readers to find their way. Arup hopes that his book will be rewarding even for non-specialists (p. 3) and a detailed list of contents would have been a welcome visible hand to guide them through the dense argument.

Fred Jevons
Monash University

Gene Technology: Issues for Australia, *by Australian Science and Technology Council,* (Australian Government Publishing Service, Canberra, 1993) pp. 151, ISBN 0 644 32561 5.

This policy document from the Australian Science and Technology Council (ASTEC) is the result of a 1992 study on research, development and commercialization of recombinant DNA technology and its implications for Australia. The document describes itself as a "considered appraisal . . . of the path which gene technology is taking and is likely to take" (p. ix) in the immediate future. As an impetus to further debate, its aim is to provide a broad, yet relatively detailed, overview of the policy issues emerging with the development of this powerful new technology. In this respect, it compares favourably with many similar documents issued by the U.S. Office of Technology Assessment.

As a first stage in the study, two working groups commissioned a variety of papers from scientists and industrialists. One group concerned itself with medical issues, the other carried out an appraisal of plant and animal gene technology. The results of these working parties were then fed into a larger round table with scientists, industry, environmental and consumer groups all represented. So, although representation in the study was relatively broad, the study was dominated nonetheless by industry and academia.

The first part of the document contains chapters that cover applications of gene technology in medicine, agriculture and food. These consist of general 'shopping lists' of what is currently and potentially possible. Some discussion of broader issues is featured in these sections, but much of that debate is saved for the later chapters which deal separately with commercialization, regulation, international links and public understanding. The general conclusion of the report is that the opportunities and challenges emerging around gene technology are determined by a complex web of scientific, commercial and regulatory factors. In particular wealth creation (a curiously British 1990's science policy term), the "science, business and community partnership" (a curiously un-British 1990's science policy term), public research focus and the regulatory environment are selected as key issues.

What is immediately striking about the sections on wealth creation, commercialization and international links is the presentation of what might be termed an industrial strategy for biotechnology. First, a general diagnosis is offered that Australian industry historically has failed to exploit its relatively strong science base. In addition, that the country is not large enough to compete in isolation in the global economy. This leads to an emphasis in the report on the internationalization of Australian biotechnology and to a number of more specific proposals. Strategic alliances between firms – both within and outside of the country – are discussed quite extensively as a key route to competitiveness. Government is also seen as playing an important part – not through strong direct intervention – but through such

measures as encouraging inward investment through tax incentives. The need to build academia-industry links is also highlighted and measures to achieve this are proposed, such as making full use of the existing Co-operative Research Centres scheme. With respect to commercialization, the increasingly important area of intellectual property rights is given some attention but perhaps might have merited a more extended discussion.

The document also recognizes that the regulatory environment in its widest sense will be critical in shaping the new gene technologies. Although the chapter which focuses on regulation is somewhat disappointing, amounting to little more than a description of current arrangements, it is refreshing it see at a later point the need to cultivate public support for biotechnology being taken seriously. In particular, it is recognised that there is a "gulf" between the perspectives of the scientific community and public interest groups. As the report states: ". . . at present, the proponents and opponents of gene technology talk 'past' each other" (p. 103). As a solution, consultation, access to information and consensus building are identified as the way forward. Central to this approach is the notion of a mutual building of confidence as opposed to the more usual policies involving unidirectional, and frequently patronizing, 'education of the public'. The latter frequently implies a situation in which decisions regarding science and technology are surrounded by secrecy and taken solely by experts.

Although the document is quite comprehensive and forward looking, it does tend to suffer in places from a degree of patchiness. In some parts it is uncritically optimistic about the prospects for gene technologies, whilst in other sections a more considered assessment of the potential risks and barriers to innovation is presented. This patchiness should not be taken as too strong a criticism as it is, most likely, a genuine reflection of the scope of interests represented in this discussion document. One might speculate that this is an inevitable trade-off between open representation and the eventual coherence of policy proposals.

It is instructive to compare *Gene Technologies: Issues for Australia* with a fairly recent British report on biotechnology policy. *Developments in Biotechnology* was produced by the UK Government's Advisory Council on Science and Technology (ACOST), a loose counterpart to ASTEC.[1] It was intended as an appraisal of both gene technologies and the broader field of biotechnology. Unlike the Australian report, the British study was mainly a list of technical possibilities and options which rarely came to grips with substantive policy issues. The key role of the state in promoting an industrial strategy, the strength of the science base and building public trust were almost entirely absent. The two documents quite obviously reflect the different policy environments and political cultures from which they were produced. Of the two, the Australian study presents a far more credible analysis and starting point for active policy debate and the development of a competitive and publicly supported biotechnology industry.

REFERENCE

1. ACOST, *Developments in Biotechnology* HMSO, London, 1989.

Paul Martin and **Brian Balmer**
Science Policy Research Unit
University of Sussex