tion, either on mathematics or on mathematicians or on scientists in general or, at least to this reader's surprise, on the history of science as an independent science. Some of these observations may be controversial—as are most subtle observations—but they are invariably illuminating and, as a rule, penetrating.

The history of mathematics contained in the book is far from being a complete history of mathematics or even a systematic review of the role that mathematics played in the sciences. It is a very eclectic story. The book ends with about 150 biographical sketches including that of Euripides, the tragedian, but not including that of Euclid. It deals with the subjects to which the author could contribute some interesting remark or original opinion. However, this reader, at least, marvelled at the number of such subjects and at the author's intimate knowledge of the original monumental contributions to science, such as those of Plato, Aristotle and Newton. He was equally surprised by the author's familiarity with scores of treatises on the history of mathematics and of the sciences.

Finally, it was a pleasure to read a book on mathematics, written by a mathematician with deep understanding of his subject, and free of the jarring misunderstandings that one encounters in many books on the history of science.

* * *

The reviewer was awarded the 1963 Nobel Prize "for systematically improving and extending the methods of quantum mechanics and applying them widely."

Nothing impious about it

ATOMISM IN ENGLAND FROM HARIOT TO NEWTON. By Robert H. Kargon. 168 pp. Oxford U. Press, London, 1967. $6.75

by L. Marton

I must confess my profound embarrassment in receiving R. H. Kargon's book for review and not knowing who Hariot was. A few days later, however, I started feeling better. I have shown the book to one of my friends, who was educated in England, has a Cambridge University degree and taught there. He never heard of Hariot either. It just goes to show that either the book is about some obscure scientists or that our education is incomplete.

BACON

DESCARTES

BOYLE

Before describing the book I would like to give my answer to the above query. Indeed Kargon's book relates the contributions to atomic theory of some of the lesser-known natural philosophers of the times around the 17th century, which is a very praiseworthy undertaking. I am a firm believer in the view that no scientific creation is entirely due to a single genius. In most cases it is possible to trace back the elements of a new thought to the contributions of several minor scientists. The "giants" accomplish most often a synthesis, either by adding some missing elements or by fusing together several apparently unrelated components that were needed to complete the edifice. I believe therefore that the present book accomplishes a very useful purpose by bringing to our knowledge the succession of events and ideas that allowed the atomic consideration of matter to triumph over the previous vague conceptions.

The early, Epicurean conception of atomism was based on considerations requiring a purely materialistic buildup of the universe. In absence of experimental proofs, practically all arguments for or against were of philosophical nature and thus subject to theological interpretation. One of the great stumbling blocks for the advancement of atomism was that it carried the stigma of atheism and many people condemned it just on that basis alone.

Kargon's book brings out the struggle in 17th-century England by listing the men, their accomplishments and the arguments used. It starts out with a description of the scientific circle gathered around Henry Percy, the ninth Earl of Northumberland, who was one of the most gifted amateurs of his time. Thomas Hariot was the leading scientist in their circle and was a staunch supporter of the atomic hypothesis.

Unfortunately, Hariot never pub-

lished anything in science, which explains our ignorance. He had, however, according to Kargon, a profound influence upon his times, and his disciples helped spread his teachings.

An important protagonist for the revival of atomism at that time was Francis Bacon, Baron Verulam. If there was a connection between Hariot and Bacon it is far from evident. Kargon writes: "The relationship between Francis Bacon. . .and the revival of atomism in the 17th century has, for several reasons, been clouded in mystery." He then goes on to show that "Bacon was both an atomist, and an anti-atomist at different points in his long career." I do not find his arguments on anti-atomism entirely convincing.

Although the title of the book implies that coverage is limited to the development of atomism in England, the author includes discussion of the ideas of non-English scientists who had an influence on the evolution of thought in England. Prominent in this respect were René Descartes and Gassend. The author's criticism of some of Descartes's theories reminded me of Voltaire's sarcastic remark: "Descartes auroit été le plus grand Philosophe de la Terre, s'il eut moins inventé." (p. 160 in Voltaire's *Elémens de la Philosophie de Neuton*, 1738.)

According to Kargon, the most important step toward acceptance of the atomic hypothesis occurred with the publication of Walter Charleton's book entitled *The Darknes of Atheism Refuted by the Light of Nature: a physico-theologicall Treatise*. It was more important to show that there is nothing impious in the atomic idea than to advance any experimental or other proof.

The end of the book is taken up by a discussion of the ideas of Robert Boyle, Barrow and Isaac Newton. As the author puts it: "By 1700 the adherents of atomism had prevailed over the obstacles which faced their predecessors in 1600." Not that it was straight sailing. Much could be said about the further vicissitudes of atomism until its final acceptance in the 20th century.

On the whole, Kargon's book is to be recommended. There are some statements with which the reader may disagree—the style is somewhat uneven—but the book contains so much interesting information that every historically minded scientist (not only the physicist) will benefit from it.

* * *

L. Marton is chief of international relations at the National Bureau of Standards.

Half lives, decay modes, abundances, level schemes . . .

TABLE OF ISOTOPES. (6th edition) By C. M. Lederer, J. M. Hollander, I. Perlman. 607 pp. Wiley, New York, 1967. Cloth $7.95, paper $4.95

by Emilio G. Segrè

The tables of isotopes published by several authors and agencies are an eloquent testimonial to the development of nuclear physics. Natural activities had been tabulated by an international committee in 1931,[1] but it was only with the dramatic developments following the Curie-Joliot discovery of artificial radioactivity that tables of isotopes became desirable. Single workers started to prepare their own and charts appeared on the walls of laboratories. Perhaps the first published one (1934) was the table by Enrico Fermi, Edoardo Amaldi, O. D'Agostino, Franco Rasetti and Emilio G. Segrè.[2] It has entries for 47 radioactive nuclei; one could still me norize its contents. By the next year a similar table had grown to 71 entries representing radioactivities, and I vividly remember the isotope chart with Z as abscissa and N as ordinate used in our laboratory to keep abreast of the new discoveries. In this chart stable isotopes were black dots, radioactive ones, red, as to be expected. Mass assignments were often subject to change and moveable pins recommended themselves for markers. The entries in the tables were standarized in a form that is not radically different from the present one. By 1937 M. Stanley Livingston and Hans Bethe in the third article of Bethe's bible,[3] had a much larger table and chart in which, however, the emphasis was put on reactions rather than on isotopes.

Three years later, in 1940, we find the first compilation by John J. Livingood and Glenn T. Seaborg[4] containing about 230 radioactive nuclei and about 290 stable ones. This is the ancestor by five generations of the tables under review.

A new table was issued by Seaborg in 1944. The information grew conspicuously during the war although some of it remained classified for several years after the end of the war. A chart compiled by me and my wife, Elfriede, at Los Alamos was made available in 1946.[5] This was one of the first documents in which results of war-time research were published. The chart contained information on neutron cross sections that was considered confidential, but ultimately it was cleared for publication. In 1948 a new *Table of Isotopes* by Seaborg and Isadore Perlman gave a great wealth of new results. It lists about 1150 nuclei and it contains much material that was useful for the elaboration of nuclear systematics.

By that time the literature on nuclei was forming an avalanche. The abstracting and compiling of data could not be managed any more by one or two persons in their spare time; it became necessary to organize a professional service. The National Bureau of Standards as well as several national laboratories entered the field and gave valuable compilations of data. Thomas Lauritsen and Katharine Way were especially deserving for their critical and laborious contributions. Compilations were also prepared for the standard reference books, such as the Landoldt-Börnstein *Tables*, here and abroad. The culmination of this process is the establishment of a new journal: *Nuclear Data*!

Nowadays the problem of compressing the existing information in a book of tables of easy and clear consultation is difficult and requires much ingenuity and thought. The magnitude of the abstracting problem is indicated