Book Reviews

An Encyclopedia in Chinese

Zhong Guo Da Bai Ke Quen Shu (Greater Encyclopedia of China). Vol. 1, Tian Wen Xue (Astronomy). Greater Encyclopedia of China Publishing House, Beijing, 1980. xxviii, 652 pp., illus., + plates. $30.

Although comprehensive reference books on specific subjects have been written throughout Chinese history, the *Greater Encyclopedia of China* is the first work of its kind to be undertaken in Chinese. If the editorial board can accomplish its task, some 80 volumes on subjects ranging from the social, natural, and medical sciences to the humanities will be published over the next decade. The inauguration of the encyclopedia could not have come at a better time, for China is now emerging from the trauma of its ten-year Cultural Revolution. Affected by the closure of the university and the censorship of any literature that was not politically doctrinaire, an entire generation of Chinese youth never had a chance to receive a university education. Today we are witnessing their losses in the distinctive bimodal age distribution of Chinese scholars visiting the West. The lack of competent scholars and professionals has also caused China to slow down its post–Cultural-Revolution modernization program. Of course a problem of this magnitude cannot be quickly solved, for it takes time to rebuild a nation's think tank. However, books such as the *Greater Encyclopedia of China* can only help to ease the current crisis. Coupled with the popular televised open-university program, the encyclopedia can provide an opportunity for members of the lost generation to acquire comprehensive university-level knowledge through self-education. In this respect the book is likely to have a social impact beyond the usual canonical usefulness of an encyclopedia.

The first volume of the *Greater Encyclopedia of China* is on astronomy. The principal theme and basic structure are very similar to those of most encyclopedias published outside China, though the content is slightly more comprehensive. In this volume there are more than 1000 entries, on all branches of astronomy. The section on the history of astronomy in China is most informative and well written. Although no present-day astronomer needs to be reminded of the priceless heritage of astronomy in China, only a small handful of scholars actually have sufficient knowledge of classical Chinese as well as astronomy to be able to utilize the rich bank of data in historic Chinese annals. The authors of this volume present a brief summary of their years of painstaking work on the transliteration of these historical astronomical records. The reader can find the fascinating history not only of calender making, eclipse records, and variable stars but also of the development of different cosmological principles. Particularly valuable to historians of Chinese astronomy is the translation of the names of over 500 stars as they are referred to in the classical Chinese annals.

In the section on instrumentation, most of the recent advances as well as classical telescope designs are clearly described, though without much detail. Considerable emphasis is put on solar and space astronomy. Recent discoveries concerning the solar neutrino problem, solar oscillations, and planetary rings are included in the volume. Physical processes relevant to stellar structure and stellar astronomy are well reviewed, with an excellent collection of articles on variable stars. The coverage of galactic and extragalactic astronomy can be supplemented with data from more recent investigations of galaxy formation, dynamical and chemical evolution of galaxies, and galaxy clusters. The section on cosmology includes a fairly thorough introduction to the most modern cosmological models. The scientific discussion of cosmological models itself marks the return of academic freedom in China, for during the Cultural Revolution research in cosmology was attacked and replaced by political jargon.

Overall, the academic standard of this volume is very high. The nonmathematical format did not prevent the authors from discussing subtle underlying physical principles. To the best of my knowledge, most of the nearly 200 color photographs are published in a Chinese book for the first time. In time, the volume will be instrumental in the popularization of astronomy to a quarter of the world's population.

Had the volume been written in English, I could strongly recommend it to any astronomy or physics undergraduate. As it is, the detailed English translation of many technical terms and of each entry heading may be useful for those astronomers who wish to pursue academic exchange with their Chinese colleagues.

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Institutions in France

The Organization of Science and Technology in France 1808–1914. Papers from a meeting, Lancaster, England, July 1977. ROBERT FOX and GEORGE WEISZ, Eds. Cambridge University Press, New York, and Editions de la Maison des Sciences de l'Homme, Paris, 1980. x, 356 pp. $37.50.

In this collection of papers the authors attempt to provide an analysis of the institutional structure of French science and technology from the establishment of the Napoleonic University in 1808 to the outbreak of the First World War. There is far greater concentration on the later part of the period, however.

The institutions stressed are ones that have tended to be neglected by historians of science, rather than elite Parisian establishments like the Ecole Polytechnique, the Ecole des Ponts et Chaussées, or the Ecole des Mines, which have received more attention. In their comprehensive paper on the institutional basis of French science, Fox and Weisz claim that the predominance of studies of Parisian institutions has obscured the importance of those in other areas and note that during the Second Empire specialized schools were springing up throughout France for instruction in the applied sciences. However, according to Karady, in his paper on educational qualifications and university careers, proximity to Paris remained for most of the 19th century an important factor for academics because of research facilities and the quality of the students. He claims that a professorship in a Paris lycée was more highly prized than the majority of faculty chairs.

The effects of politically oppressive regimes on research, budgets for science, and its professional organization are also assessed. Fox and Weisz provide an analysis of attitudes toward sci-

entific research as they varied with political change. Development was hindered, for instance, by mistrust and restricted budgets during the Bourbon Restoration and the Second Empire. Zwerling, however, in his paper on the Ecole Normale Supérieure, where future lycée teachers were trained, rejects accepted explanations for a decline in French science. Rather than seeing over-centralization and political instability as fundamental, he relates changes in the French scientific community to the emergence of an industrial society in France during the 19th century. He also points out that mathematics could adjust to changing circumstances because of the lesser need for financial support and research facilities.

Zwerling's contribution provides useful new evidence of the role of the Ecole Normale in scientific development. During its early years, the teaching of science was not emphasized at the Ecole Normale, but in the 1830's this situation began to change and, according to Zwerling, *normaliens* played an increasingly important role in scientific teaching and research. Reforms in the 1850's stressed the need for science in the lycées with consequent effects on the Ecole Normale. Zwerling provides useful comparisons with the Ecole Polytechnique, with respect not only to scientific research but also to the social backgrounds and ambitions of the students. He provides evidence that the *polytechniciens* came increasingly from the upper levels of the bourgeoisie and the *normaliens* from the lower levels; this is interesting in view of the democratizing aims of the founders of the Ecole Polytechnique. He illustrates the support of developing industry for provincial faculties of science. While *polytechniciens* could envisage top careers in the civil service, new types of scientific career were open to *normaliens* in an expanding French economy. However, according to Zwerling, the economy itself dictated the type of career possible, and he sees in its slow expansion relative to that of Germany an explanation for what has been considered to be the decline in French science.

In comparing the scientific achievements of the Ecole Polytechnique and the Ecole Normale, Zwerling's stress on the output of scientific papers is not wholly convincing. Merely to compare numbers of papers is inadequate, since quality is not assessed and, moreover, the number of papers published by *normaliens* increased sharply, according to Zwerling's statistics, with the foundation of the *Annales Scientifiques de l'Ecole Normale Supérieure* in 1864, publishing almost exclusively the works of *normaliens*. However, Zwerling's thorough research throws interesting new light on the history of the Ecole Normale.

Weisz's paper on medical education concentrates on the period from 1870 to 1914. Some mention of the earlier years, linking development in hygiene with public works, would have been interesting. There is scant reference to the *officiers de santé*, and their role is not explained. As regards the organization of medical teaching and the political struggles involved, however, the work is full and comprehensive, as is Crawford's study of the effects on scientific progress of the prizes of the Academy of Sciences and the increasing importance of their material rather than symbolic value. Limoges describes the decline and growing isolation of the Muséum d'Histoire Naturelle during the 19th century but rather neglects the earlier part of the period, apart from providing interesting comparisons of its budgets with those of other institutions.

Shinn provides an excellent analysis of the changing concept of the "engineer" and the barrier between the state engineering corps and the growing needs of industry. He claims that participation in industry was considered socially degrading, but he does not mention the role of *polytechniciens* in the Saint-Simonian movement for the advancement of industry. He claims that the power of the state corps exists today in France because of the entrenched values of the privileged classes, but attitudes began to alter with the growth of industry and the need for highly educated technical and scientific personnel. His contribution is most useful in assessing changes in engineering education and the role of the engineer in French society. Day stresses the political motivation for changes in technological education. He throws new light on *Université* attitudes and the emergence of technical education, as does Paul when he describes the increasing stress on applied science, the failure of the *grandes écoles* to meet the needs of industry, and the changing funding of education, with subsidies from local authorities and regional industry.

What emerges most forcibly from this collection is a picture of entrenched traditions. Though studies of French scientific research have usually resulted in unfavorable comparisons with Germany, the two countries were in fact, according to Lundgreen, developing in similar ways, with strong bureaucratic attitudes influencing the recruitment of manpower and favoring systematic learning and training. The requirement of formal education and qualifications on both sides of the Rhine gave rise to or enforced the rule of meritocracy, but industry and the economy dictated change according to prevailing needs. In Germany and Switzerland, first-class scientists were harnessed to laboratories whose research was directly related to expanding and powerful industry. France's development was different, but the most successful French industries were, according to Paul, directly linked to institutes or had their own laboratories for pursuing the industrial application of scientific research.

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The Brain

The Organization of the Cerebral Cortex. Proceedings of a colloquium, Woods Hole, Mass. FRANCIS O. SCHMITT, FREDERIC G. WORDEN, GEORGE ADELMAN, and STEPHEN G. DENNIS, Eds. MIT Press, Cambridge, Mass., 1981. xxii, 592 pp., illus. $50.

The cerebral cortex is perhaps the most uniform of all mammalian brain regions in its anatomical organization. Everywhere it can be subdivided tangentially from pial surface to white matter into more or less six cell and fiber layers. Such uniformity even at this gross cytoarchitectural level implies that many of the underlying neural computations must be rather similar throughout. This is a hopeful view, one that means that by studying the structure and function of even a small portion of this immense collection of neurons it may be possible to gain insight into the functioning of the whole. In *The Organization of the Cerebral Cortex*, a collection of papers presented at a 1979 Neurosciences Research Program Colloquium, many different regions of cortex (motor, visual, somatosensory, frontal-association) are examined from almost every point of view (chemistry, physiology, ultrastructure, development, cytoarchitecture, and more). The result: an up-to-date affirmation of the view that a number of broad principles underlie the organization of the cerebral cortex.

At least three sets of major principles govern the organization of the cerebral cortex: laminar, columnar, and topographic. Until recently, some of the best examples of these have come from studies of the mammalian visual system, and consequently this volume draws heavily on this research. For example, Golgi