linear betatron oscillations, magnet problems (here, the Russians report on their 680-Mev synchrocyclotron and also on their new 10-Bev synchrotron, which is about complete), radio-frequency acceleration, electron-synchrotron problems, problems in the use of accelerators (this section covers only experience with existing machines), and, finally, general topics, including the Princeton-Pennsylvania proton-synchrotron and the Stanford linear accelerator.

This book is well printed. There are numerous errors, which arise from the difficulty of getting authors who are scattered all over the world to check their contributions carefully and quickly. In general, these do not cause trouble in reading. A more serious criticism is that, since the meeting was attended mainly by experts, many of the papers will be found to be very difficult to follow by anyone not familiar with the subject. However, the book does contain a great deal of information on the new types of accelerators, most of which is not published elsewhere except in the internal reports of the groups working on these problems. It is, therefore, a very valuable book for anyone who wishes to become a specialist, and many parts of it will be found useful by anyone desiring information about these new ideas.

ROBERT O. HAXBY
Midwestern Universities Research Association

Early Electrical Machines. The experiments and apparatus of two enquiring centuries (1600 to 1800) that led to the triumphs of the electrical age. Bern Dibner. Burndy Library, Norwalk, Conn., 1957. 57 pp. Illus. $1.50.

The picture of Otto von Guericke pursuing a drifting feather with his rubbed sulfur globe not only recalls a landmark in the history of electricity but constitutes a fit symbol of the instrument through the use of which, in the course of a century and a half, a miscellany of occult manifestations of nature were assembled into a science. Bern Dibner has undertaken to write a commemoration of that instrument, which is at the same time an excellent capsule history of electricity during the heyday of the electric machine.

Histories of electricity tend to become bloodless when the illustrations and descriptions of the quaint experiments—as they seem to us—are eliminated. A book such as this, which dwells on this era, rather than hurrying through it and touching only the "high spots," is an interesting and useful antidote to the malady of oversimplification which often afflicts works on the history of science. The illustrations in the present work are well selected and beautifully reproduced, and Dibner has given a fuller than usual account of the multitudinous experiments of the empirically minded electricians of the 17th and 18th centuries.

Modern technologists, it is to be feared, give too little thought to the debt owed their predecessors. It is pleasant to know of an outstanding exception in Dibner, whose beautiful and well-written publications on the history of science have gained him a well-deserved reputation, both as a student and as a patron of the history of science and technology.

ROBERT P. MULTHAUF
Smithsonian Institution

Ernest Rutherford, Atom Pioneer. John Rowland. Philosophical Library, New York, 1957. 160 pp. $4.75.

Ernest Rutherford was born on 30 August 1871, near the town of Nelson, New Zealand, and died on 19 October 1937 in Cambridge, England. Into this all too short life of 66 years (his father and mother lived to the age of 89 and 92 years, respectively) there were crowded an incredible number of scientific accomplishments and honors. At the age of 23 he earned his B.Sc. degree in New Zealand and left for the Cavendish Laboratory, Cambridge, with the aid of the single available scholarship. Three years later he earned a B.A. research degree and 1 year thereafter, at the age of only 27, he became Macdonald professor of physics at McGill University, Montreal, Canada. Nine years later he took charge of the physics department at Manchester University, England, and after another 12 years, at the age of 48, he succeeded his old teacher, J. J. Thomson, in England's most distinguished position in physics, that of Cavendish professor at Cambridge, a position he held until his death.

At McGill, Rutherford laid the experimental foundations of the entire field of radioactivity and wrote the first and second editions of his authoritative book of that title. At Manchester his theory of the nuclear atom was born and experimentally established. At Cambridge, in 1919, he accomplished, for the first time, the artificial transmutation of elements, using alpha-ray bombardment to transform ordinary nitrogen into an isotope of oxygen.

In 1903, at the age of 32, Rutherford became a fellow of the Royal Society (and in 1925, its president); at the age of 37 he received the Nobel prize, *in chemistry;* at the age of 43 he was knighted, and at the age of 60, he became a baron.

Rutherford was an experimental genius, with comparatively little facility in mathematics and with slight sympathy for involved mathematical theories. In this he was much like Faraday, in whose papers, as Rutherford once pointed out, there does not appear a single line of mathematics. When Rutherford was asked, in 1929, to address the British Association, meeting in South Africa, on "The trend in modern physics," he replied that such a topic would not take more than 2 minutes to deal with. "All I could say would be that the theoretical physicists have got their tails up, and it is time that we experimentalists pulled them down again!"

Until close to the time of his death, Rutherford enjoyed the most robust health. He was often taken, by strangers, for a farmer rather than a professor. He married a childhood sweetheart (after an engagement of 5 years!) and had an exceptionally peaceful and happy married life. In spite of the honors heaped upon him, Rutherford preserved to the end his innate modesty. He was always generous in his recognition of the work of others, including that of his coworkers. He was a tremendously hard worker and expected the same of his assistants. But he was both respected and loved by everyone who had associations with him. An intimate friend said of him, "Rutherford never made an enemy and never lost a friend." There are truly few persons in all scientific history who can so well be chosen as a model and an inspiration to others in the field. For just this reason it is appropriate that the details of Rutherford's scientific and personal life be widely publicized.

Such details are, in fact, contained in his official biography, written only 2 years after his death by A. S. Eve, a distinguished physicist and a close friend and colleague of Rutherford at McGill University. Eve's book is very interesting as well as authoritative. Now John Rowland has written a much more condensed biography. The major portion of Eve's material consists of letters to and from Rutherford, both personal and scientific. Nearly 300 such letters are quoted in full or in part, and they constitute collectively the most intriguing feature of the volume for the professional scientist.

Rowland's new book, on the contrary, merely quotes a sentence here and there from such letters. It represents, however, a well-selected and well-written brief account of Rutherford's life and can be read with profit and pleasure by a large section of the public. Unfortunately it closes with an eleven-page "Epilogue" on advances in physics since the death of Rutherford. Here Rowland falls down badly. For instance, Fermi, in place of McMillan, is credited with the discovery of the first transuranium element, neptunium. Rowland's description of the re-