

emergent processes, as distinct from the selection of the capabilities that made them possible, 'Darwinian' adds nothing to our understanding, for this is not what Darwin meant by 'natural selection'. Marshall, like Vromen, recognised that consciousness, although directly responsible for only a small proportion of actions, created a new evolutionary process: expectations now mattered, and with them deliberate attempts to influence the process of change. Moreover, these attempts extend from the generation of new variants to the introduction of organised selection and attempts to perpetuate or to destroy particular evolved practices or characteristics. The result is not, as Marshall insisted, the replacement of evolutionary processes by rational choice; instruction and direction are fallible, and even science depends on conjecture and refutation, but we have moved a long way from the biological model. If such kinds of evolution are 'nested in Darwinism' they behave like cuckoos in the nest.

Adam Smith leads more directly than 'Darwinism' to an understanding of modern innovation. The content of the processes of variety generation, selection and perpetuation are very different from those in biological evolution; each may be deliberately organised, and although not all the consequences are intended that does not reduce the significance of purposeful behaviour (as Smith pointed out); and the processes may be closely linked. Selection and variation in human society both depend on imaginative connections, and the two are sometimes inseparable. Vromen (p. 192) notices this interdependence, which contrasts sharply with biological Darwinism, but does not discuss its implications. Evolutionary processes in biological and social systems are not structurally equivalent, for the pattern of connections both within and between the elements of variation, selection and preservation – which is precisely what defines structure – is substantially different. For social scientists, biological variation and selection both appear as special, and even extreme cases of evolutionary processes. The evolution of knowledge is most effectively tackled by a division of labour, as Smith explained in his earliest surviving work, and 'Darwinian' is best used to describe biological versions of evolution.

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Knowledge Generation: Technological Change and Economic Growth in Colonial Australia by Gary Bryan Magee, (Melbourne: Australian Scholarly Publishing, 2000), pp. 277 + xii.

Most interpretations of 19th century Australian economic development place stress on the inflows of capital and labour, and their use in bringing the colonial economy's natural resources into productive use. In contrast, Magee's starting points are that economic growth accounting, more generally, stresses the role of technological progress, and that the contribution of technology to colonial Australia's economic development has been underplayed. His approach deploys the wealth of patent data available for Victoria in the period 1853–1904, to show the extent of inventive activity, and to argue that technology, especially after its adaptation to Australian needs, played an important role in colonial economic development.

This is a book that should be read starting from the back, which comprises an appendix detailing the patent data on which the author's arguments rest. The summaries in the appendix are based on 13 000 Victorian patents. Put simply this book asks what these data tell us of Australian economic development, and concludes, convincingly enough, that the answer is quite a lot.

Magee's key contribution lies in his painstaking extraction and the re-organisation of the great variety of information, which can be found in the Victorian patent records. Victoria had the most effective, low cost system for registering patents in colonial Australia. The data inform on the industry specificity of patents, on the address of the inventor, and their personal characteristics, including age and gender. They shed light, for example, on the relative contributions of Victorian, other Australian, and overseas inventors, and on direction of inventive effort towards different industries, and how this varied between domestic and overseas patentees. A detailed picture of 19th century Australian inventors emerges, which highlight their typically urban backgrounds, the extent they were immigrants, and that the great majority were male.

An important finding shows that approximately two-thirds of Victorian patents granted between 1853 and 1904 were to those living in Australia. This share diminished to 59 per cent by 1903, but highlights the substantial inventive activity in colonial economy, which in itself counters perceptions that Australian economic development

rested simply on inflows in capital and labour. A particularly interesting discussion is provided of revealed technological advantage, which shows, for example, that Australian inventive effort was concentrated in certain sectors, including agriculture, medicines and mining. Overseas addresses were more prominent in the patents for brewing, communications, and especially for heat, light and power. Overseas patentees were also more likely to be firms, while Australian-based patentees were typically individuals. Almost as an aside Magee also makes a useful contribution to comparative British-American economic history, by identifying by industry-use, Australian patent activity with origins in these countries. British-based patent activity was particularly strong in chemicals and food processing, while Americans dominated refrigeration and tobacco product patents.

Although the enduring contribution of the book will lie in the construction and the summarising of the patent data, Magee also offers explanations of the growth and pattern of inventive activity, measure by numbers of patents, in Australia. His interpretation places stress on the demand side, principally measured by Victorian gross domestic profit, although supply side forces, including the prevalence of engineers, are given a role. Patent activity in Victoria rose sharply in the 1880s, principally, Magee argues, in response to growing commercial opportunities, although the cost of taking out patents was reduced in 1884. Given that comparisons are made with American experience and Yankee ingenuity, there might be scope for further research on education more generally, rather than the quantity of engineers, and its relation to patent or inventive activity. That the Australian education system tended to follow the British model, with an emphasis on workplace-based apprenticeships, rather than the American model with more years of formal schooling, the possible implications of education for the extent or type of patent activity might be worth investigating, using, for example, panel data.

While Magee makes a convincing argument that technology should be awarded a more prominent position in the historiography of Australian economic development, his book eschews explicit quantification of its role. Despite the rise of endogenous approaches to understanding economic growth, total factor productivity still figures prominently in economic historians' discussion of economic growth. Recent explanations of American economic growth, for example, have

downplayed the importance of productivity in the 19th century, and but argued for a sharp productivity rise and thus a more important growth role for technology in the 20th century. Given the emphasis Magee place on technology, and the conceptual framework he proposes to understand Australian development, further research on the empirics of his model for the 19th century would be useful. Of course not all patents have productivity augmenting consequences, some of the mining patents for example, may simply enable resource exploitation, but, nevertheless, a quantitative model appears desirable.

Magee notes that he believes his book is the last entirely researched and written within the corridors of the Economic History Department of the Research School of Social Sciences at the Australian National University (ANU). Much of our understanding of Australian economic development, especially of its quantitative record, emerged from the work of that department. This work is highly regarded outside Australia, and has been invaluable to those interested in understanding comparative economic development. Magee's book is a valuable addition to long and distinguished record of achievement. Most importantly it adds new data that are important to an understanding of long-run Australian economic development. Unless mechanisms alternative to those once provided at the ANU are found for quantitative historical research within Australia, the prospects of further understanding Australian, and indeed, economic development more generally, will be sadly diminished.

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A Biographical Dictionary of Woman Economists, Robert W. Dimand, Mary Ann Dimand, and Evelyn L. Forget (eds), (Elgar, Cheltenham, 2000), pp. xvii + 491.

A total of 80 contributors and 120 entries make up this volume, that constitutes a systematic attempt to record and document the contributions made by women to economics – in the broad sense of the term – over a period of two centuries.

The earliest entry, Pricilla Wakefield's comments on the *Wealth of Nations*, dates to 1798. The