long since left behind the era of the single scientist working alone in his laboratory. With the emergence of the group scientific effort, there also emerges the need for management. Whether it is the nature of scientists which makes them more difficult to manage, or whether it is simply that one is faced with the problem of managing a group of individuals of above normal intelligence, we just do not know.

The discussions in this book consider some, but by no means all, of the problems involved in the management of scientists. The act of management in this area has three principal factors: hiring, firing, and providing a proper environment. Only the last of the three aspects is discussed here. Anyone who has been involved in the management of scientists, however, will recognize the great importance of the first two, and it is somewhat surprising that they are not discussed in a book with this title.

In the first chapter Everett Mendelsohn gives an excellent and revealing history of the emergence of science in the 19th century, with some illuminating insights into the problems of those times and some remarkable parallels to our problems today.

The chapter entitled "The psychology of scientists," by Anne Roe, is perhaps an unfortunate inclusion, for it provides a detailed analysis of a nonrandom sample of scientists. Perhaps all that is proved is that scientists make reasonably good actors, for the list which she provides of the traits of productive scientists is exactly what one would expect. It preserves intact the image of the scientist.

The chapters by Royden Sanders and Albert Siepert, on the problems of managing research, provide a strong contrast. Siepert's analysis of government laboratories is an excellent article that provides a constructive discussion of this kind of laboratory, but the one by Sanders, on industrial laboratories, is replete with such exhortations as "provide proper climate," "nurture the creative," "recognize good ideas," "learn to communicate," "have courage," and "guard against complacency" —advice which may be good, but is not constructive.

Norman Kaplan's article on the organization of science is interesting because of its healthy criticism of industrial laboratories and their attempt to emulate the university atmosphere, a trend which has certainly not been a universal success and one which certainly needs reevaluation.

In the final article, on the adaptive process, Herbert Shepard attempts to strike an analogy between adaptive biological organisms and the research laboratory, an analogy that he pursues to the bitter end. Some of the examples are apt and amusing, but others show the strain of a forced fit.

It is difficult to know who, if anyone, is likely to profit from reading the book, for those already involved in the management of scientists will learn little (with the possible exception of some of Sanders' quotations), and those who are newly faced with the problem of managing scientists will find little to guide them on their chosen path. Perhaps if the title had been less dogmatic, less inclusive, and more cautious, one could recommend the book to nonprofessionals as a source of some illuminating sidelights on the world of science, scientists, and their administrative environment.

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Russian Popularization

Accelerators of Charged Particles. B. S. Ratner. Translated from the Russian edition by L. A. Fenn. H. W. Curtis, Translation Ed. Pergamon, London; Macmillan, New York, 1964. viii + 120 pp. Illus. $3.50.

The conquest of the air through the development of the airplane and the conquest of outer space by means of telescopes and rockets have been heralded almost daily in our newspapers, and it is a dull boy indeed who cannot give an adequate account of either field (although he might get a bit foggy in dealing with the distant parts of outer space). The conquest of inner space, the world of the atom and within that of the electron and proton, remains less well known. Although rockets and telescopes are familiar to all, their equivalents for exploring the inner world, the accelerators of charged particles, are not as well known.

B. S. Ratner of Moscow has set for himself the task of explaining these tools to the general reader and has written *Accelerators of Charged Particles* with the assumption that all the terms and concepts of atomic physics are unfamiliar to his readers. Thus, he begins with a review of the atomic world and of how we have come to know of the properties of atoms through, for example, the classical scattering experiments of Rutherford. Proceeding to a description of the early and very simple accelerators, such as the transformer-rectifier generator of Cockcroft and Walton or of the electrostatic machine of Van de Graaff, he then explains how beams of particles produced by such machines can be used to "see" into the nucleus.

In subsequent chapters Ratner deals with more sophisticated machines such as cyclotrons or betatrons which give higher energy and which were used especially in the early exploration of the nucleus, largely in the era before 1940. This brings him to the golden age of his subject, the last 15 years, during which time remarkably large and complex accelerators have been constructed to study the properties of the subnuclear particles—the proton, the electron, various kinds of mesons, as well as the rich and exotic forms of these particles that can be created by collisions between them. It is during this period that the Russians have participated vigorously in the field and have attempted to be competitive with, possibly even superior to, researchers in this country. The book is at its best at this point in giving simple explanations of the ideas and principles underlying the construction of such machines as the synchrocyclotron (phasotron), the synchrotron, the linac (linear accelerator), and the proton synchrotron (synchrophasotron).

The translation has not been carefully made; most of the names, having been twice transliterated, come out badly misspelled. It is inexcusable to read about the bevatron at the California Institute. I would also criticize Ratner for not having explained more fully the reason for building the large machines and for not giving more of a taste of the beautiful and multifarious results that have made the building of so many great accelerators such a justifiable activity. Although he gives a rather complete introduction to the techniques and experiments of classical nuclear physics, the author has almost totally ignored the techniques and experiments of high energy physics, techniques and experiments that, after all, are part and parcel of the accelerators themselves.

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