work on differentiation. The author is to be congratulated on limiting his mention of cancer to some two dozen lines and then proceeding to his topic without straining analogies.

Haven and Bloor attempt to present much of the available information on "Lipids in cancer"—a rich diet in which more evaluative predigestion would have been useful. The most intriguing work reported is that on the beneficial effects of including tumor tissue (now further localized to the phospholipid portion of such tissue) in the diet of rats that bear tumors.

Under the title "The relation between carcinogenic activity and the physical and chemical properties of angular benzacridines," Lacassagne and his group make available, in English, their complex theoretical analysis of the *K* region in the molecular structure of carcinogens. The search for biochemorphologic features at the electron level is undoubtedly worth while but, alas, beyond my capacities to review.

Mühlbock, in the last paper, on "The hormonal genesis of mammary cancer," presents this old topic in a somewhat different and informative fashion. Of particular interest is the attempted and reasonable reconciliation of the hormonal aspects of mammary tumors in mice and in the human female.

The editors, Jesse P. Greenstein and Alexander Haddow, and the publisher are to be congratulated for their valuable contributions to the cancer literature. The value of the reviews would be increased by including the titles of the references. If these were numbered and referred to by number in the text, most of the additional space would be compensated for, and the distraction of having too many parenthetical names and dates in the text would be obviated.

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Separation and Purification. vol. III, pt. 1, of *Technique of Organic Chemistry.* Arnold Weissberger, Ed. Interscience, New York, ed. 2, 1956. 873 pp. Illus. $17.50.

The former volume III in this admirable series possessed no title and treated of a diverse group of topics. In the present revision, the volume has been divided into two parts: part I, *Separation and Purification,* reviewed here, and part II, *Laboratory Engineering,* to be reviewed later. Into the latter portion have gone those topics that are concerned primarily with reactants and the reaction itself: "Selection of materials for the construction of equipment" (new); "Heating and cooling" (revised); "Grinding, screening, and classifying" (new); "Mixing" (little changed); and "Operations with gases" (new). It may be added parenthetically that it is the "laboratory" aspects of the subject which are stressed, rather than the "engineering" approach.

Into part I have gone those topics that are concerned with the isolation, separation, purification, and identification of mixtures of products and of other compounds. Most of the sections of part I have been revised, and expanded also, so that, while the former single volume contained only 671 pages, the two parts now total 1284 pages. It seems significant that each chapter has been expanded, if only by four pages, so that the reader may well ask why the authors invariably add newer material to the older rather than allowing natural selection to replace the outmoded by the modern.

The chapter headings of part I are as follows: "Diffusion methods," including "Thermal diffusion of organic liquids" (new), "Barrier separations" (new), "Dialysis and electrodialysis" (little changed), and "Zone electrophoresis" (new); "Laboratory extraction and countercurrent distribution" (revised), including a section on "Liquid-liquid extraction for increased quantities" (new); "Crystallization and recrystallization" (revised); "Centrifuging" (revised); "Filtration" (revised); and "Solvent removal, evaporation and drying" (revised).

The major revisions in the present volume, when compared with the corresponding portion of the previous edition, reflect rather accurately the areas of greatest recent activity. This is particularly apparent in the first chapter, which contains three completely new sections, not found in the earlier edition. The techniques of thermal diffusion, barrier separations (molecular sieves), and zone (paper) electrophoresis have become prominent only in very recent years, and a majority of the references in these three sections are to the literature since 1950, the date of the previous edition of this work.

In the chapters that have been revised from the first edition, the more active areas also have been greatly enlarged. Thus, R. S. Tipson's "Crystallization and recrystallization" now contains an excellent 15-page treatment of molecular compounds and inclusion complexes, while D. and L. C. Craigs' "Laboratory extraction and countercurrent distribution" devotes 20 pages to their highly successful automatic countercurrent distribution apparatus and 12 pages (with seven tables) to the selection of suitable solvent systems. A similar welcome expansion has been accorded the section on freeze-drying in the late Geoffrey Broughton's "Solvent removal . . ." chapter.

There are, of course, omissions. I would have welcomed a discussion of the commercially available zeolite molecular sieves in the "Barrier separation" section, a treatment of three-phase countercurrent distribution in the extraction chapter, and an application of freeze-drying techniques to nonaqueous systems. For those who are unfamiliar with the "Technique of organic chemistry" series, it may be worth while to note that additional separation and isolation techniques are treated in other volumes; for example, "Distillation" (vol. IV), "Adsorption and chromatography" (vol. V), "The ultracentrifuge" (vol. I, part I), and "Electrophoresis" (vol. I, part II).

However, the observations which are applicable to the series in general may, with conviction, be applied to the present volume. It is well written, it is profusely illustrated, and it is thorough in its treatment, maintaining a nice balance of theoretical and practical aspects. It must indeed rank as a standard reference work.

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High Energy Accelerators. vol. 1 of *CERN Symposium on High Energy Accelerators and Pion Physics, Proceedings.* Geneva, 11–23 June 1956. European Organization for Nuclear Research, Geneva, 1956. 567 pp. Illus. F. 40.

This book is the first volume of a two-volume report on the European Organization for Nuclear Research (CERN) Symposium. It covers the material presented in the first week of the symposium.

After an introduction by J. B. Adams of CERN, the first section concerns new ideas for high-energy accelerators. In this section are papers concerning fixed-frequency alternating-gradient accelerators, fixed-frequency cyclotrons, and ideas about colliding beam accelerators. Here, also, are some Russian ideas about completely new possible methods for acceleration of particles, with the aid of plasmas, and so forth.

The second section is about problems connected with the transition energy in alternating-gradient accelerators. Here again, the Russian workers have a novel idea for circumventing this problem.

The third session has to do with the problems of getting particles out of machines. In this section there are papers concerning some of the existing synchrotrons and synchrocyclotrons as well as proposals for new machines. The following seven sections cover, in turn, linear accelerators and injection problems, non-

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
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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.

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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-