Innovation in East Asia: The Challenge to Japan *by Michael Hobday* (Edward Edgar, Cheltenham 1995), pp. 290, £45, ISBN 1 85898 017 8.

It is well known that East (or 'Pacific') Asia is by far the fastest growing region of the world, containing both the most successful economy of the twentieth century — Japan — and the most populous country, China, which has also begun to show great economic potential. Hobday is concerned in this book with neither, but with the four economies which are the closest challengers to Japan, the 'four little dragons': South Korea, Taiwan, Singapore and Hong Kong. In the first two chapters he shows how these four countries have acquired a key economic role in East Asia. The somewhat complacent Japanese view that they, like the rest of East Asia, would follow the Japanese lead in economic development and remain under a Japanese 'umbrella', has been shaken — by their dynamism, their ability to chart their own paths (three of them being characteristically 'overseas Chinese') and their close links with the United States and China. What follows puts the firm, not the state, in each of these countries, at centre stage. He first outlines a scheme of how the 'latecomer' firm can move from a state of relative extreme backwardness, through an extended process of technological catching up, to reach the technological frontier. Then, country by country, case study by case study, he shows how, and how far, firms have followed this path — in a few cases, all the way to the frontier; at all events, a long way towards it.

His main focus is the electronics industry, easily the largest exporter in all but Hong Kong, and thus capable of giving all kinds of comparative insights into the four countries' performance. Only in Taiwan does he glance at other industries — bicycles, athletic shoes and sewing machines. He finds great diversity among the four, largely attributable to differences in government policy. The two city states relied mainly on transnational companies (TNCs) to build up their electronics industries, while Taiwan and Korea depended mainly on domestic firms. On the other hand, each pair showed great difference in degree of interventionism, Singapore and Korea being much more *dirigiste* than the others. Singapore's determined encouragement helps explain how, with less than half the population, it out-exported Hong Kong in this sector by about two to one in 1991. Korea and Taiwan, on the other hand, were quite similar in performance — Taiwan exporting rather more per head and rather less as a proportion of total manufactured exports — but very different in strategy: the Koreans relied on the great *chaebols* to get scale economies in high volume areas like metal oxide semiconductors, having been able (with state aid) to bear long years of losses. The Taiwanese firms, smaller and with much less state aid, concentrated, at least initially, on niche markets. Yet, for all the diversity, the path followed was similar in many respects: all four countries got started with labour-intensive manufacturing, either by domestic firms subcontracting for firms in the US or Japan, or through TNC investment. Their key advantage at this stage was cheap, literate and numerate labour. They then added one layer of activity, competence and advantage after another, in parallel with improvements in education and infrastructure. A key role, at least in Taiwan and Korea, was played by senior engineers and scientists returning from US firms. Hobday rather effectively demolishes the idea of 'leapfrogging', the view that latecomers get advantage from *not* being established in a technology which becomes obsolete, for example, when electro-mechanical controls gave way to electronic ones. On the contrary, he shows that one of the key advantages of the dragons in getting into electronics was precisely their widely-diffused competence in humdrum mechanical and electrical technologies. Their advance was fast, but it was nonetheless incremental.

The study has limitations, most of which Hobday freely concedes. The concentration on electronics confines it to a sector which is "a fast-growing, internationally traded industry in which the division of tasks across national boundaries is technologically possibly and advantageous to TNCs. Electronics is also a manufacturing-driven, high throughput industry

where the cost of workers, technicians and engineers plays a crucial part in competitive advantage" (p.187). Many other manufacturing industries have all or most of these characteristics: many, as he says, have not, and the dragons' strengths and weaknesses in them cannot be easily judged from this book. He has little to say on the dragons' culture and its effects on performance — the issue, as he points out in a discreet endnote to his conclusion, is very controversial, and outside his competence. In view of the nonsense which has been written on the subject, one must respect his reticence and be grateful not to be told, for example, that all the dragons, with Japan, benefit from 'neo-Confuciansim' (Chinese and Japanese culture being at least as different as any two in Europe). But he earlier makes it clear that 'overseas Chinese' culture has a striking effect on management styles in three of the dragons. National culture clearly makes a difference, complex and subtle as it may be. So, one might expect, do managerial practices which have been learnt in the process of industrialisation. As Hiroyuki Itami has shown for Japan, many Japanese managerial practices correspond rather closely to the requirements of latecomers, and such insights could usefully have been combined with Hobday's own on the latecomer firm. There is, finally, one important omission from his policy advice for countries wishing to emulate the dragons. He rightly commends their governments' heavy spending on technically-oriented mass education. But when the mass of the population is impoverished peasants or shanty-town dwellers, spending on education will not educate the poor: their poverty must be eased first. The Taiwanese and Korean governments did this in the early 1950s by radical land reform. That example is much more controversial and at least as important. But these are minor faults. This is a well-written and important book which should be required reading for anyone wishing to understand the pattern of advantage in electronics, the rise of East Asia, and the process of technological catch-up for latecomer countries.

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Science on the Run: Information Management and Industrial Geophysics at Schlumberger, 1920-1940 *by Geoffrey C. Bowker* (MIT Press, Cambridge, MA, 1994), pp.viii+191. ISBN 0-262-02367-9.

It is a pleasure to welcome this latest addition to the excellent MIT series on 'Inside Technology' — which has featured the work of Wiebe Bijker, John Law, Harry Collins, and Donald MacKenzie, and which has already done much good in bringing recent theoretical work in the social construction of science and technology to a non-specialist audience. In this brief but telling account, helped by unprecedented access to family archives and advice, Bowker opens the 'black box' called Schlumberger — possibly one of the most mythic names in oil exploration — to ask what can be learned from its approach and style of 'doing' science. His enquiry takes him to the methodological frontiers between industrial and information science, and between field research and public explanation. He shows how, in the years following the First World War, and through the interwar years, Schulmberger created a new science, and a new way of doing science, in the laboratory of the field, and so gained an almost unquestioned, competitive edge in the world's oil industry. It did so by codifying and putting into practice two measurements — electrical indications of perme-