Adopting a new culture

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The Study of Change: Chemistry in China 1840–1949. By James Reardon-Anderson. *Cambridge University Press: 1991. Pp. 444. £45, $59.95.*

THE chemistry of the Western world reached China only in the middle of the last century. Before that, the Chinese had different and individualistic systems of chemistry, the development of which has been assiduously traced by Joseph Needham and his team in the fifth volume of *Science and Civilisation in China* (Cambridge University Press; more than 4,000 pages so far). James Reardon-Anderson, of Georgetown University, has gathered a great deal of information on the period when Westerners brought their chemistry to China, when Chinese scholars started to study in the West and returned home with new knowledge, and when institutions of higher education developed in China for educating and training on home territory.

The period under review, 1840 to 1949, encompassed important upheavals. From 1644 until 1911, China was ruled by emperors of the Ch'ing Dynasty. The Sino-Japanese War of 1894–95 weakened traditional structures and this led to the revolution of 1911. There followed an unstable interregnum until 1927 when the nationalist government under the Kuomintang Party took charge. The subsequent period, the Nanking decade (so called because the party made Nanking its capital), was characterized by strong central authority. In 1937 the Japanese invaded and the nationalists, who retreated inland, gradually lost power to the communists. By 1949, after four years of civil war, the Chinese Communist Party was left firmly in control. Reardon-Anderson successfully relates the development of chemistry in China to these different political climates. He stimulates thoughts about how our own scientific development may have been influenced by changing political forces, and about how even the most academic pursuits cannot be charted accurately by applying purely internalist historiography.

The Chinese did not take to Western chemistry naturally. The classically trained scholar was characterized by "bookishness, the pre-occupation with philosophical and literary subjects, denigration of manual and technical skills, and undue respect for established authority". Libraries were preferred to workshops. There were, however, changing currents being felt in the middle of the nineteenth century, at the very time when contacts with the West were increased. Hsü Shou, who failed his Civil Service examination, met John Fryer, an unconvinced English missionary, in 1867 at the Kiangnan Arsenal. Here they established a translation bureau and, by 1908, 139 science books had been published, the first chemistry tract being David Ames Wells's *Principles and Applications of Chemistry* (which, when translated back from Chinese, becomes the more enticing *Authentic Mirror of Chemical Science*).

An immediate problem was nomenclature. Although the Chinese had names for some of the metals, new scientific terms were burgeoning and the Chinese language did not lend itself to an easy solution. All agreed that only Chinese characters should be used — there would be no borrowing from the Roman script. Translators also decided that Western sounds should not be transliterated. Ultimately, the main figures involved in this labour agreed that a single character should be assigned to each chemical element. After much consideration, Fryer and Hsü published their *Chinese–Western Glossary of Chemical Substances* in 1885. It was a necessary step for any future progress, although a system for organic chemistry did not come until later.

Institutionalization of science started early in the twentieth century with the establishment of mission colleges and other bodies for teaching at an undergraduate level. The Rockefeller Foundation played a large part, with surveys of medical-education provision in 1914 and 1915, followed quickly by generous funding of the Peking Union Medical College. This and other colleges were staffed by US teachers of high calibre, which led to the better Chinese students going to the United States to obtain postgraduate qualifications. Chinese schools did not prepare students well for higher education in science. Instruction was almost entirely by lecturing and little practical work was attempted. Teachers sometimes taught under misconceptions caused by problems with translation: a botany teacher of the 1920s once misread the characters for 'natural conditions' as 'heavenly dragon conditions' and the lesson went off at a tangent, the teacher lecturing the class on the difference between the flying dragons of the heavens and the manifest dragons of the fields.

In spite of the cultural difficulties, serious and scholarly chemists did emerge from the system. The most prominent of the first generation was Wu Hsein, who graduated from Harvard Medical School and the Massachusetts Institute of Technology. As a biochemist, Wu's early work was to devise techniques for measurement of constituents in the blood (the Folin–Wu method). Later he developed a theory to explain denaturation of proteins. Because of the sympathetic environment of the Peking Union Medical College, his reputation grew and he came to be regarded as a member of the international scientific community. But the dependence of Chinese graduates on the West, in that they had to travel to the United States and Europe for their postgraduate education, did have a deleterious effect. The best graduates lost touch with students who were immediately junior to them, and whom they would have been helping to teach had they stayed in China. This task was assigned to less able laboratory instructors, who had no prospect of promotion.

One of the most contentious areas of

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