

tein, but the only Plate 1 seems to be a picture of Andromeda nebula 175 pages later.) Another paragraph mentions Stanley Miller's experiment on amino acid synthesis from the raw materials.

An article on chlorophyll was written apparently during the craze some years ago for chlorophyll deodorizers and is mostly concerned with exposing the uselessness of the material for that function. Articles on Protein Structure (Corey and Pauling), Brain Mechanisms in Behavior (Sperry), and Plant Hormones (Bonner) are well written and informative.

Several of the articles in the physical science section (Earthquakes, Volcanoes, Hypersonic Research at Caltech) while individually interesting perhaps are more properly engineering (i.e., second or third echelon) than frontier. There is a short article on cosmic rays at the North Pole but no mention at all of nuclear physics (except a discussion on cosmic abundance of the elements), or low-temperature physics, or fundamental particles, or solid-state problems, frontiers to which even a thoughtful layman could, and should, be introduced.

The section on science and society has a number of thoughtful short pieces on the philosophy of science and the relation of science to society (by DuBridge, Feynman, Oppenheimer, and others). There is also a piece called *Why Do We Laugh and Cry?*; the author has decided that "... laughter is ... (a punishment used) ... to degrade any competing system of values".

In conclusion one feels that the book is neither a clear nor unified description of the most advanced problems of science, as implied in its introduction, although a number of isolated articles are certainly worth reading.

The Physics of Clouds. By B. J. Mason. 481 pp. Oxford U. Press, New York, 1957. \$11.20. *Reviewed by Ferguson Hall, US Weather Bureau.*

This carefully prepared treatise on the physics of clouds and related subjects could hardly be more welcome in this age of expanding meteorological knowledge. The widespread interest in the possibilities of weather control and artificial precipitation has given tremendous impetus to cloud and precipitation research during the past decade. In rather encyclopedic fashion Mason (Imperial College, London) has accomplished a seemingly impossible task in gathering together a vast assortment of individual research contributions, carefully placing them in perspective, skillfully evaluating their significance, and even adding no small measure of his own important findings.

Many readers will turn immediately to the chapter on the artificial stimulation of precipitation, and will be rewarded with as sound an appraisal as is possible in our present state of knowledge. Further perusal will be just as rewarding, however, and will lay before the reader the whole broad field of the microphysics of clouds (much of which needs further exploration). Also to be found are chapters on the larger-scale aspects of

cloud growth and dissipation (contributed by Frank Ludlam, also of Imperial College), the use of radar in "x-raying" clouds and in storm detection, the generation of atmospheric electricity and the thunderstorm, and the growth and forms of snow crystals—in short, practically every aspect of this branch of meteorology.

This is a book for the specialist and nonspecialist alike, as well as for the school library, the science teacher, and the student. May the latter be thus encouraged to enter this new and exciting field of research! The book deserves wide distribution.

The Relativistic Gas. By J. L. Synge. 108 pp. (North-Holland, Holland) Interscience Publishers, Inc., New York, 1957. \$4.50. *Reviewed by Philip M. Morse, Massachusetts Institute of Technology.*

This short monograph is an extended postscript to the author's earlier work, *Relativity, the Special Theory*. Kinetic theory turns out to be a rather prickly subject to rephrase in terms of special relativity. Many of the basic constructs—mean-free-path, momentum transfer, and so on—are not Lorentz covariant and it is not clear how they should be extended to fit the relativistic pattern. Professor Synge examines these problems, suggests possible solutions, and works out some of the consequences. He discusses distribution functions, the relativistic definitions of pressure, temperature, and the equipartition of energy, and ends with a discussion of shock waves in a relativistic gas. An understanding of the whole subject of relativistic kinetic theory is needed to make progress in investigating the origins of cosmic rays and of interstellar radiation in general. This volume represents some progress in the subject, though more work yet needs to be done, as Professor Synge would readily agree.

Quantum Mechanics, Non-Relativistic Theory. Vol. 3 of Course of Theoretical Physics. By L. D. Landau and E. M. Lifshitz. Translated from Russian by J. B. Sykes and J. S. Bell. 515 pp. (Pergamon Press Ltd., England) For US and Canada only, Addison-Wesley Publishing Co., Inc., Reading, Mass., 1958. \$12.50. *Reviewed by M. E. Rose, Oak Ridge National Laboratory.*

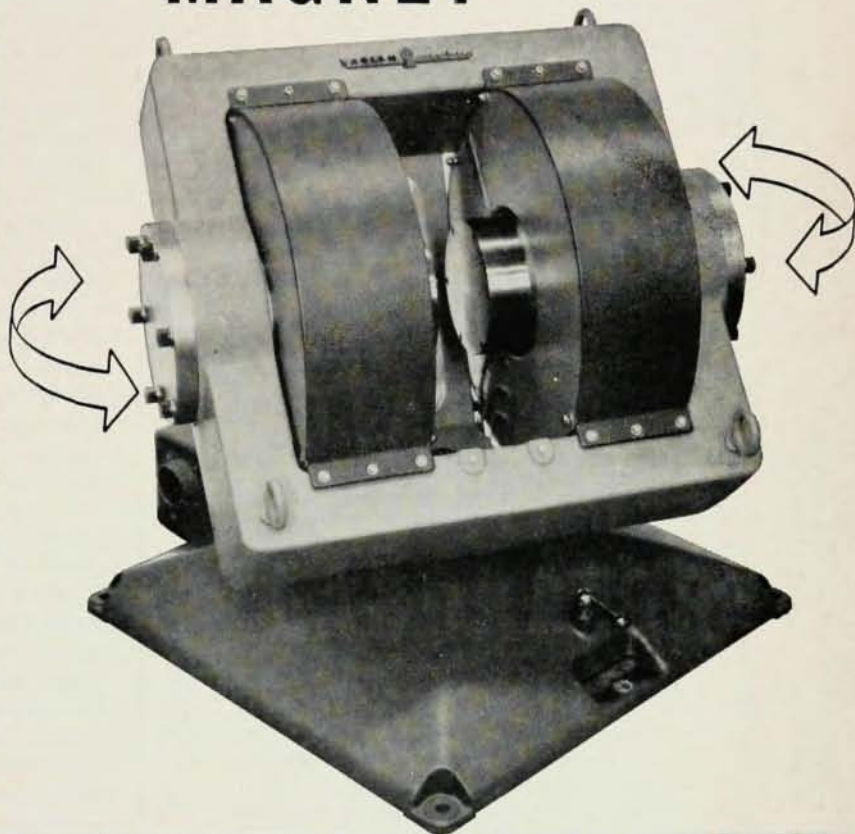
To come immediately to the heart of the matter, it is this reviewer's opinion that this book on nonrelativistic quantum mechanics by Landau and Lifshitz represents a magnificent contribution to the pedagogy of physics. Perhaps this description will be regarded as an extreme one; in any event it deserves a word of explanation.

To begin with, the book is one of a series on theoretical physics which is to comprise nine volumes. Of these, all but two (Relativistic Quantum Theory and Physical Kinetics) have been written. One of the remaining seven is the well-known *Classical Theory of Fields* which has already appeared in an English edition, although a second edition is promised by the pub-

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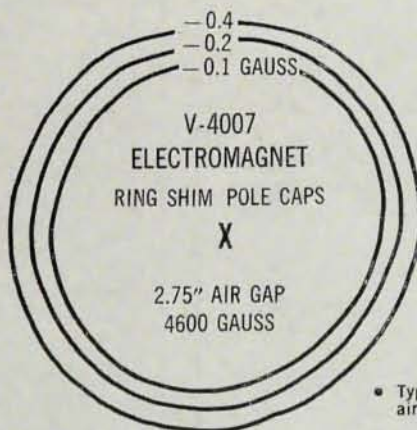
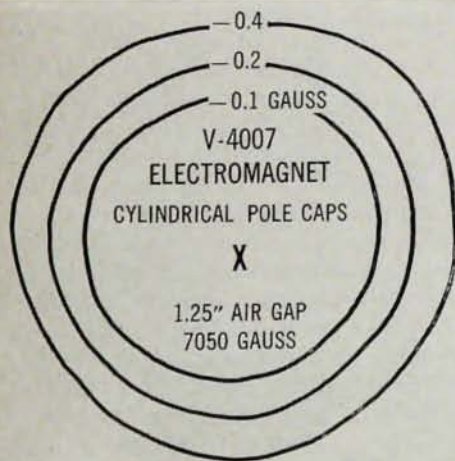
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lishers in early 1959. Aside from the present volume, and those already mentioned, the series consists of *Statistical Physics* (published) and *Macroscopic Electrodynamics, Mechanics, Hydrodynamics, and Elasticity*. The publishers state that by 1960 all nine volumes should appear in the English edition. This is not the first instance in which essentially all the major disciplines of theoretical physics have been put between book covers. It is not even the first occasion wherein this achievement has been accomplished by anything less than a team of thirty or forty experts. Irrelevant and invidious comparisons aside, a judgment based on the quality of those volumes of the series which are now available and a reasonable extrapolation would lead one to endorse enthusiastically the publication of the Landau-Lifshitz course as a boon to the present and to many future generations of graduate students as well as to their instructors.

One of the interesting features of the present volume is the fact that it was written in 1947 and that the Russian edition has been in existence for fully a decade. If I may momentarily step out of the anonymous third person, I would like to detail my own experience as far as this book is concerned. I was vaguely aware of its existence but due to lack of time and, much more important, a complete ignorance of Russian, I had done little more than rifle its pages—hardly the way to become acquainted with any book. Assuming that this experience is typical, and I would judge that it is, the conclusion that the translators have performed a worthwhile service is inescapable. The fact that they have done a competent job, judging by the way the book "reads", is perhaps almost as important.

Turning to the contents of the book the first impression one gets is that this is a more grown-up way of teaching quantum mechanics than one encounters in the average text. This is not only a first impression—it is a lasting one. One is reminded of the true sophistication of quantum mechanics not only by the approach to the subject but also in the choice of subject matter and the mode of treatment. The approach is to first emphasize the physical principles (superposition, uncertainty, role of measurement) before the discussion of the algorithms of quantum mechanics. This same point of view was first utilized by Dirac in his famous book but I have never felt the latter account of quantum mechanics was suitable or intended as a textbook. Of course, to cite this emphasis on the "physics" as an attractive feature is to set up a subjective element as an absolute desideratum. It is quite possible that there are those who would find this way of teaching physics, or quantum mechanics in particular, unsuitable or undesirable. While it is to be hoped that such a decision would be a minority decision it is recognized that one is sometimes forced to compromise with what might be called the "principles of optimum pedagogy" because of a lack of preparation, and hence, of sophistication on the part of the students. If this is a serious consideration one may perhaps take heart from the tendencies, just now discernible, of "beefing up" the elementary courses in

physics, starting with those at the high-school level. If this educational girding of the loins is not a passing fad, its benefits may filter up to the graduate school in time.

The specific contents of this book are worthy of note. The publishers' assertion that here one is offered a comprehensive exposition of quantum mechanics is certainly a justified claim. Not much of importance is omitted and there are several topics, usually treated in skimpy fashion if at all, which here receive something like an adequate discussion. Under the latter heading we mention Chapter 4 on angular momentum and group theoretic discussions of identical particles (Chapter 9, which also includes sections on second quantization) and the theory of symmetry (Chapter 12, a rather full discussion of finite groups).

One of the basic rules of reviewmanship is the requirement that one find some fault with the book under review. For the most part such remarks as could properly come under this heading are concerned with matters of taste. For example, the treatment of magnetic field effects (Chapter 16) is rather skimpy and would well be expanded at the expense of the two chapters on molecular physics. The only objective value of the foregoing statement is to be found in the observation that probably more people are interested in the former topic than in the latter—or that more is to be learned from a study of the former. An objection of a somewhat different nature is the peculiar circumstance that Chapter 4 is written without introducing the *concept* of the vector addition coefficients although several special examples are calculated in the course of events. Although these quantities have since become very popular, they were well known in 1947. The failure to introduce them makes the formulae for matrix elements of irreducible tensor operators (Wigner-Eckart theorem) appear very mysterious and, in general, the woods are obscured by the trees. Nevertheless, in Chapter 12 these coefficients do appear and their unitary character is made apparent.

Throughout the book a number of well-thought-out problems are given together with the solutions thereof. The mathematical appendices are useful and the physical appearance of the book is pleasing.

The Story of Albert Einstein. By Mae Blacker Freeman. 178 pp. Random House, New York, 1958. \$2.95. Reviewed by P. Morrison, Cornell University.

There are three Einsteins: the mythical archetypal professor without worldly cares, lost in the incomprehensible world of his thoughts; the real prince of theorists, who published in a single year or two a handful of papers, any one of which might have earned the Nobel Prize and all of which stand in the very foundation of our present physics; and the warm, independent, humorous author of hundreds of letters, interviews, petitions, telegrams, bespeaking a score of causes in the interests of the poor, the forgotten, the oppressed, or of the peace. No one has been able to draw this great

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