

The technological rainbow

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Empowering Technology: Implementing a US Strategy. Edited by Lewis M. Branscomb. MIT Press: 1993. Pp. 315. £33.75, \$37.50 (hbk); £15.95, \$17.95 (pbk).

PRESIDENT Bill Clinton came into office pledging to use government to rejuvenate civilian industry in the United States, a method employed gingerly by his free-market, Republican predecessors. By the measure of money, bureaucratic turmoil and heroic goals, Clinton is indeed labouring furiously on his promise.

More than \$8 billion is to be shifted from the Pentagon to civilian research during the next few years, ending long-standing military dominance in federal research and development spending. The renowned financier of military innovation, the Defense Advanced Research Projects Agency (DARPA), has shed the 'D' in its title and is now charged with bankrolling research that spans military and civilian projects. Clinton has proclaimed plans to develop a clean, highly fuel-efficient automobile through a collaboration between America's 'big three' car manufacturers and government researchers. Federal laboratories that thrived on Cold War missions are being reorientated to industrial tasks. And with government money and orchestration, plus reassuring winks from the anti-trust authorities, industrial research consortia are being formed to work on technical problems common to particular sectors of industry.

Precursors of these activities can be found in the Reagan-Bush presidencies, regardless of their scorn for 'industrial policy' and derision of sheltered Washington bureaucrats trying to 'pick winners'. The difference is scale and enthusiasm — huge on the part of Clinton, in contrast to the halting steps and ideological misgivings of the previous administrations.

Cheers, with serious reservations, are expressed for the Clinton shift by the editor and principal author of this collection, Lewis M. Branscomb, whose range of senior-level service is rare even in professionally mobile America. Director of the Science, Technology, and Public Policy Program at the Kennedy School of Government, Harvard University, Branscomb was formerly chief scientist at IBM, director of the National Bureau of Standards and chairman of the National Science Board, the policy-making body of the National Science Foundation.

Clinton has correctly focused on the pace and scope of technology adoption as

a weak link in US industrial performance, Branscomb writes. But, he argues, although useful technologies are abundant, the policies and structures of the federal government are ill suited to the task of strengthening the link. The technical agencies with the big budgets are Cold War leftovers with ingrained wrong habits for dealing with civilian industry, he continues. But even as they and old-line civilian agencies try to change, he contends, the federal apparatus remains too modest and timid for the new era of global industrial competition. Branscomb calls for nothing less than a comprehensive mobilization of resources — schools, federal, state and local agencies, government laboratories, universities and so on — to instil technological vigour in US industry.

He puts particular emphasis on encouraging technological enlightenment in the hundreds of thousands of small companies that are generally below Washington's threshold of notice. A fellow author in the volume, Harvey Brooks, professor of technology and public policy (emeritus) at Harvard, suggests the creation of academic-industrial "buffer institutions" in which industry and universities could collaborate without "erosion of the academic culture". No sector or institution that might contribute to technological superiority is overlooked.

Despite his concentration on government, Branscomb's design for high-tech nirvana says the job of government is to facilitate, orchestrate and finance, not to lead.

Branscomb is both hopeful and pessimistic about government's capacity to handle this role. He points out, for example: "Most of the civilian agencies lack experience with investing in the industrial technology base and in industrial extension and information infrastructure; these programs can only grow with experience". And he warns that "[g]overnment officials must be industrially experienced and must recognize the idiosyncratic nature of specific technologies and of each particular high-tech industry". To do their part in the new industrial regime, "government officials will have to become much more sophisticated in technology, economics, and politics than was necessary to administer basic research support to universities and manage the government's own technological responsibilities".

Can the US government fill the role? The potential has been demonstrated, Branscomb argues, by DARPA's prescient underwriting of "pathbreaking technologies that created industries". The National Institutes of Health (NIH) also sowed the scientific seeds for the biotechnology revolution and its great industrial promise. The role of the government's technical managers in these achievements is not to be discounted. But DARPA and

the NIH were free to drench their fields of technical choice in money, with few questions asked: \$4 billion a year from the NIH for biotechnology and \$1.5 billion for DARPA's various projects.

One may be sceptical about whether government can muster the sophistication in technology, economics and politics prescribed by Branscomb. But closer technological relations between government and civilian industry are already here and are bound to increase, if only because of the lure of federal money. The effectiveness of these collaborations, however, is far from established, while their potential for becoming politically contaminated is always there. Furthermore, industry has good reason to be wary of government's steadfastness in science and technology, as the refugees from the political collapse of the Superconducting Super Collider can attest.

Branscomb urges patience and caution in developing the new era of technological collaboration. The participants must learn their way, he warns. But the dominant tone in *Empowering Technology* is that we must get on with it, quickly. However, the reality of the moment is that high-tech US industry seems to be picking up speed and profits on its own. The problem just dawning on America is that rising technological prowess kills jobs.

Robert M. White, president of the National Academy of Engineering, recently delivered a gloomy public address entitled "What Is at the End of the Technological Rainbow?" Large-scale job losses, he answered, and he went on to raise the possibility that contemporary technology is not conforming to its historic role of job creation — a startling observation from the chief of America's high temple of engineering. "Is our faith in historical precedent well founded?" White asked. "The answer", he said, "is that nobody knows."

Branscomb passes quickly over issues of the underside of technology, noting that "technology decreases the demand for labor in a static demand situation". His goal is industrial efficiency and productivity, and the promise is that they can add to general prosperity, as they have in the past. Perhaps they can. But wonder is mounting about what lies at the end of the technological rainbow. □

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