Recent trends in the history of science are illustrated in two new books

Until fairly recently, almost all of the work done in the history of science was the product of a handful of devoted amateurs, whose primary interest and professional departments were the sciences, philosophy, literature, or general history. Since the war, the history of science has been growing rapidly, both as a subject taught in colleges and technological institutes and as a field for graduate study and research. Two aspects of this growth are the appearance of reviews or surveys of recent publications to enable scholars and scientists to keep abreast of current developments and the production of studies that are based on examination of manuscripts and are not limited to previously published material. The books reviewed here illustrate these trends in scholarship. The **Unpublished Papers of Isaac Newton** (a selection from the Portsmouth Collection in the University Library, Cambridge) chosen, edited, and translated by A. Rupert Hall and Marie Boas Hall [Cambridge University Press, New York, 1962, 436 pp. $11] gives a glimpse into the treasures still awaiting the scholar with sufficient daring to sort the manuscript papers of leading scientists. The **History of Science** (volume 1 of an annual review of literature, research, and teaching) edited by A. C. Crombie and M. A. Hoskin [Heffer, Cambridge, England, 1962. 134 pp. 30s.] has been designed specifically as "an instrument of research and criticism" in this area.

The rise of the history of science as a professional discipline does not (and should not) shut the door to major contributions by scientists; clearly, no historian of science can ever hope to have the insight into a scientific problem of a scientist who has devoted a life-time to the contemplation of the subject to which that problem belongs. Conversely, the scientist, who usually does not have experience in history, can not hope to rival the historian in his command of the background material or in his understanding of the many ways by which scientific advances may be made. Current writing on the history of science shows equally outstanding examples of contributions made by scientists interested in history and by historians of science.

Because the literature on the various aspects of the history of science is growing at so rapid a rate, there is need for surveys of recent publications and for statements of research problems. It is specifically to fill such a need that A. C. Crombie and M. A. Hoskin—lecturers in the history of science, respectively, at Oxford and Cambridge—have founded the new British annual. It contains four such reviews: "The physical sciences in the first half of the nineteenth century: problems and sources" by L. Pearce Williams; "The expanding world of Newtonian research" by D. T. Whiteside; "Science and technology in the eighteenth century" by D. S. L. Cardwell; and "The history of medicine in 1960–61" by F. N. L. Poynter. These essays vary greatly among themselves. Williams and Whiteside display an amazing grasp of the central problems and enable one to learn at once about primary source materials and the recent monographic literature, while Poynter presents an admirable survey of recent contributions and at the same time calls attention to gaps that require additional research. Cardwell is less successful because he strays far from his subject, does not give the reader an introduction to sources, and limits himself to but one small part of power technology. There are also some excellent essay-reviews of important recent books and some shorter notices, which somehow seem out of place. Although the editors hope their review will be international, the contributors with one exception are all British; the list of doctoral theses in preparation and the accounts of the teaching of science are strictly limited to British (and one Australian) universities. A more truly international presentation will no doubt occur in later volumes.

One aspect of the development of the history of science as a professional discipline is that there has been an elevation of standards. Historians of science are no longer content to base their analyses on printed writings of scientists, but they now demand a study of the manuscript material whenever possible. Currently there is a great flurry of interest in Isaac Newton, accompanied by a considerable exploration of his unpublished writings. Yet it is strange to relate that no attempt has been made (or is now being contemplated) to produce a full edition of all of Newton's published and unpublished writings to replace that of Samuel Horsley (printed during the period 1779 to 1785). An edition of Newton's correspondence is being prepared by the Royal Society (three volumes have already been published by Cambridge University Press), and we may expect, in the near future, a number of studies based on Newton's notebooks, drafts of papers, projected revisions of published works, unpublished works, and miscellaneous jottings. All of Newton's mathematical papers are being edited by D. T. Whiteside, with the assistance of Michael Hoskin, while Alexandre Koyré and I have undertaken an edition of Newton's *Principia*. The new collection made by A. Rupert Hall and Marie Boas Hall of Indiana University is described as "the first attempt to add to the published collection of Newton's scientific writing since 1838," but this is an over-statement because Eddleston, Brewster, Rouse Ball, and others have published scientific writings of Newton from the manuscripts beginning in 1838, and some important scientific papers have been included in the Royal Society's edition of the correspondence.

This volume of Newton's papers deals with mathematics, mechanics, theory of matter, problems connected with the *Principia*, and education. The starting point of the Halls was their interest "in tracing the development of Newton's ideas on the nature of matter," but they could not help entering "the shadowy realm where physics, metaphysics and theology overlap in Newton's mind." However, they have "printed nothing" from the several working notebooks extant, "nothing of Newton's chemistry, nor of his optics." Since many of the documents are written in Latin, the editors have given English translations that are faithful to the original, readable, and illuminating.

In a series of articles published dur-

ing the last several years the Halls have established their mastery of Newton's thoughts concerning the nature of matter. For most scientists and historians, the sections of the book dealing with this question (including the newly published drafts of the preface to the *Principia*, the early suppressed *Conclusio* to that work, and the first versions of the final *Scholium Generale*) will prove of greatest interest. The Halls show that Newton again and again tried to find a place for his theory of matter in his *Principia* as if he felt that "some notice should be given of the microscopic architecture of nature side by side with the majestic system of celestial motions unfolded by mathematical analysis." Most scholars know this theory of matter through the later "Queries" added by Newton to successive editions of his *Opticks*. Now, thanks to the labors of the Halls, Newton's views may be studied, step-by-step, as they were developed. The theory of matter is perhaps the most interesting of all Newton's theories, because it was basically unsuccessful and thus reveals to us the tortuous steps of a profound thinker wrestling with a fundamental problem that proved to be continually beyond his powers.

All scholars, of course, will not agree with the choice of selections the editors have made. For instance, they have included some, but why not *all*, versions of the famous *Scholium Generale*, with which the later editions of the *Principia* conclude. Another source of regret is that the Latin and English versions are not printed on facing pages. Since there are neither paragraph numbers nor cross-reference page numbers, it is quite a chore to find the English translation of a given paragraph, or the original Latin corresponding to an English statement, in a lengthy selection. Although the exposition of Newton's ideas concerning matter, motion, dynamics, and education is continually illuminating, the presentation of Newton's mathematics is less successful. Some mathematical slips make the text meaningless—for example, when the editors suggest an interpretation "Following Newton's assumptions, and making $\dot{x} = \ddot{\dot{x}} = 1$"; clearly both the first and second derivatives cannot be equal to unity since $\ddot{\dot{x}} = 1$ implies that $\dot{x} = 0$. Certainly all readers will be sorry that the Halls chose to give only introductory essays to the papers they have selected for publication, rather than to provide the notes and commentaries which make difficult texts understandable. This is all the more regrettable for, in their essays, the editors show us the kind of understanding that they have happily achieved after much profound study.

Such points of criticism are small, however, in comparison to the significant merits of this book. It opens up, for most readers, a set of wholly new dimensions of Newton's scientific thought, and it provides in the editorial introductions a new basis for understanding Newton's ideas concerning matter. Historians and scientists will be grateful to the Halls for having undertaken this labor and for bringing to light these neglected aspects of Newton's creative efforts. They have produced a significant book and have ably demonstrated the importance of supplementing a study of printed works by an examination of manuscript sources.

The new annual, *History of Science*, should be in every scientific library and ought to be consulted by everyone who contemplates a study on any historical aspect of science. The *Unpublished Scientific Papers of Isaac Newton* will have an even wider appeal, since it deals with such basic scientific questions. Under the able tutelage of the Halls, scientists, philosophers, and historians of science will be able to read these documents with profit and pleasure, not only to learn the inner scientific thoughts of one of the greatest of all scientists but also to explore in Newton's terms, basic questions of methodology and scientific philosophy.

I. BERNARD COHEN
History of Science,
Harvard University

Collected Papers

Applied Geophysics, USSR. Nicholas Rast, Ed. Pergamon, New York, 1962. 429 pp. Illus. $15.

Applied Geophysics, USSR, is not a textbook; it contains translations of 17 recent and informative papers written by various Russian authors and dealing with a relatively wide range of topics. However, all the work pertains to phases of exploration geophysics related to oil or petroleum engineering. A large portion of the information consists of mathematical developments, but a few noteworthy examples of theory applied to real problems are presented. One purpose of the book is to present and focus attention on the vigorous scientific research by geophysicists in the U.S.S.R.

The contents are divided into four parts: seismology, gravimetry, electrical sonde methods, and oil geophysics. The first three deal with materials indicated by their titles, but it may surprise some to find that the fourth deals almost exclusively with well-logging procedures. Most American geophysicists consider well logging more closely related to petroleum engineering than to geophysics.

In general the papers, which appear as separate chapters, summarize the ideas of their authors with few direct references to ideas or developments that have originated with others. This fault is tempered somewhat by the excellent bibliographies (containing works in various languages) at the ends of most of the papers. These bibliographies, which contain more than 160 entries, and the approximately 160 well-chosen illustrations greatly strengthen this compendium. Since Russian papers form a large portion of them, the bibliographies are particularly valuable to the student of geophysics.

As a whole the book contains an extraordinary amount of information and ideas expertly presented. Discussions, developments, and illustrative materials are well chosen and clearly presented. Although its format is good, there is some lack of continuity in subject matter among its various chapters, but the translator's smooth style has resulted in an easy transition in reading from paper to paper, not often encountered in translations from the Russian language to the English language. Although much of the information presented is not new to informed geophysicists, some very interesting departures from the usual treatment of geophysical data are illustrated. For example, one 30-page chapter is devoted to the use of stereographic projections in solving spatial problems of the so-called geometrical seismics. I find this particular treatment quite refreshing because the demonstration is instructive and represents a novel manner of deriving and representing seismic information. The communicative modes of approach to problems treated here will undoubtedly result in a wider understanding by geophysics students of certain principles of geophysical exploration and their applications, but the