



Augmented Plane Wave Method

A Guide to Performing Electronic Structure Calculations

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268 Pages

Cloth: \$9.00/\$7.20 prepaid*
Paper: \$4.95/\$3.96 prepaid*

This lecture note and reprint volume provides instruction in the augmented plane wave method, one of the techniques of electronic structure calculations. It is intended to supplement courses in the theory of solid state physics at the senior and graduate level. The reprinted papers at the end are by Slater, Wood, Burdick, Johnson, Conklin, Pratt, Mattheis, Terrell, Watson, Dimmock, Freeman, Ern, Switendick, Scop, and Loucks.

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that of Schrödinger of 1943 and including of course the famous Einstein papers of the 'thirties and 'forties. The attempt is made to summarize all the principal theoretical points of view and to compare them by introducing so far as possible a uniform notation. Even the less successful attempts have been included for the light they may shed on future developments.

Part three of the volume is devoted to a review of the more highly speculative attempts that have been made to introduce a connection between gravitation and quantum theory, in other words to quantify the gravitational field. Here there is much mention of gravitons, and both linear and nonlinear field theories are discussed. In comparing the various points of view that have appeared in some profusion in the past twenty years the impartial nonspecialist observer is apt to conclude that the problem is one of estimating the likely future success of theories that so far have enjoyed only a dubious reception. The lack of clear-cut experimental verification is of course a drawback in the assessment of such theories. Nevertheless it is imperative to encourage speculation, for only by this route can ultimate success be achieved.

The author's style is clear but terse, and only the person well acquainted with the general background will be able to grasp the details. For the expert one of the chief merits of the book is the extensive bibliography of 429 items. Unfortunately its usefulness as a reference is much diminished by the lack of an index.

* * *

R. B. Lindsay, who is Hazard Professor of Physics at Brown University, writes frequently on the history and philosophy of physics.

A great American physical chemist

THE QUINTESSENCE OF IRVING LANGMUIR. By Albert Rosenfeld. 369 pp. Pergamon Press, New York, 1966. Paper, \$2.95

by R. B. Lindsay

Since science is the creation of scientists, the lives of those who have made outstanding contributions to its development will always be of interest and

value to both the scientific community and the general public. Hence the writing of scientific biography is an important business. Unfortunately it must be admitted that it is an extremely difficult task. His fellow scientists want to know what the man really did to justify his fame, but, though they are willing to accept a certain amount of technical detail, wish to have it explained in sufficiently simple language so as to be understandable by the competent nonspecialist. A certain amount of human-interest element is desirable, but it must not be overdone. To meet these demands is sufficiently difficult for the biographer, but his task is made even harder when he has to produce a readable and comprehensible picture of the scientist for the general reader. The latter type of biography is all too likely to reduce to a collection of anecdotes.

The author of the life of Irving Langmuir, here under review, has in general steered fairly skillfully between the two extremes of a purely technical account of the subject's scientific work and a popular story of his personality and nonscientific activities. The book was first written as volume 12 of the series of *The Collected Works of Irving Langmuir*, published in 1961 by the Pergamon Press. It now appears as a paperback, intended for a wider audience, in the series *Selected Readings in Physics in the Commonwealth and International Library*. D. ter Haar, the general editor of the series, contributes a foreword. The series is intended in general to be anthological in character, but will eventually provide estimates of the achievements of famous physicists with reprints of their principal papers. This biography by Albert Rosenfeld, the science editor of *Life* magazine, takes a somewhat different slant, but its publication in the series was nevertheless felt to meet a real need.

Irving Langmuir was without doubt one of the great American physical chemists and physicists of the first half of the twentieth century. With insatiable curiosity and fertile imagination he penetrated into a host of problems on the borderline of chemistry and physics. His name will forever be associated with the physics and chemistry of surfaces. He had more than

most people the happy knack of seeing both the theoretical implications of a problem and its practical applications. This is in general well brought out by Rosenfeld, though there are some rather obvious gaps. Little or nothing is said about the important work on electric discharges in gases, and the practical significance of his improved vacuum pump is scarcely mentioned. On the other hand there is probably more emphasis on the Lewis-Langmuir octet theory of valence than its importance warrants. It was definitely out of the main stream of chemical physics and was of course very quickly superseded by the more fundamental ideas of Bohr and his quantum-mechanical successors.

There is a great deal of emphasis on the human side of Langmuir, his family relationships and his association with professional colleagues at home and abroad. Some indeed may feel that there is a bit too much of this, but it certainly makes for interesting reading and will obviously appeal particularly to younger readers, who are eager to learn what a great scientist was really like. A good photograph of Langmuir serves as a frontispiece. However, a generous insertion of relevant illustrations would have made the volume even more appealing.

Asimov on noble gases

THE NOBLE GASES. By Isaac Asimov, 161 pp. Basic Books, New York, 1966. \$4.50

by Charles F. Eck

This book is an interesting, popular history of the noble gases. The author, a prolific expositor of science, is associate professor of biochemistry at Boston University School of Medicine. He has written numerous popular books on physics, chemistry and biology and has recently received the James T. Grady award for outstanding science reporting.

Asimov covers discovery, structure, supply, uses and inertness of the noble gases. In the book, for example, may be found an account of the difficulties and long delays before the first noble gas in the atmosphere, argon, was discovered. Helium, because of its importance, has a separate chapter. A

chapter on fluorine furnishes the background for the noble-gas compounds, and the book ends with a chapter on their formation, beginning with Bartlett's preparation of xenon rhodofluoride.

Asimov points out that there is a large supply of noble gases in the atmosphere, noting that even the rarest isotopes of the noble gases, such as helium-3 and xenon-126, exist there in tonnage quantities. The author's statement (page 105) that helium-3 "has no practical uses" is in error. Currently, helium-3 is used in neutron detectors, low temperature refrigerators and cryostats, gas lasers and nuclear bombardment studies. The supply of helium-3 for the above uses is not from the atmosphere; it is obtained as a byproduct of nuclear technology.

This book reveals the wide effect noble gases had on the development of science: Their discovery provided a test of the periodic table; the field of cryogenics was broadened with the liquefaction of helium; and the domain of inorganic chemistry was extended with the formation of noble-gas compounds. Accordingly, this book serves as enjoyable background reading for science students and laymen as well as those who were science students some years ago. It has an index, but no references.

* * *

The reviewer, group leader of stable isotopes separation at Mound Laboratory, Miamisburg, Ohio, has been separating noble-gas isotopes by the thermal diffusion process for six years.

An unconventional introduction

ABOUT VECTORS. By Banesh Hoffmann. 134 pp. Prentice-Hall, Englewood Cliffs, N.J., 1966. \$4.35

by Peter L. Balise

Reading in the preface that this book is intended to "disturb and annoy," and reading further at random, one discovers here a most unconventional introduction to n -dimensional vectors. Indeed the author does disturb by continually raising questions, sometimes unanswered, that force the reader to consider whether he really understands the concepts. Because it is



Relativistic Hydrodynamics and Magneto-hydrodynamics

Lectures on the Existence of Solutions

André Lichnerowicz
Collège de France

160 Pages

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This informal research monograph presents a new mathematical study of the equations of motion for both charged and uncharged relativistic fluids. It includes the first known existence theorem for the equations of magnetohydrodynamics, and a new approach to the theory of shock waves.

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