Snapshot of process of transformation

Dietmar Braun

***Science and Innovation. Rethinking the Rationales for Funding and Governance* edited by Aldo Geuna, Ammon J Salter and W Edward Steinmueller**

Edward Elgar, Cheltenham, 413 pages, 2003, £85, ISBN 1-84376-109-2, 2004, £35, ISBN 1-84376-850-X

Most scholars of science and technology studies (STS) would agree that we are experiencing a time of major change, in terms of thinking about science, organising knowledge production, linking academic science to industry and funding research. This edited volume endeavours to take a snapshot of this process of transformation by highlighting several areas appropriate to demonstrating and analysing basic characteristics and problems of evolving structures and policies today.

The title, *Science and Innovation*, reveals that the link between public-funded research and industrial research is at the centre of many of the 11 articles and various comments by distinguished scholars. *Rethinking the Rationales for Funding and Governance*, the subtitle, does not mean that the contributions to the book deal explicitly with policy making and assessing the changes in governments' strategies to cope with the new challenges. It is rather meant to present the basic changes in knowledge production and diffusion and reflect upon some implications for future governance of the new and evolving structures, patterns and dynamics. As the editors state: "This book does not provide a new rationale for policy intervention … Rather it is an exploration of the changing context for such a rationale to emerge" (page 399).

We might have reasonable doubt on the coherence of such exercises where a number of scholars present their views in an edited book. Often the introduction of the editors is the only effort to construct some common ground of otherwise fragmented articles. The edited volume discussed here has the advantage that it is based on a two-year collaboration of most contributors to the volume, financed by the European Union. The articles presented here were discussed in a conference held at the University of Sussex in March 2002. So, the editors had the advantage of building up some interaction between contributors and discuss the main lines of the articles. Was this successful?

I have a mixed, though overall favourable, opinion. Without any doubt, we do not find an effort to construct a common and coherent framework. Certainly, the articles subscribe to the problematic described above. However, they are not cumulative in their presentation nor do they refer to or oppose each other. The editors have attempted to group together several articles under a common label — the "evolving research policy environment", "new actor relationships", and "models of research funding" — and this fits quite nicely without, however, improving the coherence of the presentation. Once again, and the editors would not contradict, the volume is rather a compilation of different angles exploring a common topic.

This having been said, the volume goes beyond the usual bundling together of articles. An obvious advantage of the volume, for example, is the idea of having, for each of the modules, two commentators that take up the different articles in the module and give it a more encompassing reflection. Of course, commentators cannot construct more coherence then there is but often their reflections take us further and even add new and more brilliant lights on the subject (for example, the comment by Steinmueller on new actor models). We should, in addition, note that the editors have also invested in a conclusion. It is really worthwhile to read it, as it summarises in a condensed and clear way what we may draw from all the different contributions to the book. It is finally here that the threads are taken up and a more coherent picture of today's "changing rationales" is given.

The analysis of the basic changes of knowledge production and diffusion in the book is certainly not new, for instance, a shift away from a state-centred governance model; accountability, evaluation and integration of user needs as the new components of knowledge organisation; increased interests of stakeholders, above all, industry in academic research; interdisciplinarity and network forms of collaboration; the loss of public trust in science — all this is well-known and often discussed. The merit of the book is that the authors try to understand why (less so) and, above all, assess where it might take us. Let me take two main lines of the book to demonstrate its usefulness.

First, today, the integration of user needs is a major challenge confronting existing institutions and modifying existing practices. This is discussed in several articles from different angles: Ben Martin, for example, acknowledges the shift to a "user rationale" in the organisation of universities but sees no danger in this for the autonomy or the satisfactory

Professor Dietmar Braun is at Université de Lausanne, Institut d'Etudes Politique et Internationales, BFSH 2, CH-1015 Lausanne, Switzerland; E-mail: Dietmar.Braun@iepi.unil.ch.

functioning of universities as it is nothing new in the development of the university system. Adaptation by differentiation and organisational restructuring has always taken place. We will see a more varied university system without dramatising its implications for future basic research.

Llerena and Meyer-Krahmer investigate the disposition of universities to transform their disciplinary into interdisciplinary research in order to foster technological innovation. New organisational structures are needed, above all incentive structures that decrease the costs of investment for researchers and linkage structures between disciplines. New career structures and making research structures more flexible, for example, by decentralising administration, are likely avenues to embark on.

Callon discusses the topic by dealing with the relationship of researchers with the lay public. The "delegative democracy" characterised by strong professionalisation and autonomy of expertise is waning in the age of "socio-technical controversies" and will be increasingly replaced by the "technical democracy" where concerned groups are taking part in research formulation and even in research collaborations. The task of politics becomes to construct public spaces where lay people and researchers can meet.

While these discussions are mostly based on sociological considerations, economic scholars take up the problem by discussing to what extent public financing of universities should be replaced by commercial financing. To what extent should basic research become commercial and therefore "closed research"? This question is taken up by Swann on the one hand, and by Foray on the other, both investigating the merits of so-called club goods, which could be a way of funding research in-between public and private. Club goods need common financing of a selected group with common interests where all the benefits remain within the group. Swann states that public financing is still the preferable way to finance basic research while Foray proposes new institutional features to further develop the idea of promoting such "industry-specific public goods".

This short overview of several articles with a common header – the organisational and new governance mechanisms needed to cope with the increasing interests of stakeholders in scientific research – confirms what has been said before: each article is shedding some light on the topic without necessarily presenting a common view.

Secondly, the most intriguing aspect of the book, which is worked out in several articles, is certainly the rise of the network structure of research and its advantages and shortcomings. Above all, if knowledge diffusion must take place across borders (disciplines, systems), networks, as non-hierarchical forms of co-operation, seem to have clear merits. Networks seem to be the adequate answer to the challenge of interdisciplinarity, co-operation between academia and industry and internationalisation. All countries nowadays have developed network instruments in one way or other. Therefore, it is valuable to step back and think about this instrument.

The book offers interesting contributions in this respect, which are, by the way, all highlighted in the conclusions. The message of the book is that we need a more balanced account of network funding. One of the most interesting articles in this respect is by Coward and Jonard who investigate diffusion and innovation patterns of knowledge under different network conditions. Although they limit their research to implicit, face-to-face diffusion of knowledge and informal transmission mechanisms, their findings are intriguing, as they state that too much networking is detrimental to innovation. One rather needs some, and not too many, stable relationships of researchers. Otherwise knowledge becomes too similar.

Another interesting finding is given by Riccaboni *et al* who look into the network interactions between universities and firms in life sciences, both in the USA and the European Union (EU). The two areas have different structures of networks (the US dense, concentrated, broad and institutionally thick networks; the EU less dense, more specialised, smaller and institutionally thin networks) with different implications for biomedical commercialisation (early and successful in the USA but not in the EU). It is clear, however, and this is stressed by the editors, that, if network structures are applied, the type of state intervention has also to change: it needs a much more flexible and contextual approach (where, I would add, *ex post* evaluations of results must be replaced by procedural evaluations) to foster network structures.

On the other hand, policy makers should not only reflect on what kind of network structure is needed, but also, as the study of Coward and Jonard suggests, that networks cannot be the only instrument. It needs a variety of heterogeneous instruments to cope with the complex, evolving knowledge production and diffusion structure or, in other words "[i]n the context of the new systems of governance in science and innovation, the development of a single, all-encompassing rationale for public funding is becoming increasingly irrelevant" (page 399). Today's policies must be multi-coloured.

A final point would be to discuss whether we are really, as the editors suggest, at the brink of a new model of science and innovation? For the editors, the evolving structures and dynamics sketched in the various articles of the book justify the argument that a new model is emerging, though it is not yet wholly developed, and consequently governance mechanisms have to be adapted. Perhaps we should omit the term model from the discussion as it implies too much coherence and homogeneity of cognitive, social and political structures. The whole discussion of the different governance models after the Second World War seems to be rather fruitless in the sense that, even in the most clearly delineated period of the 'science-push-model', we have a combination of scientific and political

rationales, a policy-mix of ways to organise knowledge production and diffusion. The article by Ben Martin is the most eloquent in explaining this with reference to the university system.

There are no concepts until now that can convincingly demonstrate the confines of one model and the transformation to another model. The continuing discussion on mode 1 and mode 2 is proof of this. There is change, of course. However, we do not know yet how lasting this change is or whether it really transforms knowledge production and diffusion in a fundamental sense. For the time being, however, this is less relevant. The changes identified in the edited volume and the implications for governance are pertinent and merit further research, as they determine at the moment our way of life as researchers. The book has certainly not presented coherent and encompassing answers to all these problems but this was not the ambition of the editors: if policy making and governance become multi-faceted, so must the analysis of governance. In this, the book has succeeded.

Learning from past mistakes

Elisabeth A Abergel

The Precautionary Principle in the 20th Century: Late Lessons from Early Warnings **edited by Paul Harremoës, David Gee, Malcom MacGarvin, Andy Sterling, Jane Keys, Brian Wynne and Sofia Guedes Va**
Earthscan Publications Ltd, 2002, £17.95, ISBN 1-85383-4 (paperback), £55, ISBN 1-85383-892-6 (hardback)

The book is organised in 14 case studies, arranged in chronological order and presented as distinct chapters, dealing with such diverse topics as toxic contaminants, radiation, antimicrobials as growth promoters, mad cow disease, DES (diethylstilbestrol, a synthetic oestrogen given to pregnant women to prevent miscarriages), depleted fish stocks, the ozone hole and PCBs (polychlorinated biphenyls). These case studies remind us of the social, political and economic costs of not taking early warnings seriously. They also illustrate the persistence of environmental problems and their intergenerational implications.

While late lessons may still be ignored today and dirty practices exported to developing countries, the examples contained in the book clearly demonstrate the need for an effective policy instrument such as the Precautionary Principle (PP) for 'collective learning'. The German Clean Air Act of 1974 called for '*vorsorgeprinzip*' or 'foresight' for dealing with potentially harmful and irreversible damage to health or the environment (page 4). This was the precursor to what we now know as the PP, an internationally recognised and enshrined norm of environmental governance.

The authors of each case study, technical experts in the field, were asked to deal with four specific questions (page 2):

"1 When was the first credible scientific 'early warning' of potential harm?
2 When and what were the main actions or inactions on risk reduction taken by authorities and others?
3 What were the resulting costs and benefits of the actions or inactions, including their distribution between groups and across time?
4 What lessons can be drawn that may help future decision-making?"

Such a structure allows common themes to emerge and the book concludes with 12 late lessons that clarify ambiguities over the practical application of the PP. Several recommendations concern the use of scientific information to base regulatory decisions. The implicit recognition of scientific uncertainty, knowledge gaps, interdisciplinary obstacles and the need for comprehensive, long-term environmental and health monitoring are all considered necessary for cautionary action.

Politically, transparent cost–benefit analyses and regulatory schemes that reflect 'real world' conditions or 'real life practices' are advocated. Lesson 7: "…Evaluate a range of alternative options for meeting needs alongside the option under appraisal, and promote more robust, diverse and adaptable technologies so as to minimise the costs of surprises and maximise the benefits of innovation" proposes to stimulate technological innovation and economic

Elisabeth A Abergel is at International Studies Program, Glendon College, York University, 2275 Bayview Avenue, Toronto, Ontario, M4N 3M6, Canada; E-mail: eabergel@glendon.yorku.ca.