time is wasted even by those who deal daily with dozens of the things. It also suggests something else: that thoughts which take six minutes to compose and five seconds to absorb may be less than fully considered. The authors have the electronic mail address of Herbert Simon. They can make electronic contact to be sure, but they may find intellectual contact just a little more difficult.

Stuart Macdonald
Warwick Business School

The Economics of Hope, *by Christopher Freeman* (Pinter Publishers, London and New York, 1992) pp.xiv + 249, £37.50, ISBN 1-85567-083-6.

Very few academics and practitioners working in the field of technical change will be unaware of the major contributions that Chris Freeman has made over the years both to the development of the subject and to the raising of the profile of the issues and the analysis with which the subject is concerned. There will also be very few who have not read at least some of Chris' work and benefited from that reading. As with much academic discourse, however, especially in a field that is often very applied and always has a major policy interest, research results and papers frequently appear as conference papers, papers for international bodies (such as the OECD) or in some of the less highline journals. This has definitely been the case with some of Chris' work. In this volume, some of his more inaccessible papers are reproduced (with a sprinkling of new material) and are made much more available.

The chapters in the book have been written at various times over the previous 25 years. The opening chapter, which appears not to have been previously published, is a review of J.D. Bernal, *The Social Function of Science*, in which Chris spells out his intellectual debt to Bernal as both a stimulus to his own work and as a forerunner to the steady progress made over the last 25 years in the quantification of, and collection of statistics relating to, the technical change process. In fact, one of the themes running throughout this volume is the progress that has been made in measurement and the need for further progress in the future.

The next two chapters (the first being a paper prepared for the OECD in 1967, the second being the text of a lecture given at the Design Council in 1983) follow the measurement theme and give examples of where progress in measurement has facilitated understanding. The first is built largely around a discussion of the Jewkes, Sawyers and Stillerman work on the sources of innovation, the second is mainly concerned with design and how design fits into the R&D taxonomy. I was particularly taken by how Chris, in the second chapter and also in the discussion of Bernal, makes clear his personal views on defence R&D.

Part 2 of the book (chapters 4-6) is headed *The Theory of Innovation and Evolutionary Economics*. Chapter 4 first appeared as an OECD paper in 1989, chapter 5 as a workshop paper in Montreal in 1990, and chapter 6 was published in the *Revue Economique* in 1991. In the authors own words, the chapters make clear that an evolutionary theory of economic growth must pay special attention to the origin, development and diffusion of dominant technology systems. These three chapters ought to be essential reading for any student of technological change wishing to discover the essence of the evolutionary approach.

Part 3 of the book (chapters 7-11) is headed, *Values, Economic Growth and the Environment*. Of the chapters, two have been previously published in *Futures* (in 1974 and 1984) one in *Science and Public Policy* (1991) and two are conference papers from 1990 and 1992. Chapter 7 is a discussion of the problems of the *Limits to Growth* literature of the 1970s. Chapter 8 continues this theme, but is primarily concerned with technology and long waves. Chapter 9 addresses issues relating to the impact of technological change on skills and employment, chapter 10 addresses environmental issues from the view point of technological change and chapter 11 addresses issues relating to technology and the quality of life. There is an epilogue to the volume, written jointly with Geoff Oldham, that discusses what is now required, in terms of improvements in measurement and advancement in economic analysis, if past successes in science policy research are to be continued into the future.

Overall, the papers in this volume give a broad picture of the issues which interest students of technological change. They are generally of the high quality that we have come to expect from Chris Freeman. Also, as we have come to expect, they reflect Chris' insights into a number of key issues and the judicious use of quantitative and qualitative evidence in the support of the arguments made. Again, as one would expect, the analysis is not in the domain of high theory, nor is the statistical work in the domain of econometrics. However, it is precisely because Chris does not attempt these that his breadth of perception is so wide. It is also as a result of the lack of formality that his work appeals to all readers.

In general, I have my doubts as to the utility of exercises such as this, where a number of past papers are pulled together in book form. In this case, however, I think we are presented with a useful collection from a major figure in the field. As a number of these papers are really quite inaccessible otherwise, there is considerable value added in the exercise. However, it is only fair to state that should we look back in a few years' time and consider Chris' contribution to the field, I do not think that this volume will be one of the highlights.

P. Stoneman
University of Warwick

Scientific Knowledge in Controversy: The Social Dynamics of the Fluoridation Debate *by Brian Martin* (State University of New York Press, Albany, 1991), pp. viii + 266, $US16.95, ISBN 0-7914-0538-9.

In Stanley Kubrick's 1963 black comedy, *Doctor Strangelove: Or How I Learned to Stop Worrying and Love the Bomb*, one of the key characters (US) General Jack D. Ripper, believes that an objective of "the international communist conspiracy (is) to sap and impurify all of our precious bodily fluids". The mechanism by which this was happening was water fluoridation. For General Ripper "Fluoridation is the most monstrously conceived and dangerous Communist plot we have ever had to face". When asked how he formulated this view General Ripper explains "Well, I first became aware of it, Mandrake, during the physical act of love... A profound sense of fatigue... a feeling of