

entrants and results in reduced market concentration. By contrast, anticipated technical change favours incumbent firms and has a concentrating effect.

To conclude, if it is true that any piece of art can be interpreted according to the observer's perspective, this is particularly so for this work because of the variety of issues and approaches which it encompasses. The editor is aware of the fragmented picture proposed in his work ('much work remains to integrate these many fragments..', p. 367). However, I agree that this heterogeneity reflects the variety of 'multidisciplinary perspectives' which characterises the economic and social research on technical change.

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Ove Granstrand (Editor), *Economics of Technology* (North Holland, Amsterdam, 1994) 496 pp. ISBN 0444815066, \$128.50.

Economics of Technology is a collection of essays, which are carefully organised to highlight that this is now an established discipline. Two features of the essays must be emphasised. First, they reflect the inter-disciplinary nature of this subject. The economics of technology draws from history (the essays by Hughes, Lindqvist, Wengenroth), economic history (Dahmén, David, Rosenberg), evolutionary economic theory (Dosi and Orsenigo), international trade (Soete), industrial economics (Carlsson et al., Phillips et al, Scherer), business studies (Fransman, Hakansson), bibliometrics and technology studies (Grupp), industrial management and economics (Eliasson, Granstrand). Second, unlike many other fields in economics, this one is inherently 'cosmopolitan'. The assorted origins of the authors that appear in this book attest to how the field has nicely merged the scholarly traditions of countries like Sweden, Italy, Germany, and of course Britain and the US.

Ove Granstrand's introduction helps the reader realise the multi-faceted, cosmopolitan nature of this subject. Apart from his historical recollection of the origins and developments of the field, his bibliometric exercise of the most cited authors in economics of technology is more than a curiosity. Citations of technology scholars have grown over time, which suggests that the field has expanded, and it has gained increasing recognition. Moreover, any established field has its own 'gurus'. Ranking of citations shows that Mansfield, Nelson, Rosenberg, Griliches, Arrow, Freeman, and Dosi (apart of course from Schumpeter) are its 'pilgrim fathers'.

Some of the essays in the book address issues that have been at the core of this field for quite a few years now. We find analyses of the relationships between technical change and market structure or long-term growth (Phillips et al., Wengenroth, Yakovets, Lindqvist), technological competition (Scherer), technology policy (Soete), technology and the theory of the firm (Eliasson), system analysis for understanding technological and economic dynamics (Granstrand). Among the 'classical' topics I would include 'evolutionary theories', which has been one of the most important attempts to provide an analytical framework for understanding the dynamic relationships between economics and technology. The chapter by Dosi and Orsenigo illustrates how the tools of evolutionary theory can be employed to explain a set of 'stylised facts' of modern macroeconomic theory. Finally, the book includes some essays that look at new important areas of enquiry, like the economics of science (David, Rosenberg), the economics of technological relationships (Hakansson), the role of knowledge as an asset (Grupp) and its relationships to patterns of integration and division of labour (Fransman). All in all, the book is a successful attempt to provide insights into old and new questions in the field, and it is a 'must' for those who would like to know where we are and where we are going in technology studies.

Books like this also prompt thinking about some broader questions – does the fact that we can now celebrate a well-defined set of achievements imply that economics of technology has left its pre-paradigmatic phase, and it is entering into its 'normal science' trajectory. In part, this is so, and the book points out how and why. Yet, we are still left with

some unanswered questions, which may not be solved just through normal science. For one reason, we know too little about the new areas of enquiry discussed by some of the authors in the book to hope that normal science can do the job. For instance, in opening the 'black box' of economics of science, David's essay is highlighting important unintended consequences of non-market allocation mechanisms, and one wonders whether incremental analytical advances will suffice to fully understand these problems. The evolutionary theory itself, as a comprehensive body of principles, has probably still a good way to go before leaving its pre-paradigmatic phase. We can only hope that more scholars will be encouraged to join in this effort to make this possible.

Another important issue is that the multi-disciplinary, heterogeneous background of the discipline has been both its strength and weakness. While enriching it with diverse analytical, empirical and institutional traditions, it also emphasised diversity and heterogeneity. But this has also implied that, especially in more recent years, a good part of the research in the economics of technology has been devoted to description of the idiosyncratic features of different cases, rather than an attempt to find commonalities. Thus, apart from some notable exceptions (beside evolutionary theory, transaction cost analysis), the field may be producing collections of facts with less effort devoted to integrating them within frameworks that are grounded in a more

unified corpus of theory. While the advantage of this trend is to highlight the peculiarities of different situations and cases, the disadvantage may be that one loses the opportunity to single out linkages and associations amongst them.

This also raises the question whether the examples of the 'pilgrim fathers' are being fully imitated. Freeman taught us how one can be analytically rigorous without writing a single equation. Rosenberg showed us how one could exploit the richness of varied historical 'anecdotes', while at the same time unveiling the general elements that link apparently diverse cases. At the same, one wonders whether the discipline is producing, even though in different people, the many Richard Nelsons that we know. More than 'evolutionary theory', I am thinking of the early Nelson(s) who wrote rigorous case studies like the one on transitor, and papers that used standard, neoclassical tools to make brilliant analytical points that explained relevant facts about technology and economics. A book like this is also an opportunity to think about some of these issues.

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