devoted to selections from his writings on heat, with helpful and engagingly written commentaries by



COUNT RUMFORD, 1753-1814

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 nonconduc-

tor 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.

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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 Par-

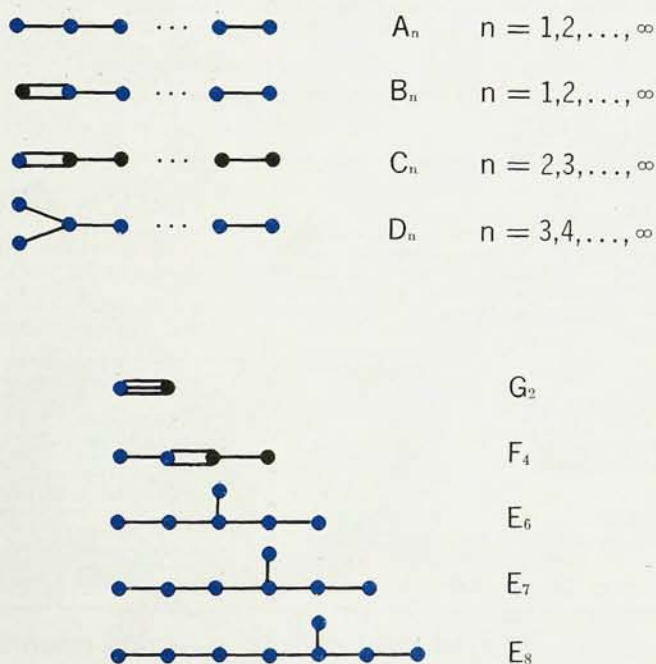
ticles is addressed to the newcomers in this branch of theoretical physics and tries to summarize results of representation theory on the basis of Dynkin-Schouten diagrams. Proofs are generally omitted, although standard references are quoted. The reviewer very much wished to see some proofs in order 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