



TAPPING lacquer from trees in late-nineteenth-century China. Taken from the latest instalment of Joseph Needham's monumental *Science and Civilisation in China*, in which C. Daniels and N. K. Menzies look at sugarcane technology and forestry. CUP, £95, \$150.

## Arms control

R. V. Jones

**National Military Establishments and the Advancement of Science and Technology.** Edited by Paul Forman and José M. Sánchez-Ron. *Kluwer*: 1996. Pp. 340. £105, \$164.

FROM its title, the reader might reasonably expect to find an authoritative and broad discussion of the contributions of such establishments as those at Farnborough and Malvern in England, or at the Massachusetts Institute of Technology in the United States, or at Volkenrode in Germany, to advances in knowledge and achievement in their respective fields.

The reader might also seek enlightenment on the possible disadvantages arising from such establishments, if, for example, as happened in post-war Britain, they resulted in a dichotomy between research and teaching so that too little of the national talent was available to bring on the next generation.

The editors have not attempted a synoptic or comparative survey of the functions of research establishments but have instead invited essays from selected authors on establishments in the United States, the United Kingdom, Norway, Germany, France, Spain and Argentina.

Russia is missing from the survey, perhaps because the situation there has recently been so fluid; and an interesting, if short, story might have been told of Tito's attempt to set up a nuclear physics institute in Yugoslavia. Some of the contributions

are commendably factual; we learn, for example, that by 1890 Argentina had several institutions devoted to the naval and military aspects of science and technology.

There is a thoughtful contribution from the United States on the military origins of space sciences, which points out that much of the scientific research during the Second World War was carried out not merely by university scientists but — here was the novelty — on university campuses, and this pattern was perpetuated in the post-war years. In the United Kingdom there was no such novelty, and the government establishments remained paramount.

The German contribution, on mathematics and war, throws light on the development of aerodynamics under Prandtl and on the involvement of the mathematicians in the V-2 rocket programme and other projects based on advanced technology.

A second US contribution, both objective and highly instructive, covers quantum electronics, and in particular the development of the maser by Charles H. Townes in the Radiation Laboratory sponsored by the US government at Columbia University. This essay is full of interest, ranging from Townes's own account of how he came to invent the maser to a discussion of C. P. Snow's "euphoria of gadgets".

Snow also earns a disparaging mention in the British contribution by D. E. H. Edgerton, whose contentious approach differs sharply from the objectivity of his fellow contributors. "I will examine an important subset of British scientific intellectuals' writings: I will show that there is remarkably little correspondence between our historical picture of what they said and our historical picture of the actual relations between science, technology and war." He concludes: "There was no cumulation of knowledge. One result was that the age of the hydrogen bomb and the permanent mobilisation [*sic*] of R&D [research and development] for warlike purposes produced the vacuous, and profoundly ahistorical moralising of CP Snow and Jacob Bronowski. They influenced, unfortunately, a whole generation of 'irritating know-alls'."

Although Edgerton supports his paper with copious references, I can hardly find among them two that would have been outstandingly relevant to the discussion. The first is *The Organisation of Research Establishments* edited by Sir John Cockcroft (Cambridge University Press, 1965) and the other is *A Discussion of the Effects of The Two World Wars on the Organisation and Development of Science in the United Kingdom*, published in *Proceedings of the Royal Society A342*, 439–591 (1975).

One of the Royal Society papers deals specifically with research establishments, and it sketches the divergent views that have been advanced ever since they came into existence. The view put forward by

Alexander Strange in the 1870s, and supported by the Devonshire Commission, was that "[t]here should be established a system of national institutions for the sole purpose of advancing science by practical research quite apart from teaching it".

Lyon Playfair, although as concerned as Strange in the public fortunes of science, saw that a possible drawback resulting from state laboratories was the impoverishment of university life, because most of the research would then be done in government laboratories, and teaching would in this way be divorced from it. He pointed out that "Germany unites the function of teaching and research in the universities, whereas France keeps them in separate institutions". This latter thought might have been in the mind of Dr Phelps, the master of Sidney Sussex College, when he opposed the founding of the Cavendish Laboratory in Cambridge with the argument: "A Prussian is a Prussian and an Englishman an Englishman, and God forbid it should be otherwise".

Edgerton's 'revisionist' approach is out of harmony with the generally informative tones of the other contributions, including that of Paul Forman, who wrote the essay on quantum electronics and the genesis of the maser mentioned above, and who is also one of the two editors. Despite Edgerton's divergent viewpoint, the editors have been so impressed by his essay, which indeed has some merit, as to write in their editorial introduction:

The British scientific intellectuals thus succeeded in misleading the British public — including, Edgerton emphasizes, British historians of science and technology — even as they misled themselves. They wished to believe, and led others to believe, that, at any rate in Britain, these two enterprises, science and war, have, historically, had only an intermittent and no intimate relationship, and that, more particularly, the rate and direction of scientific and technologic progress may be discussed without close attention to society's investment in its war-making capabilities.

I am not sure about who would qualify as a British scientific intellectual, but I imagine that Francis Bacon would have been one of the first — and he wrote in 1605 that "experience doth warrant, that both in persons and in times, there hath been a meeting and concurrence in Learning and in Arms flourishing and excelling in the same men and in the same ages".

If ever I meet one of the generation of "British scientific intellectuals" as portrayed by Edgerton, I shall be tempted to follow the precept of Hermann Goering regarding 'Kultur' and reach for my gun. □

R. V. Jones, director of British scientific intelligence 1952–53, is at 8 Queens Terrace, Aberdeen AB1 1XL, UK