nuclear weapon. There, this book ends, with the promise of another to cover the war years and the subsequent work of the Lawrence Radiation Laboratory in Berkeley.

Anyone who shared these great years of achievement, even in part, will find this book both interesting and nostalgic, if longer than necessary to provide adequate cover of the achievements of the Laboratory. Others may find it too comprehensive, prolix, and even boring — too much like reading a dictionary, or the list of papers and citations submitted by an candidate for a professorship.

Kamen's, *Radiant Science, Dark Politics: A Memoir of the Nuclear Age* (University of California Press) also is far too long and detailed. Kamen was responsible in the Radiation Laboratory for the chemical side of production of radioactive isotopes for use in physical, chemical, and medical experimental work and treatment. A remarkable viola player of Russian-Jewish parentage, he was dismissed from the Manhattan Project as a security risk. I value his friendship.

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Science, Technology and Society in Postwar Japan *by Shigeru Nakayama.* (Kegan Paul International, London and New York, 1991), pp. xv + 259, £ stg.45.00, ISBN 0710304285.

The energence of Japan as a major force in world technology has prompted many attempts to unravel the secrets of Japanese technological dynamism. Too often, however, these studies, in their search for lessons from Japan, overlook the fact that rapid technological change has been a topic of intense controversy within Japan itself. Although there can be little doubt that Japan's economic and technological miracles have improved material well-being in many ways, they have also involved enormous social costs. Could the costs have been avoided? Could scientific and technological knowledge have been used in less environmentally damaging ways? What social forces influenced the choice of technologies by private firms and government policy makers? Questions like these, which have been central concerns of recent debates on the social shaping of technology, too often seem to be put aside when Japanese technology is being considered.

It is refreshing, then, to find a study of Japan which takes the social shaping, and the social implications, of Japanese science and technology very seriously. Nakayama Shigeru, who is one Japan's leading historians of science, gives an illuminating and often suprising overview of the controversies surrounding the development of science and technology in postwar Japan. Nakayama argues that, in the second half of the twentieth century, science and technology have become indistinguishable. Rather than trying to separate science and technology, therefore, he divides the scientific and technological complex into four catergories, defined by the audience to which research is addressed. These categories — academic science, private science, public science and service science — provide the basic structure around which the book is organised.

The first chapters deal with the changing university system and its impact on scientific research in postwar Japan. The most fascinating aspect of this

section is its discussion of the heated political debates which raged within the Japanese scientific community in the early postwar decades. The story, for example, of *Chidanken,* the earth sciences research group which insisted on research funds being equally divided amongst all members in the interests of democracy, makes a nice antidote to the more familiar image of the ruthless Japanese pursuit of high technology. Nakayama's discussion also highlights the postwar Japanese policy of promoting cheap mass-level tertiary education, and considers some of the dilemmas which this poses as Japan seeks to encourage advanced and original scientific research.

The discussion of private science — i.e., corporate research and development — is more brief, but makes some interesting observations, particularly on the impact of lifetime employment upon the career paths and attitudes of Japanese researchers. There is also a helpful sketch of the origins of the QC system, outlining the process by which a system invented in the US came to be exported to Japan, refined by Japanese management, and then rediscovered by US firms in the 1970s.

As Nakayama notes private science and public science (i.e., science and technology sponsored by the state) have become very closely interwoven in the second half of the twentieth century: so much so, indeed, that the distinction between the two is not always clear. His chapter on public science nevertheless highlights the main features of government science and technology policy in the postwar period, and provides some interesting discussion of Japan's nuclear energy and nuclear fusion projects. This was one section, though, which I found a little *too* concise. Even within the constraints of a general survey of this nature, it would have been helpful to allow more room for discussion of topics like the various cooperative technology projects sponsored by MITI in the 1980s, and to provide a more detailed account of recent developments in areas like space technology. (The problems encountered by Japan's efforts to develop a truly independent rocket program, incidently, seem to bear out Nakayama's observation that national big science projects are not Japan's strong suit).

A key question raised by Nakayama's study is the issue of service science. Is it possible, he asks, to develop an alternative form of science and technology, which will be directed to the needs of the community rather than to the interests of the state or of large private corporations. In discussing the question, Nakayama outlines some of the major debates on appropriate technology which have emerged from the Japanese anti-pollution movements of the 1970s. His relatively detailed examination of the microelectronics revolution in Chapter 8 makes the point that human beings are constantly expected to adapt themselves to the demands of new technologies. The concept of service science, on the other hand, implies that it is science and technology themselves which must be adapted in more fundamental ways to meet changing human needs. This study offers no simple prescriptions for achieveing this aim, but raises questions whose relevance extends far beyond the borders of Japan.

The concluding chapters of the book take up the issue of scientific and technological competition between Japan and the United States. Nakayama observes the omens of declining US dominance in science and technology, but is somewhat sceptical about Japan's ability to assume the mantle of scientific superpower. The new generation of Japanese students shows relatively little interest in the study of science, and academic internationalisation is proceeding too slowly to attract large numbers of researchers from overseas. Shortages of personnel, it seems, may prevent Japan from emerging as the centre of a new

scientific world order, and may even slow the future development of corporate research.

Science, Technology and Society in Postwar Japan is a readable and thought-provoking study, although marred by occasional editorial lapses. One small irritation is a curious editorial aversion to hyphens, which means that readers are confronted with mouthfuls like "capitalintensiveness" (allinoneword). Minor quibbles aside, however, Nakayama's study is an important contribution to our understanding of science and technology in Japan. Although sometimes pessimistic in tone, it avoids simplistic judgements on the success and costs of Japan's scientific and technological development, and provides and insight into the complex dilemmas and debates which have surrounded that development process. For this reason, it is not just a book for readers interested in Japanese science and technology, but also for readers with a more general interest in the social context of contemporary science.

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The Age of Information: The Past Development and Future Significance of Computing and Communications *by Stephen Saxby*
(Macmillan, London, 1990) pp.264, $AUS150.00, ISBN 0-333-54832-9.

This book provides a useful reference guide for those who need to be brought up to speed on developments that have taken place over the last 30 years or so in relation to information and communication technology (ICT). The text has been purpose written as an "information source" for undergraduates in Law and represents a synthesis of approximately one thousand references. Saxby canvasses several disciplinary perspective on information in the introductory chapter (philosophical, mathematical, economic and legal), yet omits others, such as geographic[1], where telecommunications now offers revolutionary possibilities for 'abolishing' distance (teleshopping, telebanking, telework, telepresence), as well as supporting the full spectrum of locational choices for the business sector, ranging from centralisation to decentralisation to internationalisation.

Like other writers of key books in this area[2] the author appropriately adopts a wide historical perspective to the issue of information technology revolutions, taking us back, where appropriate, to the sixteenth and seventeenth century for examples of information bottlenecks and information flows which parallel those found in contemporary society (especially in Chapters 2 and 3). Unlike such authors, however, there is no underlying thesis to the book, no challenging propositions, no problematique. A pity, as there are a number of issues in the ICT area deserving of a legal perspective, several of which elicit only cursory reference; for example: intellectual property, cross border information flows, standards, privatisation, regulation, etc.

In the remaining chapters of the book, Saxby devotes roughly equal space to each of the three key components of the information revolution — computer hardware, software and communications. Chapter 4 provides the reader with case studies of those industries which have grown up around the new computer