According to the author's foreword, the object of the story is to emphasize the conflict between collaborative research and the intense desire of scientists for personal recognition. This hardly seems to need emphasizing: the eternal professional jealousies, the race for publishing priority and the endemic back-stabbing is universally known as the very stuff of which the scientific establishment is made. Perhaps a more engaging novel could have been written around a murder at an international congress, where passions in the lecture halls, committees and presidia not infrequently approach homicidal proportions! □

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***American Progress* by John Gast (Gene Autry Western Heritage Museum). The picture is reproduced from the cover of *Does Technology Drive History?* edited by Merritt Roe Smith and Leo Marx. The 12 contributors, most of them historians, explore the enduring question of to what extent, and by what means, does a society's technology determine its political, social, economic and cultural forms. It is a debate that was launched by Karl Marx with his provocative remark that "the hand-mill gives you society with the feudal lord; the steam-mill, society with the industrial capitalist". MIT Press, $35, £31.50 (hbk), $16.95, £14.95 (pbk).**

The middle landscape

John de la Mothe

Regional Advantage: Culture and Competition in Silicon Valley and Route 128. By AnnaLee Saxenian. *Harvard University Press: 1994. Pp. 226. $24.95, £19.95.*
Technopolis: High-Technology Industry and Regional Development in Southern California. By Allen J. Scott. *University of California Press: 1994. Pp. 322. $35.*
Restructuring for Innovation: The Remaking of the US Semiconductor Industry. By David P. Angel. *Guilford: 1994. Pp. 216. $27.95.*
Future Imperfect: The Mixed Blessings of Technology in America. By Howard W. Segal. *University of Massachusetts Press: 1994. Pp. 245. $40, £38 (hbk); $15.95, £15.20 (pbk).*

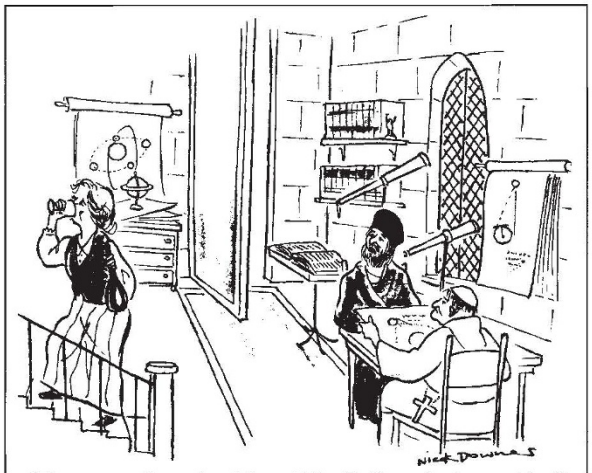
THE 1980s was a period of painful and far-reaching adjustment in the world economy. The term 'globalization' entered popular parlance and seemed to suggest that location no longer mattered. Prophets of industrial competition predicted 'the end of geography'. Companies had begun to invest off-shore in foreign labs without actually moving there. World financial centres such as London, New York and Tokyo became the hubs for overnight currency transactions. The race for new products became a matter of highly mobile intellectual resources rather than highly fixed natural resources. Quality mattered, not quantity. Value added was no longer based on what one had, but on what one did. Mass production gave way to flexible manufacturing. Influential economists began to talk of a transition from an economy based on objects to one based on ideas. Policy analysts began questioning whether or not the nation state actually mattered any longer. Indeed, with an economy driven by intangible investment, foreign direct investment and innovation, the meaningful factors of production could no longer be controlled by governments. The world indeed seemed a changed place. And perhaps nowhere was this more starkly felt than in the United States.

After three decades of technological and commercial domination, those industries that had come to represent US strength, such as aerospace, electronics and space equipment, began, in the 1980s, to lose both market share and technological leadership, principally to Japan. By 1986, Japan had surpassed the United States as the largest producer of semiconductors in the world, and Japanese companies were assuming an increasingly dominant position in key enabling technologies. By 1989, Japan actually ran a trade surplus of $1.5 billion in semiconductors with the United States, while it began spending more on research and development than it did on factories and equipment. Industrial observers around the world warned that US companies could be permanently driven from the profitable segments of the high-technology markets such as computers and communication.

An almost allergic reaction ensued. Polemic fuelled a heated, and not always constructive or clear-minded, policy debate and led influential policy analysts such as Laura Tyson, Robert Reich and Lester Thurow to ask "who's bashing whom?", "who is us?" and "who will own the twenty-first century?". Less profound thinkers gave themselves up to finger pointing, crass nationalism, chest beating and flag waving, all of which became something of a daily activity. Meanwhile jobs were lost, industries rusted, long-standing communities dispersed and the United States — finally — seemed truly to have lost its way. Or had it?

What is clear is that we are working within a new economic context. Unfortunately for policy-makers, however, they do not yet have a satisfactory interpretative scheme of this new world. Dominant policy frameworks continue to give privilege to commodities rather than to knowledge. But not only have we learned that competitive advantage for companies, nations and regions alike depends on intangibles such as technical know-how, specialized skills, smart infrastructure, product and service quality, and research and development; it also depends on clustering. Highly dispersed national systems of innovation cannot be depended on to deliver the kinds of adjustments and restructurings that have become essential in recent years.

It is for this reason that we can see that



"There was a time when I thought the Earth revolved around *her*"

More than 150 of Nick Downes's popular cartoons on science are collected together in *Whatever Happened to "Eureka"?*, published in paperback by Rutgers University Press at $10.95.

growth, in a number of nations ranging from Italy and Canada to the United States, has been driven over the past 30 years by local systems of innovation. The so-called 'Four Motors of Europe' represent one much discussed example of clustering in which highly specialized skills (focused on software, automobiles and telecommunications) have combined in one location with locally developed infrastructures, well managed organizations, specialized financing arrangements and international investment. Silicon Valley in California and Route 128 in Massachusetts are two US examples. So if one were interested not in polemic but in the actual processes of adjustment, competition and restructuring and the factors that might account for success and failure, then one could do worse than peruse the volumes under review here.

In *Regional Advantage* by AnnaLee Saxenian, a comparative tale is engagingly told of Silicon Valley and Route 128. These are two of the leading US centres of electronics innovation and entrepreneurship. The regions are similar in many respects: both trace their origins in university research and military spending, and both faced severe downturns in the early 1980s. Today, however, Silicon Valley is flourishing once again whereas Route 128 continues in its decline.

Saxenian asks important and stimulating questions. What accounts for this difference in fortune? What was it that allowed Silicon Valley to adapt successfully to intensifying international competition, while Route 128 ceded its comparative advantage in computer design and manufacturing to the west coast? Using evidence gathered in hundreds of interviews with managers, entrepreneurs and policy-makers, Saxenian argues that despite similar histories and technologies, Silicon Valley developed a decentralized industrial system that encourages experimentation, collaboration and collective learning among networks of specialized companies, whereas Route 128 came to be dominated by a few self-sufficient corporations.

Where Saxenian succeeds through the use of cultural history and detailed interview, Allen J. Scott's *Technopolis* succeeds by offering a highly sophisticated, if drier, empirical- cum- statistical treatment of industrial structure and spatial organization in the manufacturing system of southern California. After beginning with a brief survey of southern California's economy, he reviews in detail the growth of the region from the 1920s to the 1980s. Focusing on three major industries that have in some ways become synonymous with southern California — aircraft, electronics and military equipment — he carefully excavates the issues related to labour markets, industrial organization and the importance of local infrastructure.

Taking a slightly different — but no less fascinating — approach, David P. Angel's *Restructuring for Innovation* concentrates less on regional differences and sources of advantage and instead tells an important tale of the restructuring of the semiconductor industry. Beginning with a critical examination of the strengths and weaknesses of the US industry as it developed in the 1970s, Angel describes the competitive difficulties that US companies experienced during the past decade. In sharp contrast to other studies that have explained the loss of market share in terms of 'unfair trading practices' by Japan, this book concentrates on the manufacturing weaknesses that have developed in US practice. The recent recovery, if it is not too early to call it that, of the US semiconductor business is based on new manufacturing strategies that have finally overcome the age-old (false) dichotomy between innovation and production.

All these books point out ways in which the United States can compete. And in *Future Imperfect*, an evocative series of essays by the historian Howard Segal, we are reminded, in a lyrical way, that the preceding three books all deal in one way or another with that essential tension that has always existed in the United States between technological optimism and pessimism. One sees the repeated failure of technology to fulfil its utopian promise which, in the 1980s, created a widespread disillusionment with the American ideal of progress. The other sees technology as the hallmark of the future. In between, technology and competition in the United States is ultimately concerned with social improvement and in this way portrays the processes of adjustment that are analysed by Angel, Saxenian and Scott — not as the end of geography but as a "middle landscape" (to allude to the title of one of Segal's most thoughtful essays) that is always full of mixed blessings. □

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New in paperback

Physics and Metaphysics: Theories of Space and Time by Jennifer Trusted. Routledge, £9.99. An examination of the relationship between metaphysical beliefs and scientific enquiry into the nature of the cosmos — in particular into the nature of space and time. The author looks at the history of science from the eleventh century to the present to illustrate the way in which religious and mystical beliefs, as well as philosophical speculation, have motivated physicists and inspired their scientific quest. It is pitched at a level suitable for beginning students of the philosophy and history of science.

The Threat at Home: Confronting the Toxic Legacy of the US Military by Seth Shulman. Beacon, $15. The author, a science journalist, offers a thorough and reasoned analysis of a serious environmental hazard.

Oscillations, Waves, and Chaos in Chemical Kinetics by Stephen K. Scott. Oxford University Press, £4.99. A short, accessible and well organized account in the Oxford Chemistry Primer series aimed at undergraduates. The author shows how the phenomena of oscillations, travelling waves and chaos arise in reacting chemical systems, and relates them to processes in biology, including the development of cardiac arrhythmias, nerve signal transmission and animal coat patterning.

Australian Rainforest by Paul Adam. Oxford University Press, £20, $35. A comprehensive review of Australian rainforest, which includes accounts of its biological and human history. It will be of interests not only to ecologists and biogeography, but also to conservationists.

The Mystery of the Quantum World by Euan Squires (2nd edn). Institute of Physics Publishing, £12.95, $24.50. An updated version of this bestselling introduction for the general reader.

Signifying Animals edited by Roy Willis. Routledge, £16.99. This book, which arose from the 1986 World Archaeological Congress, contains 19 essays that examine what animals mean to human beings around the world. The book will appeal to social and cultural anthropologists, cognitive psychologists and archaeologists, as well as to all those with an interest in animal symbolism.