BOOK REVIEWS

Conditions of Science

Science and Dissent in Post-Mao China. The Politics of Knowledge. H. LYMAN MILLER. University of Washington Press, Seattle, 1996. xii, 370 pp. $38, ISBN 0-295-97505-9; paper, $18.95, ISBN 0-295-97532-6.

When Deng Xiaoping came to power in China in 1978, one of his first moves was to reverse the Maoist politicization of intellectual activity, particularly in the sciences. He promised scientists that they would be able to carry on their work free of political interference. Despite Deng's intentions, Lyman Miller in *Science and Dissent in Post-Mao China* shows that this policy was not altogether successful. In contrast to the Mao era (1949–76), when all intellectual endeavor, including science, was under the tight control of the party-state, under Deng scientists and most intellectuals were granted a degree of freedom in their intellectual activity. Nevertheless, some party interference and Marxist ideological guidance continued, especially in areas related to politics. This was true even in the sciences.

Specifically, Miller details the debate between physicists on the nature of the universe—those who espoused the Einstein view that the universe is "finite but unbounded" and those who insisted that it was "infinite" in accordance with the views of Engels and Lenin. The former group, led by the cosmologist Fang Lizhi and the historian of science Xu Liangying, asserted that the latter's view politicized science; the latter group insisted that Fang's and Xu's view was a violation of Marxist philosophy. This debate created two rival groups. The Fang and Xu group regarded Marxism as only one of a "hundred schools" of thought, whereas the opposing group regarded Marxism as still dominant over the other schools.

Fang, Xu, and their disciples linked their demand for the autonomy and pluralism of science with democracy. They asserted that democracy fostered science because it provided the institutions and political context that made possible individual inquiry, questioning of preconceived notions, openness to new ideas, readiness to think independently, and equal treatment. Moreover, as the Deng leadership became increasingly focused by the late 1980s on economic reform, Fang and Xu charged that its socialist utilitarian attitude toward science left little room for the pursuit of science for its own sake and had led to the relative impoverishment of basic research and theoretical scientists.

Miller does a fine job of delineating the debate between the scientific monists and pluralists in the Deng era, but he accepts uncritically the assertion of the pluralists that democracy was necessary in order for science to flourish. It may be true that science stagnates and may even wither under a totalitarian regime that controls and manipulates science for its own political purposes, as happened in Nazi Germany, Stalin's Soviet Union, and Mao's China. But it is not necessarily true that it stagnates under authoritarian regimes that allow a degree of intellectual freedom. If that were the case there would not have been any scientific progress before the 20th century. Intellectual pluralism can flourish and has done so under authoritarian regimes.

In addition, the focus on applied science and commercialism that Fang and Xu attribute to Deng's socialist utilitarian policies has much less to do with socialism than with China's move to the market in the 1980s. Research scientists are leaving their laboratories and research institutes to make money in the markets opened up by Deng's reforms. In the former Soviet Union and even under Mao, more scientists were involved in pure science and had more status than they now have in Deng's market economy and in Russia's currently marketizing and democratizing society. Fang's and Xu's distress over the market's impact on science notwithstanding, the move to the market is one of the preconditions for the democratization they much desire.

Miller claims that scientific liberals provided much of the rhetoric of dissent at Tiananmen Square in the spring 1989 demonstrations (p. 241). Indeed, a few scientists, such as Fang and Xu, were important figures in the revival of political liberalism in post-Mao China, and their ideas may have influenced the student leaders of the pro-democracy movement. But their numbers were meager in comparison with the numbers of social scientists, writers, and even Marxist thinkers involved in the political reform movement in Deng's China. Moreover, the proportion of scientists in China's dissident movement is small by comparison with the number involved in the Soviet dissident movement. Whereas scientists along with writers led the movement for democracy in the former Soviet Union, they have been a distinct minority in the movement in China. Natural scientists, even under Deng's socialist regime, have more privileges than their social science counterparts. Whereas China's social scientists are criticized for their academic work as well as for their political views, even China's most outspoken natural scientists, as Miller points out, are criticized only for their political views, not for their scientific views.

China's scientific dissidents, such as Fang and Xu, are right when they say that China needs democracy, but they need it so they can speak out on political issues, not necessarily on scientific issues. Their demand for democracy has less to do with the needs of China's scientists than with the need to expose the corruption now rampant in official circles, to limit the party's still arbitrary abuse of power, and to protect freedom of expression on public affairs. On scientific matters, China's scientists have a greater degree of freedom and autonomy than other intellectual and social groups. Democracy is important for the improvement of the life and livelihood of China's population in general. The standard of living of China's scientists may have declined, but compared to the majority of the population they still are a privileged lot.

Despite his lack of critical distance from his subjects, Miller's chronicle of the emergence of dissent in China's scientific community and delineation of its important debates reveal an area of China's intellectual life that hitherto has been obscured and little understood. In this respect, he has done a service not only to those who study China but also to scientists who may want to know about the political concerns of their Chinese counterparts.

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Brain Structures

Comparative Vertebrate Neuroanatomy. Evolution and Adaptation. ANN B. BUTLER AND WILLIAM HOODS. Wiley-Liss, New York, 1996. xviii, 514 pp., illus. $74.95 or £60. ISBN 0-471-8889-3.

Anyone who remembers Herrick's *Brain of the Tiger Salamander* or Craigie's *Neuroanatomy of the Rat* will recall with pleasure how an experienced hand can through a deceptively simple account provide a broad perspective of the whole nervous system, in the case of the

former transcending the apparent gulf in organization of the brain between mammals and non-mammalian vertebrates. This largely imaginary gulf has grown wider in recent years, not so much as the result of the explosion of information as of the reduction in the number of neuroanatomists working on birds, reptiles, amphibians, and fish and of the propensity of mammalian neurobiologists, if they think of other vertebrates at all, to recoil from the seemingly vastly different and multifarious organizational plans exhibited by the non-mammalian brain.

The authors of *Comparative Vertebrate Neuroanatomy* have been major contributors to the study of the connectional anatomy of the non-mammalian central nervous system, and for them connections form the principal basis for drawing homologies that help bridge the gulf.

A large part of the book is devoted to a non-mammalocentric description of the nervous system in which long tract connections figure prominently. Microscopic and finer structural analysis remains relatively superficial, and the persistent use of "interneurons" in the old-fashioned sense referring to everything that is not a dorsal-root-ganglion, autonomic-nervous-system, or ventral-horn cell will be a surprise to the expert and a source of confusion to the student.

Basic evolutionary theory figures prominently, and much confidence is expressed in the value of cladistics in defining relationships between species and lines of descent. However, cladistic analysis is only as good as the ability of the classifier to discern homologous features. The authors' willingness to incorporate parts of the hypothalamus into the thalamus because they receive connections from ascending somatosensory pathways seems to reflect confidence in connections over other organizational features. Perhaps more unfortunate is the resurrection of the long-discredited view of the thalamic reticular nucleus as the rostral extension of the reticular formation on the grounds that its cells superficially resemble those of the brainstem.

There is repeated discussion, with appropriate debunking, of a hierarchical phylogenetic scale leading to the supposedly superior brain of the human, likened, as is customary, to Aristotle's scale of nature, although whether Aristotle ever saw this ladder as an evolutionary progression is doubtful. It is also doubtful that many scientists take this idea seriously today, and the anthropocentric idea of a ladder of evolution based on progressive increase in complexity of brain organization and behavior is probably only loose talk, other than among those who stand, as Joyce put it, "with one hand on the Bible and the other on *The Origin of Species*." To emphasize, as the authors do, that brain evolution has not been an orthogenetic progression from the generalized, undifferentiated, and unspecialized to the specialized, highly differentiated human brain is appropriate, however. The independent and multiple lines of evolution of the forebrain, not all of them directed toward a mammalian cerebral cortex, underscore this.

Two new perspectives are predominant themes. One is a classification of the cranial nerves based primarily on their embryological origins and incorporating modern ideas on the segmentation of the head and brain, extending the number of nerves beyond the traditional 12 of human neuroanatomy. The authors separate off the sensory (placodal) and motor/autonomic components of the glossopharyngeal and vagus nerves and extend the list of nerves to include the terminal and vomeronasal, which are rudimentary or absent in the adult human, and the profundus, which is incorporated into the trigeminal, as well as raise the lateral line nerves to rightful prominence. There are few new insights in this, and the principal objective seems to have been to provide an *aide mémoire* for students. The segmental organization of the head, brain, and cranial nerves postulated by the authors is interesting although highly conjectural, and they seem so bent on identifying a "typical" head segment that one cannot help recalling the unhappy fate of some earlier views of head segmentation.

The second perspective is emphasis on the division of the sensory pathways that lead through the thalamus to the telencephalon in most vertebrates into those arising in the retina and dorsal column nuclei on the one hand and those arising in the tectal region on the other. These are called the lemnothalamic and collothalamic pathways, respectively—names that jar as much by repeated usage as by their tortured Latin and Greek or lack of euphony. The authors probably go too far in attempting to force all elements of the thalamus and other structures into dependencies of the lemniscus or retina or of the midbrain colliculi.

The authors have combined a remarkably broad view of the fundamental organization of the nervous system with insights into its specializations and adaptations. The examples are drawn from a wide variety of vertebrate forms, presented without swamping the reader in detail. The result is a readable and enjoyable account. The authors say that their book is not directed at the specialist, but many a (mammalian) specialist will find this a useful work to dip into as a guide to brain organization in other vertebrates and as a reminder of the fundamental biology of the brain and its appendages.

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Vignette: Autumn Thought

Most scientists are not going to spend much time worrying in late October/early November whether that magic telegram from Stockholm is going to arrive. It is pretty easy in science to assign people, including oneself, to broadly correct bands of achievement. . . . Real generators of widespread anxiety, therefore, are going to be those awards that are at a high enough level to signify a satisfying achievement, but not so high that they are realistically beyond one's grasp. An example in the Commonwealth community would be election as a Fellow of the Royal Society. . . . Because the pyramid of achievement widens as it goes down, many more scientists will worry about getting into "the Royal" . . . than about getting a Nobel Prize.

—*John Polkinghorne*, in *Beyond Science* (Cambridge University Press)

Papers in Physics

Particle Physics. One Hundred Years of Discoveries. An Annotated Chronological Bibliography. V. V. EXHELA *et al.* AIP Press, Woodbury, NY, 1996. viii, 328 pp. Paper, $49. ISBN 1-56396-642-5.

This compilation of précis of some 600 papers—roughly one-quarter from 1895–1946, three-quarters from the past half-century, and of the latter well over half from 1947–1967—is a collaboration between the U.S. (that is, Berkeley) and the Russian (Protvino) particle data groups. For each paper there is a phrase proclaiming its significance; its full title (in the original language for earlier papers but only in English translation for later papers); a list of all authors if fewer than five; the orig-