



L'OSSERVATORE PASADENA.

Title Applications of Nuclear Physics

Author J. H. Fremlin

Publisher The English University Press, Limited, 1964

Pages xii + 340

Price 25 shillings

Reviewers Don M. Yost and John B. Hatcher

The author of this book is a *Reader in Physics* at the University of Birmingham (England), and his admirable work (*jacta est alea*) may be likened to a hermaphrodite brig in that it sails nicely with the gentle winds of physics and also with refreshing vigor close to the more difficult and hazardous gales of chemistry. We (= the reviewers) don't know just what a *Reader in Physics* is, but we are convinced by the book that the author's stipend should be doubled.

There was a time when those of us born or raised west of Dodge City pictured England as a pleasant, provincial island where the men raced around the countryside in Rolls-Royces chasing small foxes, where the women rode through the streets on horseback protesting oppressive taxes, and where millions of innocent children were brought up on Latin, Alice in Wonderland, W. Shakespeare, and on the exploits of the privateer, Sir Francis Drake. But this picture is, in part, now notably different, the change really having been initiated by a transplanted New Zealander (Rutherford) and a visiting Dane (Bohr). The author's book makes a further wholesome contribution to this change.

Now suppose we look at the book. An industrialist on contemplating the title might hope that it would help justify the employment of bright young nuclear physicists who have previously dwelt in the lofty world of leptons, parity, and strangeness. While the table of contents dashes this particular hope somewhat, he will be delighted to find a survey-text-reference to which he can refer his more enlightened employees.

The book is clearly written and is very readable, which is more than we can say for Physical Review Letters, Izvestia, L'Osservatore Romano, and Fanny Hill. Junior and senior science students in the better colleges should find the book very helpful, and graduate students and full blown researchers will find it useful to have near at hand. It begins with a short, non-mathematical chapter on atomic and nuclear structures together with interesting numerical estimates of nucleon-nucleon forces. Here one finds also the Einstein mass-energy relation, a description of isotopes, the (Heisenberg) uncertainty principle, and Pauli's exclusion principle, again with numerical estimates where germane to the discussion. Chapter 2 treats

of radioactivity, including fission, and the various types of decay particles, laws, and modes.

In the next three chapters the author takes up in some detail the several known methods and instruments used for the detection and measurement of the radiations emitted by radioactive substances. Here the reader will find a competent discussion of almost everything from ionization chambers, Geiger counters and scintillators, to Cherenkov counters, semiconductors, bubble chambers and photographic emulsions. Following these chapters is one devoted to statistics and counting efficiencies, which deserves the attention of those who have either a firm or cautious faith in the postulates of the subject.

There then follows two very welcome chapters on the determination of half-lives and the production of radioactive isotopes. Here the beginner will find that while accelerators are truly wonderful machines (and California should have more and bigger ones), they are not as productive of radioactive isotopes as the modern fission reactors or "piles." There is also a section on atomic bombs which gives some materials estimates.

Up to this point the author doesn't even mention the S-matrix, Regge Poles or the writings of the elite S-fraternity. Whenever either of us wakes up from dreams about the S-matrix, he automatically reaches for loaded horse pistols, and his purple thoughts may only appear in print as $^{**}\%_{\beta}/\alpha_1!!$

In the chapters that follow, however, the author does do something that is unheard of in this country; scilicet, he goes into chemistry and does well at it too! Remember, he is a physicist. When a physicist in this country decides to take an interest in chemistry, he usually goes into biology or banking. The author does devote a generous and stimulating chapter to the use of radioisotopes in biology, but the reader may, of course, skip it if he has no patience with such matters.

Most of the applications are found in four chapters; the two on chemistry and biology just mentioned, one on radioisotopic dating, and a short one (eight pages) on all others.

The chapter on dating is excellent, covering everything from stars to booze. In fact, it only wants a few pages of reference and discussion of other methods (e.g. fluorine dating, so brilliantly originated by Middleton in England in 1844, and applied recently to the identification of the Piltdown Hoax by Oakley, Hoskins, *et al.*) to be the complete introduction-handbook for the Archeology-Anthropology practitioners. In this chapter the author implies that Professor W. F. Libby committed a sin in using a vintage wine in tritium dating experiments; we think so too.

We also agree with the author that disposable newspapers are convenient for covering a laboratory bench, but in the world of government funded industrial research, the use of old newspapers would pose monumental security and fiscal complexities. In academic laboratories (in this country) the political views of the newspapers need not conform with those of the department head since he is usually away advising the government or the chairmen of the boards of firms.

In the chapter on Miscellaneous Applications we can forgive the author for not making any suggestions for catching British train robbers, halting the population explosion, or for tracking down Los Angeles bank bandits. But it is disappointing to find no references to recent American developments of isotopic power sources (some now in orbit), the use of α -particle emitters in upper-atmospheric frost-point measurement equipment now being flown, etc., etc.

The book ends with six helpful appendices, a bibliography, and an index. Appendix I contains a number of circuit diagrams (none with transistors) for counters and other equipment; the remaining ones contain useful tables of data, recipes, and instructions. The 4+ page bibliography starts with Friedlander and Kennedy (and Miller now no doubt) and goes on from there in several well selected directions. We salute the index. Throughout the book are numerous tables, figures, graphs, and plates (including three of a buttercup leaf).

By tradition reviewers are supposed to be sleek tigers who have an uncanny ability to find and pounce upon any errors or weaknesses, trivial or not, that may occur. We can't rightly claim to be tigers (even in the current American sense), but just for the sake of the game we would like to know who was responsible for the last sentence beginning in line 6 on page 189. In the preface the author makes gracious acknowledgement to his wife and daughter for their help with the many fine illustrations in his book. Even at the risk of having to regret it for the rest of our days, we would like to ask just which track in plate VII is track A.

In our opinion Dr. Fremlin has made a valuable contribution to the applied experimental side of nuclear physics and chemistry and he has done it in a clear, scholarly, and down-to-earth manner. We hope he does a small monograph on the S-matrix with equal skill and refreshing tone. Dr. Fremlin's book is one of a series on physical sciences, the general editor of the series being Sir Graham Sutton who is well known for his researches on Meteorology.

Professor Don M. Yost, recently retired, has spent his entire career at the California Institute of Technology, where his broad interests in the fields of inorganic chemistry, physical chemistry, and mathematics, his stabilizing perspective in matters scientific and otherwise, his penetrating analysis of human nature, and his obvious wit and charm have combined to inspire and assist in the metamorphosis of numerous

struggling graduate students into a long list of now well-known Ph.Ds, whose great admiration for "Don" he so richly deserves.

His co-author for the present book review is described in the following paragraph lifted from Prof. Yost's letter of transmittal: "You will note at once that I have a co-author on the review, videlicet Dr. John B. Hatcher, whom I believe you know. He has had considerable (and sometimes turbulent) experience with radioactivity, as well as with the publication business. About ten years ago he went into industry and is now a (wealthy) industrial chemist. His wife is an instructor in anthropology at the University of Minnesota. You may not know that Jack's father was a linotype operator, and that Jack learned the trade at an early age; as an undergraduate here he earned his way through school by linotyping; he was editor of the Caltech paper one year. In Iron Nail Club circles Jack writes under the pen name, Pasquale de los Llanos."

Additional factual information on each man is found in American Men of Science. Further enlightenment on the Iron Nail Club is allegedly contained in "A Memoir on the Origin of The Iron Nail Club", a review of which will be found on p. 5 of the Journal of Intermittency, 1, No. 1, May 1959 (published by the Intermittent Press, 3104 Silver Lake Road, Minneapolis 18, Minn.)

FOR CALCULATING TRAJECTORIES . . .

Title ROCKET—Rand's Omnibus Calculator of the Kinematics of Earth Trajectories

Author Barry W. Boehm

Publisher Prentice-Hall, Inc., 1964

Pages xxxiv + 254

Price \$5.95

Reviewer Otto C. Turchan

ROCKET—Rand's Omnibus Calculator of the Kinematics of Earth Trajectories—represents a digital computer program for the mathematical simulation of simple aerospace vehicle flight dynamics. This computer program was developed at the Rand Corporation as an aid to their research studies in astronautics and allied fields. In the review of this book it is evident that the contents are designed to represent a user's manual as an inseparable companion to the Rocket computer program. Consequently, the book itself is a valuable contribution to the field of potential users and programmers who may be faced with the problem of adapting the Rocket computer program to the solution of some of the possible trajectory problems. The contents of the book can be best described as a set of operating instructions for the Rocket program user giving some insight into the fundamental construction and developmental details of the program itself.

The Rocket program is a mathematical tool by which the simple equations of motion of a point mass in an inverse-square central force field can be integrated by a digital computer to obtain vehicle position and velocity along the flown trajectory. The trajectory computation is per-