

man is his "constant need for progress."

Destinations that progress leads to must also, I think, be explored if the history of technology is to be more than an exercise in antiquarian description or an uncritical celebration of the single-valued progress implied just above. Dumas says specifically that his volumes are intended only to describe; political, social, and economic context is mentioned only when "indispensable." Surely he must be aware that the assumptions he and his collaborators make regarding the nature and importance of political, social, and economic context cannot help coloring their criteria for success, progress, importance, and other attributes of the technical developments they describe. A shift in point of view may even switch cause and effect. Context is not only indispensable but in fact unavoidable. History is not science. Better, then, that the reader be reminded frequently and explicitly of the assumptions surrounding the history of technology that he reads.

It ought to be possible to combine accurate technical description and an analysis of the relationships between technical alternatives and the dynamic situations of men in history. The general historian or any other reader of these books hardly needs 12 pages on Papin, but he is entitled to an explanation that will enable him to appreciate the technical alternatives that were open to Papin and the further possibilities that they opened for those who followed him. If the reader knows nothing of the technical milieu, he can only perpetuate the myth of a logical and rational pattern of technological development.

Perhaps the most important lesson to be learned from technical understanding would be the absence of an expected cause-effect relationship. The logical decision-making process of the technologist exists largely in his imagination, and his resemblance to the economic model of man is hard to maintain in the face of his enthusiasms and his loyalties. Historians of science have scuttled the stereotype of a scientific method leading inexorably in only one possible direction. Historians of technology may, one hopes, contribute to undermining our world view that sees technology as a benign social determinant that can be neither criticized nor controlled.

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Intercultural History

Clerks and Craftsmen in China and the West. Lectures and Addresses on the History of Science and Technology. JOSEPH NEEDHAM. Based largely on collaborative work with Wang Ling, Lu Gwei-Djen, and Ho Ping-Yü. Cambridge University Press, New York, 1970. xx + 472 pp. + plates. \$22.50.

In the 1940's Joseph Needham abandoned a distinguished career in the biological sciences. As the 1970's open, he is without doubt the world's greatest intercultural historian. One may—indeed, one must—disagree with him on some details, but no controversy can dim the majesty of the task which he has set for himself. His massive *Science and Civilisation in China* (nearly half of its planned 12 volumes have been published) deals not only with China's very considerable achievements in technology and science but also with the radiation of these achievements to the rest of Asia and to the West. But these great systematic tomes are formidable even for specialists.

Fortunately Needham has now begun to gather, revise, and republish the many less formal addresses and papers which are partial sketches or by-products of his great work. Here his thinking is much more accessible: indeed, the fluidity of the lecture form, and Needham's artful way with words, make the casual reading of this book a delight. To pick it up is to join one of our century's remarkable minds as it ranges the whole of Eurasia and the millennia of history. It is also to learn to share Needham's moral commitment to studies which "may turn out to be a contribution not only to objective history, but also to the cause of international understanding and friendship."

The items assembled here are an intellectual smorgasbord. The essay on "The translation of old Chinese scientific and technical texts" is a revelation of the linguistic difficulties surrounding Needham's enterprise. "The earliest snow crystal observations" demonstrates that long before Albertus Magnus first pointed in the West to the geometry of these crystals the Chinese were familiar with it. Nowhere does the amazing empirical skill of the Chinese tradition emerge more luminously than in Needham's discussion of "Proto-endocrinology in medieval China": it is startling to learn of the

extraction of male and female sex hormones from urine for pharmaceutical purposes, the early use of iodine-rich seaweed as a cure for goiter, and the intelligent efforts to aid diabetics. The metallurgy of iron and steel, Chinese clockwork, Chinese contributions to shipbuilding and the nautical arts which in the 15th century enabled great fleets to sail as far as Africa, the origins of chain suspension bridges, "The pre-natal history of the steam-engine," and much else are here to expand our horizons of both time and space. And always there is Needham's insistence on "The unity of science: Asia's indispensable contribution." As the astronauts look back at our small terrestrial globe and perceive it as a unit, so will Needham's readers.

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East and West

Western Medical Pioneers in Feudal Japan. JOHN Z. BOWERS. Published for the Josiah Macy, Jr., Foundation by the Johns Hopkins Press, Baltimore, 1970. xvi + 248 pp., illus. \$8.95.

Dawn of Western Science in Japan: Ranga Kotohajime. GENPAKU SUGITA. Translated from the Japanese by Ryōzō Matsumoto, supervised by Tomio Ogata. Hokuseido Press, Tokyo, 1969. xii + 74 pp., illus. 400 yen.

John Z. Bowers spent a year and a half as a visiting professor on the faculty of medicine of the Kyoto National University. After his return from Japan he published an important historical study entitled *Medical Education in Japan* (Harper and Row, 1965), which actually deals with the sequence of foreign medical systems imported into, and absorbed by, Japan and with a great many extraordinary personalities who were involved in this educational transfer. Now, in *Western Medical Pioneers in Feudal Japan*, Bowers devotes a complete volume to the first importation of Western medicine into Japan.

Western medicine was not the first foreign medical system to be adopted by the Japanese, who had begun their art of healing with the adaptation of Chinese ideologies and practices. Hence, in order to set the stage, Bowers presents in his new book a chapter on "Medicine before the Dutch." This brief chapter deals in an all too cursory manner with the more than 1000 years