

The Challenge of Scientometrics: The Development, Measurement, and Self-organization of Scientific Communications. Loet Leydesdorff. DSWO Press, Leiden. 1995. 231 pp.

This book, in a sense, presents one man's perspective of the content and direction of the emerging discipline of scientometrics and its place in (or relation to) science studies. It derives from and summarizes Loet Leydesdorff's 15 years of work. Trained as a student of philosophy and linguistics, Leydesdorff always had a perspective which is considerably different from that of mainstream scientometricists such as Derek Price, Gene Garfield, Mike Moravcsik, Tibor Braun, and Ton van Raan who were all trained as physicists or chemists. While the majority of scientometricists are essentially interested in empirical analysis of observed patterns, Leydesdorff has a penchant for theory and a predilection for philosophical and sociological underpinnings of whatever is subjected to measurement in scientometrics. It is this keen interest in theory which led him, early in his development as a scientometricist, to organize a workshop on 'the relation between qualitative theories in science and technology studies and the use of scientometric methods', which this reviewer had the privilege of attending (see the special issue of *Scientometrics*, 1989, for papers presented at this meeting).

In this elegantly produced volume, Leydesdorff has essentially reproduced 15 of his published papers, with some modifications resulting from an attempt to weld them together into a cohesive book. I must say, he has taken full advantage of hindsight in this endeavour. In one sense, this book attempts to bring together the quantitative methods of scientometrics and the science indicators movement on the one hand and the disparate studies in the areas of history, philosophy and sociology of science which are coalescing into the rubric called 'science studies' on the other. There have been attempts to bring about such a synthesis. See, for example, the volumes edited by Ina Spiegel-Rosing and Derek Price (*Science, Technology and Society: A Cross-Disciplinary Perspective*, 1977), Karen Knorr-Cetina and Michael Mulkay (*Science Observed: Perspective on the Social Study of Science*,

1983), and Shiela Jasanoff *et al.* (*Handbook of Science and Technology Studies*, 1994). Leydesdorff feels that these collections brought out as yearbooks and handbooks do not really integrate all aspects of the dynamics of science and that we actually lack methods of true integration. This slim volume is Leydesdorff's attempt to bring about a true integration. As the blurb on the cover says 'the various dimensions of the problem of studying the sciences empirically are clarified here in a methodological analysis of theoretical traditions, including the sociology of scientific knowledge and neo-conventionalism in the philosophy of science'.

Looking at the study of science as a multidimensional problem—where the three core dimensions are cognitions, texts and scientists—Leydesdorff views the sciences as multi-layered and flexible communication systems and hence the dynamics of science to be amenable to 'information theoretic' analysis. His approach differs from that of sociologists of knowledge in that he emphasizes the need for rigorous distinction between static and dynamic questions pertaining to socio-cognitive (inter-)action and the structure of scientific knowledge. For him the meaning and context of these interactions as well as the 'asymmetry' that will necessarily prevail among the social, cognitive and socio-cognitive variations are important. For him 'information' is more fundamental than 'words' in science, which formed the basis of tools such as the co-word analysis. It is in this context, I thought, he could have benefitted from Ranganathan's analytico-synthetic method, which was fruitfully used by Robert Fugmann in heuristic selection of drug molecular structures to be actually synthesized for testing. After all, much of scientometrics, as it has evolved till now, deals with measuring surrogates such as publications, words, references, etc., whereas Ranganathan and Fugmann dealt with the very stuff of information *per se*.

Leydesdorff argues both at the theoretical and empirical levels against a sociological reduction of the multidimensional problem to only the two dimensions of the literary manifestations of the sciences and the perception of local actor groups. In his search for better methods of science studies, Leydesdorff suggests that methods should allow for the use of

qualitative data and dynamic analysis—such as information theory, especially probabilistic reasoning. He demonstrates the use of this method in the static and dynamic analysis of relations among eighteen texts. Then he proceeds to look at irreversibilities in networks and that leads him to second-order systems theory, the theory of self-organization and finally to mathematical sociology of science.

On the whole, this is an ambitious book, and a book only Leydesdorff could have written. There are not many others in contemporary scientometrics who have the intellectual preparation and aptitude of Leydesdorff. Students of science studies and scientometrics endowed with a theoretical bent of mind will find this book interesting and useful. Not surprisingly, the book is Eurocentric. Rarely do we find references to Asian or African researchers. There is a reference to Wu Yishan, only to acknowledge that he told the author that there are two Chinese words for information. A paper by Sahal and another by Shahidullah (coauthored with two others) are quoted in passing. Not one from India is cited. Is there a message for scientometricists of India?

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Controlling Pollution: Incentives and Regulations. Shekhar Mehta, Sudipto Mundle and U. Sankar. Sage Publications India Pvt Ltd., M 32, Greater Kailash, New Delhi 110 048. Price: Rs 250. 153 pp.

The book is the outcome of research on market-based instruments (MBIs) for pollution control, undertaken by the NIPFP at the instance of Union Ministry for Environment & Forests, with financial support of the World Health Organization, arising out of policy statement on abatement of pollution issued by the Government of India in February 1992, which *inter alia* emphasized the policy shift from defining objectives to practical concerns of actual implementation. The underlining thesis of the authors is that the MBIs need to be deployed with command and control (CAC) approach to ensure imple-