Book Reviews

CHINA'S SCIENTIFIC TRADITION

Clerks and Craftsmen in China and the West

Lectures and Addresses on the History of Science and Technology. By Joseph Needham. Based largely on collaborative work with Wang Ling, Lu Gwei-Djen and Ho Ping-Yu. Pp. xix+470+40 plates. (Cambridge University Press: London, March 1970.) 150*s*; $22.50.

Clerks and Craftsmen in China and the West is the third collection of essays by Joseph Needham to have appeared during the past year. In many respects it is the most splendid member of the trio.

Dr Needham's interest in the history of Chinese science dates back to the mid-thirties. At that time he was the Dunn Reader in Biochemistry at Cambridge, not to mention the author of three works on the history and philosophy of biology in the West. What drew his attention Eastward was the arrival of three young Chinese biochemists at the Dunn Institute. "Whatever they took away with them from Cambridge," he later wrote, "they left there a precious conviction that Chinese civilization had played a role of hitherto unrecognised amplitude in the history of science and technology." Needham's conviction was deepened during the Second World War when he served for three years as scientific liaison officer for the British Embassy in Chungking. Since 1948 he has been able to devote his full attention to the history of *Science and Civilisation in China*.

As a summary of the entire project's most significant findings to date, the book under review could not be bettered. It consists of nineteen papers which range in scale from "The Earliest Snow Crystal Observations" to "The Role of Europe and China in the Evolution of Oecumenical Science". While Needham's erudition is breathtaking, it should rarely intimidate the non-specialist reader.

To begin with the more specific topics. The essays on iron and steel production, nautical technologies and the mechanical clock lucidly portray China's technical supremacy in mediaeval times. Of special interest to those who have read the earlier volumes of *Science and Civilisation* will be the first appearance in book form of Needham's (and Lu Gwei-Djen's) accounts of Chinese medicine. Five articles are devoted to the development from antiquity to the present of preventive medicine, qualifying examinations for physicians, proto-endocrinology and elixir poisoning. For such extremely important material the author has provided an admirably clear and comprehensive exposition.

Clerks and Craftsmen does contain, however, one topic whose treatment, in terms of clarity and credibility, does not quite attain Dr Needham's very high standards. I refer to his revised Newcomen Lecture on "The Pre-Natal History of the Steam-Engine". As the title implies, Needham wishes to assert that Chinese mechanical engineers directly contributed to the evolution of a machine crucial to the Western industrial revolution. He specifies two such contributions: the combination of eccentric, connecting-rod and piston-rod for the interconversion of rotary and rectilinear motion (in the Sung or Thang dynasties); and the double-acting piston and cylinder principle. Granting the originality of the Chinese in these areas, the author still has to show when, where and how such developments were transmitted to the West. Needham will only argue for a highly probable transmission, without denying the possibility of independent (albeit, later) discoveries in Europe during the Renaissance. In addition to certain evidential weaknesses, which the author recognizes, the essay's difficult technical vocabulary sets it apart from all the rest.

To return now to the more general aspects of this volume, we find Dr Needham an eloquent expositor of China's role in the evolution of world science. Here he is not so much concerned with the question as to why science, in its modern form, did not originate with the Chinese. For his views on this subject we must refer back to *The Grand Titration* (see *Nature*, **224**, 515; 1969). Needham instead is content to demonstrate the richness of China's scientific traditions, and in his emphasis on indisputable achievements the author (perhaps unconsciously) casts a new light upon his great work.

Let me explain. Ever since the early 1930s Needham has espoused a neo-Marxist approach to the history of science. The central axiom of this historiography is that modern science could only have evolved in a capitalist framework where merchants, requiring exact knowledge about the Heavens and the Earth for the expansion of trade, encouraged a union between craftsmen and natural philosophers. Applying this hypothesis to China in his earliest papers, Dr Needham maintained that the imperial mandarinate, by its control of the merchants, prevented modern or "oecumenical" science's origination in east Asia. Needham's work in this period was thus failure-orientated. By his adoption of an essentially tragic view of Chinese history, he encouraged a backward looking view of the society to which he felt so drawn. Even the recitation of China's scientific and technical advances was overshadowed by the sense that such developments were not to result in the birth of a Chinese Galileo.

Since that time Needham has become immersed in telling the story of what the scientists and technologists of ancient and mediaeval China thought and accomplished. In *Clerks and Craftsmen* and, above all, in *Science and Civilisation in China*, we are now encouraged to think not about the absence of modern science but about the vitality and seriousness of traditional Chinese science. Needham's view of history (and our own) has become in the process far more forward looking and, to my way of thinking, more historical.

One final point should be mentioned. *Clerks and Craftsmen* is in two senses one of the most beautiful books to have been produced in recent years. This sense of beauty derives in part from the evident care which the Cambridge University Press (and Dr Needham) have taken in their selection of paper, type face and binding. Beyond that one must also note the quiet sensitivity which informs much of Needham's prose. Here is an example (p. 94):

> " . . . the word *ling* is one of the loveliest words in the language, meaning 'spirituality'—indeed 'numinous' might be the best translation of *ling*. Imagine a temple, for instance, in some remote and beautiful place in the mountains, which you are visiting in company with distinguished, elegant and charming people, where the priest-in-charge is intelligent, the associations inspiring, the scenery magnificent and the weather is fine, well, this 'sacredness' of the place, to cap the whole, is summed up by the word 'ling'."

Altogether this is a rare and wonderful book.

PAUL GARY WERSKEY

HAHN'S MEMORIES

My Life

By Otto Hahn. Translated by Ernst Kaiser and Eithne Wilkins. Pp. 208. (Macdonald: London, March 1970.) 40*s*.

IN 1962 Professor Hahn published a book entitled *Vom Radiothor zur Uranspaltung, eine wissenschaftliche Selbstbiographie*, in the introduction to which he wrote: "The question arose if I could present in a single volume my