Book review

Assessing the societal implications of emerging technologies: anticipatory governance in practice

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Michelson was a Research Associate at the Project on Emerging Nanotechnologies (PEN) at the Woodrow Wilson International Center: his underlying purpose in this book is to paint a picture of that project over its lifetime. So how to grasp the purposes of the Wilson Center and the Pew Charitable Trust when the PEN project was created? Its mission statement describes this clearly as follows: "Our goal is to inform the debate and to create an active public and policy dialogue. It is not to advocate either for or against, particular nanotechnologies. We seek to ensure that as these technologies are developed, potential human health and environmental risks are anticipated, properly understood, and effectively managed".

In this sense, the project, along with so many others that claim a connection between society and emerging technologies, characterised by mounting complexity, makes a pseudological statement that creates unachievable expectations. Why? Because complexity makes ignorance (Roberts, 2013) inevitable which in turn makes reliable anticipation, though highly desirable, a near impossibility and understanding incomplete. The influence of these two features is suggested in the Consumer Product Inventory (CPI), created in PEN, of products containing some form of nanomaterial, as the CPI is said to be biased towards the present rather than future evolutions of nanotechnology as envisaged by Roco (http://rnano.org/whatis.htm) in the US (and other) National Nanotechnology Initiative.

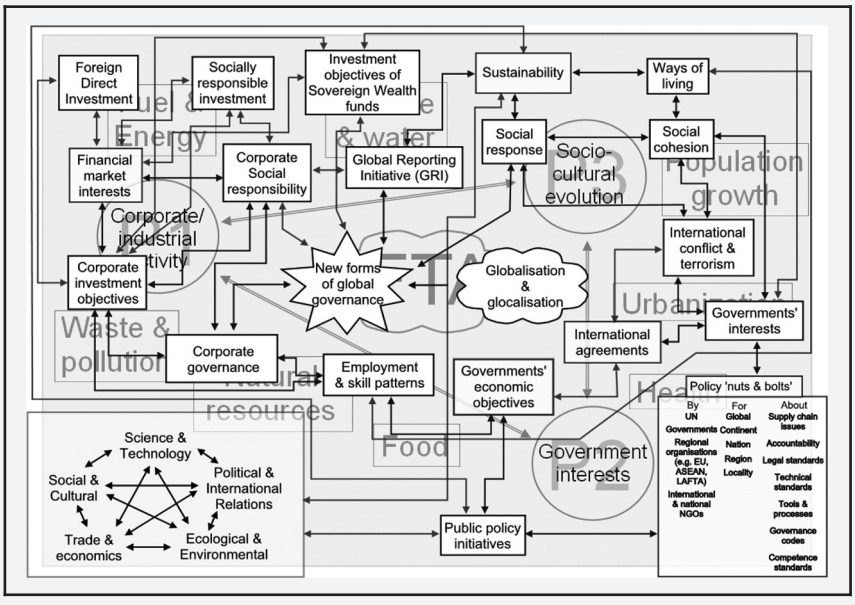
Throughout its evolution, nanotechnology has been plagued by mistiness and fog about what it is, a vagueness that is hampered efforts to create a better appreciation of its potential, good and bad sides and its risks to the polity. These are PEN's focus of attention. Very recent publicity has "revealed" to the polity that many cleaning products contain "plastic microbeads" as an abrasive. Their long-term destination is the world's seas and oceans and hence fish to their detriment and ultimately humans. Would the notion of anticipatory governance, one of the important notions referred to in the book, have steered this situation in a different course?

However, the book fills a niche in the nanotechnology and synthetic biology fields in as much as both emerging technologies, and the genus as a whole, need the kind of dialogue it fulfils in its seven chapters: whether its content can be taken into contexts other than the USA is a moot question. The first chapter sets out a view of shaping policy towards emerging technologies and commendably ends by setting out the structure of the rest of the book. The second chapter sets out the institutional context and an overview of the PEN and similar projects. Chapter 3 sets out reasons for "taking the future seriously", an admonition that is frequently heard in the "futurists world". It is a notion that is

paradoxical: in this chapter, there are few new ideas. The notion of *anticipatory governance* does not dispel the fog while making some rather grand claims for foresight. Similarly, the notion of responsible research and innovation, which has crept into current parlance, offers little to clarify the notion of anticipatory governance, which decides what is and what is not responsible research and innovation is not dealt with. Chapter 4 delves into the notion of anticipating alternative futures positing a major role for foresight (the term is defined in Chapter 3). Again, a number of well-known, but implausible ideas about foresight and its uses are paraded. Usefully, four ways of using PEN to influence policy are presented, but none are original. The chapter ends with a short piece about the social construction of plausible foresight which emphasizes the need to integrate notions about the near-term and the longer-term evolution of nanotechnology and synthetic biology. The fifth chapter is devoted to the key role of boundaries and their inappropriateness in nanotechnology and synthetic biology, as both are fields where social, technical, economic, ecology, politics and human values/norms (the STEEPV set) intersect. Michelson chooses to debate the situations involved in terms of boundary objects and boundary organizations which seems to miss the point: boundaries are conceptual and perceptual human notions that require integration and convergence across many intersections of them. If there is such a notion as a *grand challenge* (it is a sterile notion), then it surely re-emerges in Chapter 6. Organizational boundary objects seem like bureaucratization of one of the most arduous, urgent and dynamic situations relating to emerging technologies. Is this a given feature of anticipatory governance? Chapter 6 rehearses the concerns in the science and technology world for "educating" the polity about the benefits and dis-benefits (the latter often in *diminuendo*, though both are plagued by ignorance relating to emerging, convergent and complex technologies). Endeavours in this field under many different acronyms have defeated many great minds. Now, there is a new mind in the field called *social media*, typified by Facebook and Twitter, which has a recognized power to influence for good or ill the public understanding of science to say little of the immense influence the editors (human and algorithmic) of social media can have: there really is a "new elephant in the room"! Finally to Chapter 7 titled "Foreshadowing the future". Perhaps one of the important features of the chapter emerges on the first page: it refers to the possibility or near certainty that the appreciation of emerging technologies gained from case studies, such as Michelson presents, will degenerate into "how to do lists" instead of "how to think" about the complexities and dynamics that emerging technologies present, in the other five dimensions of the STEEPV set in which they roam.

As a case study of the social aspects of nanotechnology, and to a lesser extent, synthetic biology, the book is commendable, providing copious references and quotations supporting various aspects of the two cases. In a sense, it is an historical reference book that draws attention to many important issues that affect policy. It does not get into either of its subjects in depth: other texts, e.g. Roco *et al.*'s (2013) "Convergence of Knowledge, Technology and Society" is needed for that. As Michelson points out, context and content are inextricably interrelated: what can be done in

Figure 1 Future technology analysis and governance



one context is not necessarily repeatable in another. Hence, the degradation towards generic "how to do" methodologies as has occurred in so-called foresight methods. At times, Michelson overplays the role of foresight which is more a right-brained way of thinking than method. In this context, anticipatory governance faces severe situations as illustrated by the diagram below from Cagnin *et al.* (2011) (Figure 1).

Note

1. Evan Michelson is now a Program Director at the Alfred P. Sloan Foundation, USA.

References

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