BOOK REVIEWS

Aurora

The Optical Aurora. By A. Omholt. Pp. xii+198. (Springer Verlag: Berlin and New York, 1971.) 58DM; $16.80.

THIS book is the fourth volume in a series on Physics and Chemistry in Space. It is concerned with the detection and interpretation of electromagnetic radiation of wavelengths in the range 100 to 100,000 Å, produced through the interaction between the stream of particles of solar origin and the Earth's atmosphere. In addition, the information concerning this optical radiation is used to deduce the influence of primary particles on the ionosphere and so to examine the perturbations of the ionosphere caused by the particles.

The author explains in his preface that because the subject of his book was very fully treated in Chamberlain's *Physics of the Aurora and Airglow* (Academic Press, 1961), he will concentrate on outlining progress made during the past decade and will refer the reader to Chamberlain's book for relevant background information.

Following an introductory chapter describing auroral forms and morphology, examining the magnetic guidance of particles and defining coordinate systems, there are chapters first on the electron aurora in which data on auroral luminosity are used to study the primary electrons producing the aurora, and second, on the proton aurora, containing a theoretical examination of the characteristics of the hydrogen emission and an account of the information that can be deduced from the observations. The next two chapters deal with the optical spectrum of the aurora (rockets and satellites have extended our knowledge of the spectrum into the ultraviolet and provided more information in the infrared) and the physics of the optical emissions, examining the processes of excitation, the interpretation of the spectrum, the life of metastable oxygen atoms, helium emissions and the sunlit aurora. There follow a review of recent work on temperature determinations from auroral emissions and an analysis of the various forms of pulsing in aurora: pulsating, flaming, flickering and streaming. In a short chapter on the optical aurora and radio observations, the association between the optical aurora and the effects of the enhanced ionization on radio wave propagation is summarized. Finally, the production and observation of X-rays in aurora are briefly described.

The book is clearly written and well produced and illustrated. It will be useful not only to spectroscopists but to all working in any branch of study of the aurora.

JAMES PATON

Lobachevsky to Pavlov

Science in Russian Culture. By A. Vucinich. Pp. xv+575. (Stanford University, Oxford University: Stanford, California, and London, July 1971.) £8.75.

VUCINICH's second volume on Science in Russian Culture starts with the aftermath of the Russian debacle in the Crimean War. This precipitated passionate demands for social reform, more efficient government, and industrial development. Science was seen as the instrument for their accomplishment, from nihilists who believed that the problem of social organization could be solved only by science, to conservative bureaucrats who saw that science was necessary for better military technique.

The translation of Darwin's *Origin of Species* was published in the year in which the serfs were emancipated. Its effect on the atmosphere of intellectual excitement was profound. In 1862 Turgenev published *Fathers and Sons,* whose hero Bazarov was the prototype of the new man, the scientific son who was to save the land of his fathers. He appeared to be modelled on I. M. Sechenov, the inspirer of Pavlov. While Turgenev was presenting the scientist as saviour, the anti-scientists were denouncing him as the desecrator of the higher moral truth. Prominent among them was Dostoevsky, whose hero in *Notes from the Underground* announced: "The conclusions of reason and arithmetic may be the law of logic, but not the law of humanity." We should "scatter rationalism to the winds . . . send these logarithms to the devil, and . . . live once more by our own foolish will!"

Russian science was strong in mathematics from the time when Euler was installed in the St Petersburg Academy of Sciences. One of the reasons was that reactionary statesmen thought it was too abstract to be politically dangerous. The most characteristic Russian contribution to science was soil science, founded by Dokuchaev. It was supported both by improving landlords and the Populists who were incensed by the assignment of poor land to the freed peasants. Though chemistry produced Butlerov and Mendeleev, it was retarded by the lack of a chemical industry. Physics was held back for similar reasons.

From 1725 until 1917 presidents of the Academy of Sciences were appointed by the authorities, not elected. The universities were virtually confined to the sons of gentry. Women were excluded and Jews restricted. In 1912 there were 8,000 Russian students studying in Western European universities, about ninety per cent of whom were Jews.

Lobachevsky spent his mathematical life at Kazan, then the most eastern university in Europe. His teacher there was the German mathematician Johann Bartels, who had taught Gauss when he was a boy of twelve. Lobachevsky lectured on his non-Euclidian geometry in 1826. Gauss's appreciation of his work was not published until after Lobachevsky's death in 1856. In 1873 W. K. Clifford, in a lecture at the Royal Institution, compared Lobachevsky with Copernicus. Each had "brought about a revolution in scientific ideas so great that it can only be compared with that wrought by the other". Lobachevsky was not discouraged by lack of mathematical recognition. His practical abilities were appreciated, especially as rector of Kazan University. He was keenly interested in the philosophy of science, and held that it was Bacon who foretold the rise of mathematics as the basis of the new scientific method.

Academician A. N. Krylov, the father-in-law of Kapitza, was an eminent applied mathematician, the translator of Newton's *Principia* with commentaries, and a naval architect who contributed to the scientific foundation of the Soviet Navy. He was related to I. M. Sechenov whom he saw in his boyhood.

A. F. Joffe, being Jewish, found a university career closed to him. After doing notable research under Röntgen the only job he could get was as laboratory assistant in the St Petersburg Polytechnical Institute. He stayed, and ultimately created the school which provided the first generation of Soviet physicists.

Vucinich's comprehensive and readable work is essential for all libraries.

J. G. CROWTHER