difficult to know which ones exist in the cases that she or he has to deal with. What the simulations do tell us is that 'neoclassical' models should not be used by policy makers under any circumstance! Chapter 6 considers policy intervention in more detail: a theoretical framework is suggested; welfare enhancing policy instruments are suggested; a worked example is used, drawing on the simulations reported earlier in the book. The main conclusion is that nondiscriminatory R&D subsidies should be used to improve the welfare performance of industries by assisting them to move towards their technological frontier. Chapter 7 provides a brief two-page summary of the book.

The research reported in this book should be regarded as a direct development of the approach of Nelson and Winter. However, Wakeley issues a bleak warning in this regard: 'the whole process is extremely time-consuming and others who may wish to follow in the footsteps of Nelson and Winter should take heed of this warning' (p.153). Wakeley has tried very hard to provide an approach which might be of use to policy makers, rather than one which simply assists researchers in examining past experience. However, I feel that what he has actually done is to highlight the weakness of both the Nelson and Winter simulation approach and standard neoclassical approaches.

I doubt very much that Schumpeter himself would have found such an approach appealing and the treatment of technological change and competition chosen is of the type which is strongly rebutted by Austrian economists. Furthermore, it would have been of considerable assistance if he had juxtaposed his simulations against a real-world case or cases so that we could see how the outcomes were reasonable approximations to actual historical experience. Use of a real case can provide much stricter stylised facts, boundaries and calibration requirements. I see no reason why this could not have been done, given the large and detailed literature on innovation processes which exists. The end result would have been a monograph which would have looked like a well-rounded book, rather than a research report dealing with simulations of a preferred algorithm. Furthermore, I did not give the book very high marks for presentation—it is not well organised and there is a great deal of repetition, which should not be necessary in such a short book.

However, having said all this, there are some aspects of this book which may be interesting to industrial economists who construct evolutionary and/or behaviouralist models. Also, a contribution of such modelling lies, not in depicting reality, but in exposing the limitations of theory which deals with analytical, rather than numerical, solutions. Wakeley has added to a growing literature which makes this point.

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For the Common Good: CSIRO and Public Sector Research and Development

Peter Ewer (Ed.)

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It is difficult to work out what this little book is intended to achieve. A collection of essays whose publication has been sponsored by the Community and Public Sector Union, *For the Common Good* concludes that 'the preservation of a strong, publicly controlled scientific organisation is required so that the Australian community retains the means to make

scientifically informed decisions about economic development and technological change' (p. 90). Yet despite some useful individual contributions, *For the Common Good* does not really come to grips with the key issue: how to reconcile the multiple and often conflicting expectations of the Commonwealth Scientific and Industrial Organization's (CSIRO) clients and stakeholders.

CSIRO represents by far the biggest single Commonwealth investment in industrial research in Australia. Given the depredations that have been visited upon the rest of the public sector over the past decade, and have accelerated since 1996, its budget has held up remarkably well. In 1997–98 CSIRO will receive AU$439 million from the federal government (with outside earnings on top of that). Moreover, the organisation enjoys considerable autonomy in the way it sets its priorities and organises its work. The Australian Broadcasting Corporation (ABC) should be so lucky.

Given its relative prominence, what CSIRO does, or does not do, matters a great deal to Australian science and to Australian industry. It is scarcely surprising that successive governments have wondered whether they have been getting value for money from their investment and have launched inquiries into CSIRO's structure and performance. As Sam Garrett-Jones and Tim Turpin show in their excellent historical survey in *For the Common Good*, CSIRO has undergone considerable change over the past 20 years, beginning with the recommendations of the Birch inquiry in 1976. The old divisional fiefdoms have been incorporated into bigger units, and there is a much clearer and more powerful top management structure. The organisation has also become less academically and more industrially orientated as a result of policy changes such as the 30% external earnings target.

Questions remain, however, as to whether the present balance between short-term applied research paid for by industry, and longer-term strategic research paid for by the government, is the right one. New research on the innovation process suggests that 'spillover' models underestimate the extent to which the benefits of new knowledge flow beyond the originating organisation. As Ron Johnston observes, 'In a pervasive knowledge economy, it is interactivity, rather than isolated organisational performance, which is all important' (p. 63).

What does this type of thinking mean for CSIRO? Unfortunately, despite its competent airing of the issues, *For the Common Good* pulls up rather short here. Ron Johnston makes an intriguing suggestion about CSIRO playing a role in developing a national 'knowledge intelligence capability' (p. 58). By this he means a capacity systematically to develop and use international networks as a way of bringing new knowledge into Australian science and industry, much as the Japanese and Koreans have successfully done over many years.

While Johnston does not suggest it himself, it is possible to take this approach a stage further, and to see CSIRO primarily as a knowledge management, rather than a research, organisation. This could involve CSIRO acting as a science and technology broker or entrepreneur, rather than as a research provider. With too few large Australian-owned firms to 'pull' the innovation system, the next best thing might be a CSIRO which helps to fill in the missing links with ideas, contacts and management skills. It is unfortunate that so much of recent policy has taken CSIRO in the opposite direction—that of a 'hired gun' or research provider to industry, with much of its expertise tied up in commercial-in-confidence contracts.

I would imagine that such suggestions, if they have been canvassed at all, would not find much favour with CSIRO's management or workforce. CSIRO has always been about doing science rather than facilitating innovation in the broader sense. The organisation's traditions, culture and formidable self-confidence derive from its capacity

to generate and apply new or adapted knowledge to designated problem areas. On the other hand, modern research is costly, complex and time-consuming and increasingly heedless of disciplinary boundaries. It is neither possible nor sensible, even for an organisation of CSIRO's scale and scope, to attempt to tackle major problems on its own. From a national perspective, collaboration across organisational boundaries would appear to offer the most efficient use of scarce resources and the most effective deployment of scientific and technical brainpower.

Such collaboration is, of course, precisely the agenda of the Cooperative Research Centres, which have absorbed most of the new money going into strategic research over the past decade. Research managers working to the boards of CRCs are finding their principal challenge is to build trust across organisational boundaries and to generate cultures which keep peoples' minds on the job, without destroying the intellectual and creative challenges which are the essence of good research.

CSIRO's best research managers have been developing and exercising these skills within the organisation for many years. An interactive future would see CSIRO making this expertise available to CRCs and other networks as part of a trans-organisational strategy. As an eminent scientist told me recently, the secret to running multidisciplinary research teams is learning how to 'translate' across disciplinary boundaries. 'Some people can do it, and some can't', he said. It seems likely that making connections not only between disciplines, but across organisational boundaries, requires holistic intellectual skills whose importance is only just beginning to be realised.

A new role for CSIRO is not what the union sponsors of *For the Common Good* had in mind in commissioning this book. Yet ideas about participative management, canvassed in the final chapter of the book, are not necessarily incompatible with such a future. Bruce Wilson and Peter Ewer believe that CSIRO should stay pretty much as it is, but become more democratic in its functioning, so that 'working scientists, technicians and support staff can make a stronger contribution to the organisation's development' (p. 90).

A CSIRO which saw its main role in facilitative terms would necessarily be a much less centralised organisation than the one which has developed since the mid-1980s. One of the faults of CSIRO's priority-setting is a tendency to see the process in top-down terms, even if existing processes for resource allocation work in more diffuse ways. If participative management means involving the people at the laboratory bench in direction-setting, there is much to be said for it.

On the other hand, *For the Common Good* is strangely quiet on new developments on the industrial relations front. Even for a book published in 1995, before the change of government, there is little recognition of the changing environment in which unions must operate. Public sector unions were able to take the first versions of enterprise bargaining in their stride. The era of Australian Workplace Agreements, together with a radically rewritten Public Service Act, poses unprecedented challenges for public sector unions in general, and for the CPSU in particular.

With its considerable autonomy, CSIRO may well be in a better position than most to avoid the worst excesses of the gale now sweeping through the rest of the Australian Public Service. If this is so, the CSIRO division of the CPSU is in an excellent position to safeguard its members' interests while supporting new initiatives in the management and development of Australian strategic research. If not, it will have its work cut out deflecting the excesses of managers for whom cutting costs is the be-all and end-all.

Despite its good intentions, *For the Common Good* offers little in the way of practical guidance for the development of public sector research in Australia. The issues have been well rehearsed in any number of reports and articles, and highlighted most recently in

some trenchant comments by Nobel prize winner Peter Doherty. For Australian science to remain competitive internationally, some hard decisions will have to be made about where the research dollars are to be placed. At the same time, sensible choices must be made about the extent to which, and the fields in which, Australians attempt to originate technology, as opposed to importing and adapting it.

These are not decisions which can, or should, be left to the board and management of CSIRO to make. But they require a much more technologically aware political community than we have yet been able to assemble in Australia.

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The Diffusion of Information Technology: Experience of Industrial Countries and Lessons for Developing Countries, A World Bank Discussion Paper, No. 281

Nagy Hanna, Ken Guy & Erik Arnold

Washington, DC, The International Bank for Reconstruction and Development, The World Bank, 1995, xix + 207 pp., ISBN 0 8213 3216 3

For those basically familiar with Everett Rogers' *Diffusion of Innovations*[1] and other related literature on the topic, this book, at first glance, would seem nothing more than the usual discussion of the standard precepts underlying transfer of technologies. But the book is more than that. The authors,[2] renowned experts in the field of informatics, selected the best practices of eight industrial countries—Canada, Germany, Ireland, the Netherlands, Sweden, UK, USA and Japan—in information technology (IT) development and diffusion for possible adaptation to the conditions of developing countries.

The book expounds on national policy portfolios and diffusion programmes in the rapidly growing IT industry over the past 10 years. With critical insights and analysis of government policies and experiences in technology transfer programmes, the book provides practical guidelines for designing IT diffusion programmes complemented with box articles and diagrams highlighting trends and developments in the industry.

Notably, there was a gradual shift in policy from IT promotion to diffusion since the late 1980s among industrial countries. This shift, from upholding 'national champions'[3] to assisting small and medium-sized enterprises (SMEs) to adopt available IT, was brought about by the increasing realization that the country can reap more political and economic benefits if efforts are directed to its widespread use. The UK, for example, has had a wide range of policies supporting IT generation and diffusion. For several years there was a 'Buy British' policy programme, but this was changed in the 1980s when the government decided to intervene less in the country's industrial structure. In the 1990s, however, strategic attempts to nurture both IT generation and diffusion were made through bridging programmes that would link producers with users and support skills transfer and manpower development, standardization and infrastructure investments.

The authors rightly point to this trend. In such an interdependent and so to speak interconnected world nowadays, countries cannot afford to remain insular. Outward-looking strategies need to be adopted to stay in line with the changes in world economy. Years ago, it would have been unthinkable for companies in industrial countries to set-up