The Academy of Sciences of the U.S.S.R.

Istoriia Akademii Nauk SSSR, vol. 2 (Academy of Sciences of the U.S.S.R. Press, 1964; 772 pp., in Russian), edited by K. V. Ostrovitianov, traces the history of the St. Petersburg Academy of Sciences, the present-day Academy of Sciences of the U.S.S.R., from the beginning of the 19th century to the eve of the October Revolution. It is the first detailed study of the scientific activities of the Academy during the 19th century. Petr' Pekarskii's classical *History of the St. Petersburg Academy of Sciences* (1870–73) did not go beyond the 18th century. G. A. Kniazev and A. V. Kol'tsov's *Short Sketch of the History of the Academy of Sciences of the U.S.S.R.* (ed. 3, 1964) allocated only 78 pages to the period covered in the volume under review.

Following the official Soviet periodization of modern Russian history, the volume is divided into three parts: the first covering the period from 1803 to 1860, the second from 1860 to 1890, and the third from 1890 to 1917. Although this division has proven to be practical for the technical organization of the book, the authors have not tried to show its deeper historical and cultural relevance.

Each part of the book is introduced by an essay on the general social and intellectual developments in the country and on the organizational changes in the Academy and its ties with the world of scholarship outside Russia. These essays, the least systematic chapters of the book, contain pertinent and interesting information but are much in need of logical unity and basic sociological analysis.

The book is more of a documentary record than a critical analysis and assessment of the Academy's activities and accomplishments. It is a valuable source of biographical data on most of the leading scientists of 19th-century Russia. To a careful and discerning reader it also reveals the growth of strong national traditions in mathematics, chemistry, embryology, mineralogy, and physiology. Although the Academy was unquestionably the leading and most widely recognized Russian scientific institution, it did not extend its membership privileges to all of the great Russian scientists. The geometer N. I. Lobachevskii, the physiologist I. M. Sechenov, and the chemist D. I. Mendeleev worked independently of the Academy and its library and laboratory facilities.

The thorny historical path traveled by the Academy reflects the painfully slow and uneven evolution of scientific thought in Russia. The glory and achievements of the Academy prior to the 1860's rested primarily on the work and eminence of foreign scholars or on that of Russian nationals of foreign, mostly German, ethnic origin. It is true that in the first half of the 19th century the Academy had among its members a number of eminent native scholars, best represented by mathematicians M. V. Ostrogradskii, P. L. Chebyshev, and O. I. Somov. But an overwhelming majority of its most illustrious men were foreigners headed by Heinrich Lenz (physics), Karl von Baer (embryology and physical anthropology), Hermann Hess (the founder of thermochemistry), and W. F. von Struve (astronomy). These men accepted Russia as their new homeland and made contributions far in excess of their personal research engagements. Most taught at St. Petersburg University or other institutions of higher education located in the national capital. They took part in numerous government committees concerned with the study of the country's human and natural resources. They were also among the founders of the Russian Geographical Society and similar associations dedicated to the advancement and the popularization of science.

The great cultural and social fermentation in Russia during the 1860's is a matter of unequivocal and abundant historical record. It was during this period, however, that the Academy's traditional stature eroded under the pressure of a widespread and popular search for national self-assertion in the field of intellectual endeavor. The new intellectuals, including an unexpectedly large number of young scholars, looked on the Academy as a "German institution" standing in the way of Russia's cultural independence. Then, in 1880, the academicians acquired new enemies by voting against D. I. Mendeleev as a candidate for the academic chair of technology and chemistry which had been left vacant by the death of N. N. Zinin. The famous chemist A. M. Butlerov and several other Russian academicians joined the growing chorus of critics of the Academy. Letters of protest came from every Russian university and from most of the learned societies. The national consciousness of Russian scientists was aroused and given a dramatic manifestation. Matters were further aggravated in 1883 when the academicians elected the German scientist F. Beilstein to fill the vacant position. Beilstein was a chemist of acknowledged accomplishment and promise, but he was not a match for Mendeleev whose star rose rapidly after his periodic law of elements received the first experimental verification and support.

Although criticism of the Academy was too harsh and often unwarranted, it helped accelerate the process of the "nationalization" of its membership. Not until after the 1880's did Russians hold a majority of the positions in the Department of the Physical and Mathematical Sciences, which also included the biological disciplines. And not until the first decade of the 20th century was Russian numerical supremacy matched by the high quality of national scholarship. There were great Russian academicians before 1900, but after that time they appeared in relative profusion. In 1908, for example, among the Academy's adjuncts, extraordinary members, and regular members were the physiologist I. P. Pavlov (Russia's first Nobel prize winner), the crystallographer E. S. Fedorov, the mathematicians N. Ia. Sonin, A. A. Markov, and A. M. Liapunov, the embryologist V. V. Zalenskii, the geologist F. N. Chernyshev, and the astronomer A. A. Belopol'skii.

The book is very rich in scientific detail of historical significance, bibliographical documentation and description of academic museums, laboratories, libraries, and publication activities. However, its numerous contributors have done a much better job in assembling information than in coordinating it into an integrated and explicitly meaningful study. The Academy's involvement in the growing philosophical and sociological problems of science has been almost completely ignored. The gigantic role of foreign scholars in advancing scientific thought in Russia has not received the thorough and systematic scrutiny that it deserves.

Despite these obvious shortcomings, this book will be of lasting value and will prove essential for all serious students of Russian intellectual history.

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Applied Physics

Foundations of Plasma Dynamics. E. H. Holt and R. E. Haskell. Macmillan, New York, 1965. xviii + 510 pp. Illus. $12.95.

"This book is written as a text in the fundamentals of plasma dynamics," state the authors in the first sentence of their preface. Although many books on plasma physics have recently been published, only a handful are useful for a complete classroom sequence. This volume is aimed at students with a background of 3 years of college work in science and engineering, and the implications are that it is also useful for the practicing engineer.

The subject matter is divided into 15 chapters that average 30 pages in length. The first and last chapters constitute, respectively, a well-written historical introduction and a very qualitative description of plasma sources. The second chapter reviews Cartesian tensors and the indicial notation that is used throughout the text, and chapter 3 establishes the rudiments of Maxwell's equations. Particle motions and collisions are scattered throughout chapters 4, 8, and 15; kinetic theory in 5 and 10; macroscopic theory in 6; plasma theory in 7 and 9; waves in 11, 12, and 13; and magneto-fluid mechanics in 14. On a chapter average, there are about eight figures of which 75 percent are line drawings, about nine exercises practically all of which relate to the development of formulas in the text, and about ten references of which 80 percent are to other texts.

Pedagogy is an all-important but somewhat elusive variable for evaluating classroom texts. From my vantage point, the desirable aspects are: (i) the book is an ambitious undertaking to distill and logically present the fundamental knowledge in the broad field of plasma physics; (ii) the mathematics is at an appropriate level (although there is no basis for the author's implication that the indicial notation is superior), with the steps of sufficient detail for a clear understanding, and (iii) the text is of reasonable length.

The less desirable aspects are: (i) the development of physical insights is left almost entirely to the reader—thus only one example (whistlers) is used throughout to elucidate any theory, and it is disturbing to find that no connection is made between the Van Allen belts mentioned in the introduction and the magnetic force in a longitudinal gradient; (ii) exercises are related only to the development of equations; and (iii) subject matter is at times too loosely connected—for example, there is no stated relationship between the MHD waves of chapter 14 and the EM waves of chapter 13. Thus instructors who adopt this text will need considerable experience, and only experience with its use will determine the book's educational effectiveness.

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Modern Biology

Selected Papers on Molecular Genetics. J. Herbert Taylor, Ed. Academic Press, New York, 1965. xii + 649 pp. Illus. Paper, $5.95; cloth, $9.

This volume provides both the student and the professional with an excellent, instantly available, reprint collection of many of the important papers on molecular genetics that have been published during the past several years. Also included are papers from the pre- and early "molecular" eras—for example, Beadle and Tatum's 1941 paper on the biochemical genetics of *Neurospora*; Pauling, Itano, Singer, and Wells's paper on sickle cell hemoglobin; as well as papers by Sturtevant, Creighton, and McClintock and Avery, MacLeod, and McCarty that are fundamental to the development of ideas of chromosome and nucleic acid structure.

Fifty-five papers related directly to the organization, molecular structure, and function of the genetic material are reproduced in five sections: Biochemical Genetics; The Nature of the Genetic Material; DNA Structure and Replication; Genetic Recombination; and The Function of the Genetic Material. Taylor has provided a short introduction to each section which helps to provide some perspective about the development of the concepts that led to the experiment described.

On the whole the collection is an excellent one and it is a very handy supplement to the texts now available to those who are studying and teaching molecular biology.

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Computers

Electronic Computers. S. H. Hollingdale and G. C. Tootill. Penguin Books, Baltimore, 1965. 336 pp. Illus. Paper, $1.65.

Electronic Analog Computer Primer. James E. Stice and Bernet S. Swanson. Blaisdell (Ginn), New York, 1965. xii + 160 pp. Illus. Paper, $2.75.

Electronic Computers was written for the general reader. The chapters that deal with the historical development of computers and with some of the programming of digital computers can probably be read with interest and profit by intelligent individuals without technical background, but to follow the content of this book the reader should have a mathematical background through elementary calculus, and preferably, some knowledge of electric circuits. Such terms as impedance, voltage, resistance, and differentiation are explained by the authors but are not likely to be clearly understood by nontechnical readers.

Analog and digital computers are discussed, and a clear distinction is drawn between the two. The analog computer is characterized as a special-purpose device of limited precision. The digital computer, on the other hand, is recognized as the general-purpose tool that it is. The authors provide a good description of what the digital computer can do and of how it is pro-