as these are crying out for explication, but Pearson and Porath are keen to serve a general audience rather than take up the lead. They deal with costs, but the book would have been greatly enhanced if they had given more thought to the costs of information when considering incivility.

Despite this neglect of information costs, the top ten things that firms can do to create a civil workplace (chapter 13) all have a strong information component: (1) set zero tolerance expectations; (2) look in the mirror (which means that managers and executive must strive to live by the norms that have been set); (3) weed out trouble before it enters your organization; (4) teach civility; (5) train employees and managers how to recognize and respond to signals; (6) put your ear to the ground and listen carefully; (7) when incivility occurs, hammer it; (8) take complaints seriously; (9) do not make excuses for powerful instigators; and (10) invest in post departure interviews. There seems to be wisdom in this and the advice could be put to good use by managers trying either to curtail incivility or to manage innovation.

Having read *The Cost of Bad Behavior*, I am convinced that incivility has a considerable cost. It can corrode an organization from the inside. I suspect that innovation is a major casualty of incivility. Perhaps the biggest threat is the impact on knowledge and by that, I mean knowledge embedded in employees. The authors quote William Faulkner: 'A mule will labor ten years willingly and patiently for you, for the privilege of kicking you once' (p.30). One kick could sink an expensive project, and more could threaten the organization. When incivility becomes entrenched and systematized, it really should not be ignored. *The Cost of Bad Behavior* alerts us to the possible consequences.

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International handbook on regulating nanotechnologies, edited by Graeme A. Hodge, Diana M. Bowman and Andrew D. Maynard, Cheltenham, Edward Elgar, 2010, 640 pp., £175.00 (hardback), ISBN 978 1 84844 673 1

The academic and policy experts who have contributed to this international handbook have produced a rich set of analysis and strategic assessment of existing (and potential) regulatory frameworks governing nanotechnologies. Mapping access to this important source material and providing an understanding of the complexity of the 'value chain', the opportunities and the potential downsides of nanotechnologies provide the reader with a framework to assess this important new technological frontier. Importantly, this approach also suggests a broad spectrum of measures to help develop and assure better governance of nanotechnologies.

Just as nanotechnologies encompass a range of disciplines, including engineering, materials science, biotechnology, medicine, physics, chemistry and information technology, this handbook is an essential tool and guide to better comprehend nanotechnologies, and should be read by the full range of people involved in its development and governance. In particular, the large diverse policy community needs to

understand more systematically the challenges faced with such new, and in many ways, revolutionary technology.

The authors succeed in demonstrating a conundrum faced by regulators – that nanotechnologies are portrayed as both simple and complex, depending on the interest being represented – so getting past the hype and teasing out the essential challenges are complex. In various forms, nanotechnologies have already seeped into products of everyday use. They also hold out the promise of breaking new frontiers of technology with magical solutions to improve health and the environment. Notwithstanding these vast opportunities, the effects and possible consequences are also, to a large degree, unknown. Increasingly, alarm bells are being rung by advocacy groups and some government regulators.

This handbook, if heeded, could help save the promoters of these technologies from being seen as little different from the promotion of genetically modified technology. This 'genetically modified factor' has, at least initially, encouraged industry to work collaboratively with non-government organisations (NGOs) in its approach to the public, but this now appears to be breaking down. The authors are well aware of this particular challenge and include policy and regulatory suggestions addressing this very real agenda.

Overall, the framework used in the handbook to analyse such a diverse scientific and physical phenomenon works well in providing a logical and conceptually useful guide to many of the issues. The introductory section is a well-developed analysis of the public policy challenges facing those attempting to regulate this technology. It provides a framework that describes how regulatory debates are typically constructed through 'three languages'. This discourse highlights issues such as: naming and labelling; the scientific and technological frontiers related to scale and the associated risks; and the all-important role of regulating such new, novel, interesting and potentially dangerous technologies and products. The background on the nanotechnology label is interesting. Adopting the word 'nanotechnology' as the overarching descriptive language serves as a societal phenomenon that frames meaning in public policy and regulatory debates. The word '. . .does not acknowledge the complexity of ideas and meanings now embedded in it. It has become a handy shorthand label for several phenomena' (p.6).

This particular branding of diverse technologies into one word with positive connotations neatly translates for the public into 'small technologies'. It provides more comfort (or cover) than clearly identifying the more accurate terms attached to the individual disciplines; for example, chemistry or engineering at the atomic scale. How different would the debate on nanotechnologies be if the word atomic scale had been adopted? This more scientific term would not provide such a smooth and largely uncritical entrée into media or business branding possibilities.

The editors then proceed to pose seven broad regulatory challenges (pp.16–17) that make this book an essential read for anyone interested in nanotechnology policy development. These represent the tip of the iceberg because, until these processes are more fully understood and until meaningful cost/benefit analyses are conducted (and acted upon), the full extent of the value of engaging in this new technology will remain 'mysterious and open to challenge'.

The seven regulatory challenges identified are: stop hiding behind the language game; achieve a cradle to grave understanding of each type of nanotechnology and its effects; develop timely and appropriate methods to measure air-borne and water-borne nanomaterials; address gaps and triggers in legislation and regulation; balance

economic growth and public health and safety protection; assess the effectiveness of different regulatory approaches; and ensure appropriate transparency and trust across all areas of regulation (for example, in foods and food contact materials, cosmetics and sunscreens).

While the title of this book aptly describes its contents, it underplays the roles and effects that these new nanotechnologies already have on everyday life – the level of technological complexity, the amazing possibilities of these new technologies, and key safety aspects of such a diverse range of new global products. This publication, therefore, represents an important effort to open up the debate in a manner that informs, questions and suggests possible regulatory scenarios. Importantly, the approach is interdisciplinary, and the mix of authors and expertise is useable by those outside academia, particularly policymakers and politicians.

The handbook is well structured and cleverly guides the reader through the complexities that underpin regulation and policy options. This is technology that can pass through the blood/brain barrier. It can be used for simple tasks – anti-bacteria cleaning cloths/non-smelly socks – through to sophisticated delivery systems for drugs and possible military uses that make science fiction seem old fashioned. This is fundamentally exciting technology, but even the simplest forms of nano products already on the market require attention.

Two examples drawn from my own policy engagement with this issue are relevant here. Nano-silver, now used in socks and bacteria-eroding cloths, is also fundamentally important for key medical applications to treat severe burns and for covering and protecting prosthesis, etc. Having this special anti-bacterial product used in such everyday activity could prove to be problematic and broader environment lifecycle issues are yet to be addressed (http://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=358028). Another example is nanotechnology used for inventory control. The paper or plastic bar code allows customers to discard this inventory device after purchase. With the advent of nanotechnology, sand-like particles with tracking capacity integrated into the product remains there to be read whenever the customer moves in and out of the shop. A benign rational for attaching such devices is that the customer's preference can be identified and individual assistance provided. The regulation is clearly inappropriate for such tracking tools.

The handbook seeks to engage the essential players by providing analyses of current practices, identifying gaps and providing substantive technical analysis that can be read by the non-expert. It also questions approaches and provides pathways to develop cohesive, collaborative and globally applicable models of regulation. It is full of memorable quotes and introduces linkages between disparate areas of regulation and commercial practice.

The structure underpinning the 26 chapters is effective. There are areas that overlap (such as the EU and US regulatory frameworks and risk-management approaches), but the treatment differs as each chapter provides a particular element to the debate. There are specialist chapters that deal with one of the early identified areas requiring special attention, carbon nanotubes, some of which have been identified as having structural similarities to long fibre amosite asbestos (chapter 11).

One of the difficulties of producing this handbook is that it covers a highly contested space. The main focus is on EU/US policy developments, but this is also where most of the scrutiny and policy developments have occurred (or, more to the point, where the information is accessible). A fleeting indication of other countries' involvement in nanotechnology is contained in chapter 5, which focuses on international

standard setting regimes and provides one of the few indications of active engagement by China and other Asian economies in regulatory debate at the global level.

Many of the authors point out that the overwhelming narrative of nanotechnology governance is based on existing regulations, existing guidelines and even existing toxicology analysis. This happens everywhere, both as the starting point and for ongoing analysis. Is this justifiable? And what is to be done if it is not? How will we even know, as so little scientific data is available for analysis or scrutiny?

Throughout the book, a key theme is the almost total lack of data. Several contributions assess why this is the case. It seems that we have missed the boat in terms of providing timely and appropriate frameworks for regulation, be they voluntary or mandatory. The amazing research and industrial discoveries in nanotechnology have been just too novel, too exciting, too applicable, and too far removed from public scrutiny to generate a more cautious approach. However, these technologies have substantial security implications for people and the environment, both short and long term.

A moratorium or mandated regulation until appropriate data are available would be regarded as stymieing very important technological developments, particularly in the area of health and the environment. The comprehensive analysis developed in this book attempts to bridge this dichotomy by providing much needed information on where and in what form the debate is taking place, on which policy tools seem to be emerging, and whether these options are fit for purpose.

The reader is not likely to put this book down and feel any level of confidence that these are issues which are in fundamentally good hands. This is not to say that the authors are antipathetic to nanotechnology *per se*. On the contrary. It is the nature of the debate itself and the current state of play that set the tone for the discussion. The EU, US and others have not used the precautionary principle, preferring instead to argue for evidence-based analysis. However, this is where the contradictions are stark. If evidence-based is the preferred model, then where are the scientific data?

This general failure to collect data systematically has now emerged as a point of contention. The lack of transparency, particularly labelling, is now being challenged, especially in sensitive sectors, such as food and cosmetics. (Following prompting from the EU parliament, new EU directives will come into force in 2013/14 requiring compulsory labelling and further scrutiny of cosmetics and novel foods containing nanotechnology.) The initial goodwill that appeared to characterise the early introduction of nanotechnologies and government commitment to facilitating dialogue with the public and NGOs has gradually slipped away. How quickly and systematically these gaps can be addressed may depend on whether the policy community heed some of the warnings or adopts some of the proposals outlined in this handbook.

While the authors and editors have produced a most valuable book, there are some gaps. Nanotechnologies are not widely understood, so a generic list of the types of products already on the market and an informed guess at the range of areas being developed by industry would have been useful. Instead, such information is peppered throughout the various chapters.

A specific chapter on the capacity of institutions to manage nanotechnologies might also have been useful. For example, a political analysis of the corporatisation of the public sector and the promotion of voluntary or industry self-managed regulation would have provided essential context on current government capacity. Universities have also undergone a transformation, particularly in science, that promotes the development of research for commercialisation. Many, if not most, of the research areas developing nanotechnologies operate within this commercialised

framework. This fact alone deserves attention to ensure a clear distinction between assessing health and safety aspects of nanotechnologies on the basis of public good rather than the vested interests of those engaged in product development. The scientific environment can no longer be assumed to be neutral. This is a technology with a value in billions of dollars.

An understanding of the political and globalised nature of the modern business model into which these new nanotechnologies now fit is of fundamental importance. It also assists in providing the reader with a sense of the real challenges ahead. This is not to suggest that this analysis is missing from the handbook, but a more robust and focused political critique would have helped identify weak capacity, regulatory and intellectual gaps and resource constraints. That said, the editors provide an extremely useful and thoughtful overall picture of the challenges posed, and a roadmap for comprehending the governance of nanotechnologies. They should be congratulated for bringing together such a diverse skill base to address an issue that is crying out for interdisciplinary analysis and governance.

A range of views is represented, including from actively engaged NGOs, such as Friends of the Earth. Also explored are insurance and intellectual property. The insurance industry's approach to nanotechnologies should be followed very carefully. This industry is highly skilled in risk-management analysis, and will be a prime indicator of health and safety risks, but locating this type of information may not be simple. Nevertheless, the insurance industry has a large potential to drive as well as moderate the production of nano products. Intellectual property does not have much potential to indicate risk. Intellectual property will indicate, albeit mostly after the fact, the number and range of technologies and products being developed. Some light relief is provided in the demonstration that for some, there are no boundaries, ethical or otherwise, to what should be patented.

The process and management of the categorisation of nanotechnologies under the International Standards Organisation (ISO) regime is an important inclusion. This is an essential part of making sense of the technology and the basic underpinning for analysis, trade, setting standards and tracking these technologies, but it is not an easy task. The ISO Technical Committee set up to address key aspects of nanotechnology (TC229) will have far-reaching effects on all of us. 'TC229 has chosen not to adopt the traditional market-driven bottom up approach of developing international standards but rather a more considered planned approach where the present and future needs of the world community are identified and addressed in a harmonised fashion' (p.105). The reader will note the early stages of international collaboration with participants from Asia joining western countries and China taking on one of the four key committee roles in this process. The Organisation for Economic Cooperation and Development and also the EU have been developing regional policy approaches for some time, and other international organisations have this technology in their sights, but it is only in this dry technical standards arena that the global nanotechnology players are active. This indicates a large policy gap. Some form of global governance is necessary to manage this new and fast emerging technology with its globalised production and distribution chain.

While the ISO TC229 non-market-driven approach can provide some assurance to the reader, there can be no doubt that the same corporate players will be present and contributing the essential data for decision taking. This is where the bulk of the expertise will reside, unless governments are prepared to invest much more in monitoring and managing this technology. It is this type of fundamental background

information that makes this handbook an essential read for policymakers, health and advocacy groups.

The key theme of the almost total lack of data has been raised earlier. Given this, politicians should take note of the underlying sensitivities and be careful not to be swayed by claims of no negative response to date. Given the lack of scientific data, it would seem obvious that appropriate data must be assembled to assist policy assessment. The EU is preparing to label some products containing nano particles. If others fail to follow suit, there may be a backlash from the public. With such new and largely untested technology fed through a global supply chain, labelling is a vital issue from both consumer and security perspectives.

Overall, the issues that make nanotechnologies, in the editors' words, 'a wicked problem', are explained in layman's language – even if concentration is required to remember the related details. The different approaches to regulation are critiqued, from the traditional government directives through to innovative arrangements. This is an important and timely publication, essential for all engaged in developing policy to manage this innovative, transformative and revolutionary technology.

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