

IMAGE DYNAMICS IN NANOTECHNOLOGY'S RISK DEBATE

Marloes van Amerom & Martin Ruivenkamp

Department of Science, Technology, Health and Policy Studies

University of Twente

PB217, 7500 AE Enschede

The Netherlands

Abstract

Nanotechnology, like previous introduction of socio-technical orders is subject to debate. With its increased development, the awareness of potential drawbacks and risks that nanotechnology may pose has been on the rise. Where the precise applications and outcomes of new technologies are not yet known, perceptions of its possible benefits and risks tend to be highly influential in shaping the ways in which it is assessed, thereby structuring social receptiveness. In the assessment of a new technology images can be influential as well. The image of 'Frankenstein Food' is a well-known example in triggering widespread public rejection of GM food, and is still often referred to in debates on the possible public rejection of nanotechnology. Thus far, images of the risks of nanotechnology and their relation to the nanotech risk debate have received little attention. This study aims to fill part of this gap by mapping two efficacious images currently used by actors in the nanotech risk debate; one metaphor 'nanoparticles as the new asbestos,' and one terse story, 'havoc wreaking molecular machines.' By considering how and why these images are produced, taken seriously and reacted upon by different stakeholders, a deeper understanding is provided in the ways in which images affect agenda-setting processes in the nanotech risk debates. Finally, the possible implications of the outcomes of these processes on the perceived desirability of the usage of nanotechnology for and in developing countries are explored.

Keywords: images, nanotech risks, future technology acceptance

1 Introduction

Since 2001, debates over the introduction of nanotechnology into society have both accelerated and intensified, with a growing number of actors discussing the risks and drawbacks of nanotechnology (Renn and Roco, 2006; Van Amerom and Rip, 2006). To pinpoint to possible risks and/or to support calls for action, nanotech risk alerters have produced a wide range of reports, brochures and policy documents, whilst also issuing opinions in the form of public announcements, and through presentations and speeches, for example at conferences (International Risk Governance Council, 2006).

Within, and in addition to written text and speeches, images used by the actors involved can be an important means of communicating risks and of generating support for the notion that a given technology is dangerous and/or should be regulated. The 'power of the image' was, for example, visible in the widespread protests against biotechnology, during which the portrayal of GM food as 'Frankenstein Food' became a popular image (Scott, 2000), which was taken up by a number of actor groups and re-circulated. Even within the nanotech debate this image is often referred to. Moore (2003), for example, warns that nanotechnology could reach a similar impasse as biotechnology earlier (Mehta, 2004) should nanotech promoters continue to ignore public fears

FTA ASSUMPTIONS, METHODS AND APPROACHES IN THE CONTEXT OF ACHIEVING OUTCOMES

of nanotechnology-related developments, and nanotech risk alerters develop similarly effective risk images in relation to nanotechnology.

The concept of an image is taken broadly here. Images may refer to representations, future notions, graphic illustrations, pictures and so on. The image of Frankenstein Food, often illustrated in graphic forms as well, is interpreted in this paper as a metaphor, as a figure of speech, as something that we use to offer a view on something by likening it to something else. Besides studying images as metaphors, images are understood here as a 'terse stories' as well; "an abbreviated and succinct simplification of the story in which parts of the plot, some of the characters, and segments of the sequence of events are left to the hearer's imagination" (Boje, et al., 2004: 2).

Nanorisk alerting parties, such as NGOs, re-insurance companies and 'prudent' scientists have used images as metaphors and/or as terse stories, to try and gather support for their concerns and/or to try and ban the technology. Thus far, the role of images in the nanotechnology risk debate has received little attention, however. To fill part of this gap, this study considers the role that images as metaphors or as terse stories have played in structuring the nanotech risk debate, and the implications of these developments for developing countries.

The next section will start off by discussing two images that are used today by relevant nanotech risk stakeholders, and their respective impact on the nanotech risk debate. The first image under scrutiny will be the metaphor 'nanoparticles as the next asbestos.' The second image to be discussed will be the terse story of 'havoc wreaking molecular machines.' Gauging the impact of an image is a complex task. Nevertheless, it is possible to ascertain whether or not an image used by a given actor has an impact and the level of its 'successfulness' in drawing attention to a particular nanorisk, by following its trace (Murdock, et al., 2003); how it is produced, taken up, used, and reproduced by different actors. To close this note, we reflect on the effects of these images on debates on the usage of nanotechnology in and for developing countries with the aim of opening up the issues for further investigation.

2 Status of images currently in use

A wide array of risk images surrounds nanotechnology. In this paper attention will be focused on two images that can be said to have been relatively durable and which are shared by a wide range of actors, namely 'nanoparticles as the new asbestos' and 'Grey Goo.'

2.1 Nanoparticles as the new asbestos

Since the start of 2002 the notion that nanoparticles could carry health, environmental and safety (HES) risks has increasingly entered and informed the nanotech risk debate. At a US Environmental Protection Agency's meeting (March 2002), researchers from the Center for Biological and Environmental Nanotechnology indicated that nanoparticles were detected in the livers of rodents, may pass the blood-brain barrier, and perhaps piggyback on bacteria to enter the food chain. On this basis, they analogised the commercial use of nanoscale carbon to either "the next best thing to sliced bread or the next asbestos" (Wiesner quoted in ETC Group, 2002: 3). Since then the notion that nanoparticles, particularly nanotubes – as small fibres able to penetrate human lungs like asbestos can – could represent a new type of 'asbestos' has become one of the most powerful images to draw attention to, and propel precautionary action regarding the HES risks of nanoparticles. The first NGO report to focus attention to the risks of nanoparticles, notably the ETC's *No Small Matter* (2002) uses the image as well. It not just

quoted Wiesner's comments (see above) rather prominently and in various parts of the paper, but actively subscribes to this notion noting how:

“Dr. Wiesner's comparison of carbon nanotubes with asbestos is not merely rhetorical, highlighting the need to assess the dangers of a material before it becomes ubiquitous. Carbon nanotubes resemble asbestos fibers in shape: they are long and needlelike” (ETC Group, 2002: 5)

On the basis of the re-produced analogy with asbestos the ETC demanded a strict regulation of nanotechnology. Whilst the image helped the ETC to draw attention to the HES risks of nanoparticles it did not stimulate any precautionary action. The ETC's call for a moratorium was viewed as overly radical in nanotech circles and the action group's involvement in the nanotech risk debate frequently painted as 'biased'. A report by the UK's Royal Society in 2004 confirming that nanoparticles could have serious HES implications, (Royal Society/Royal Academy of Engineering, 2004) also used the nanoparticles as asbestos' image, however, giving this notion increased legitimacy. Further action around the nanoparticle risk issue on the basis of the comparison between nanotubes and asbestos was stimulated when re-insurance company Swiss Re focused attention on the possible risks of nanoparticles in its publication 'Nanotechnology. No Small matter, many unknowns'. The notion that nanoparticles could turn out to be a second asbestos leading to major damage claims for companies and their (re-)insurance companies by affected customers and workers, considerably underpinned Swiss Re's call for an application of the precautionary principle with respect to nanoparticles (Hett, 2004). Today, this call has been increasingly heeded with national and international governance initiatives emerging aiming to check or regulate nanotech risks (International Risk Governance Council, 2006), including and particularly the risks of nanoparticles (Amerom and Rip, 2006).

2.2 *Havoc wreaking molecular machines or nanobots*

Ever since Eric Drexler's *Engines of Creation* (1986) the notion of 'Grey Goo', whereby out of control *non-biological* molecular machines eat up the entire biosphere, has been identified as a possible nanotech danger. Further impetus to this notion was given by the founder of Sun Microsystems Bill Joy, who foresees in an article in *Wired Magazine* (2000) that nanotechnology, when converged with biotechnology and increasingly sophisticated artificial intelligence systems, could threaten the survival of humankind on the basis of Grey Goo. Even though Crichton's novel *Prey* (2002) is about out-of-control swarms of biological organisms, it has further sustained the notion of Grey Goo. The differences between Drexler's goo and Crichton's swarms are often ignored; "everyone seems to lump them together indiscriminately" (ETC Group, 2004: 7). This is why the notion of Grey Goo is interpreted here as a terse story. Simplified and abbreviated, Grey Goo is about havoc wreaking molecular machines; other parts of the story are left to the reader's/hearer's imagination without 'damaging' the notion itself.

Grey Goo also became a prime image used to imagine nanotech dangers in newspapers worldwide (Anderson et al., 2004). It continues to shape nanotech risk imagining today (see for example UNESCO, 2006). However, where it was still a popular image in the first years of this millennium to imagine nanotech risks (see for example ETC, 2002; Munich Re, 2002), since Mid 2004 the image of Grey Goo has increasingly been stigmatised, whereby it has been portrayed by nanotech promoters and nanotech risk alerters as 'science fiction and unrealistic'. It has also been increasingly counterpoised with images posing nanoparticles as risky, whereby the latter has been labelled 'immediate and realistic' as compared to the Grey Goo risk image (Van Amerom and Rip, 2006).

3 Discussion

The image of Grey Goo has, thus far, evoked little direct (policy) action, contrary to the image of 'nanoparticles as the next asbestos'. Developments with regard to nanotechnology & developing countries echo this pattern. Debates on the usage of nanotechnology for and in developing countries have, thus far, been little influenced by the image of Grey Goo. The image of nanoparticles as the new asbestos has, however, increasingly been taken up in discussions on the development of nanotechnology in the emerging industrial countries (Maclurcan, 2005).

One reason is that up-coming industrial countries, especially those with their own emerging nanotech R&D have been increasingly invited to participate and contribute to international discussions on nanotechnology risks organised by forums or networks dominated by industrialised countries, such as the OECD. As noted before, these initiatives are particularly driven by a desire to check the HES risks of nanoparticles. The image of nanoparticles as the next asbestos considerably shaped these concerns.

However, the reception of the image of the 'nanoparticles as the new asbestos' tends to be very different in, and for the emerging industrial countries. The reason is that this image is often counter posed by the 'nano divide'. The nano divide refers to the idea of a widening of the gap between industrial and emerging industrial countries based upon their different capacities to develop and exploit nanotechnologies (Mnyusiwalla, et al., 2003).

Framed on the backdrop of the nano divide the images of risks that are perceived as important in the industrial countries are different from those images circulating the risk debate in the emerging industrial countries. Whereas the image of nanoparticles as asbestos is placed high on the agenda of the industrial countries, the emerging industrial countries place the nano divide as the most concerning risk (Court, et al., 2004; Hebden, 2005; Maclurcan, 2005), and, the image of nanoparticles as the next asbestos, is relegated to lower levels of the hierarchy of images of risks within the risk debate.

Not only can images be framed differently changing their hierarchal position, images can be framed in such a way that the content of the message changes. The image of the 'future warrior,' or the 'soldier of the future' represents a good example. In the US this image has sometimes been used to promote nanotechnology – including as a means to protect the country against terrorism and 'rogue states'. However, the same image can be approached from another perspective as well (Kary, 2002; Altmann, 2005). The notion that nanotechnology-driven developments could cause a new arms race conform the one dominating the Cold War, with the possibility of life-destructing warfare, changes the perspective of the image of the 'warrior of the future' and in so doing becomes a pivotal image for fears related to the military implications of nanotechnology.

If a truly global nanotech risk governance debate is going to take place, then further engagement with the production, framing and reception of nanotech risk images - including images of risks alternate to those put forward by the industrialized countries, who are currently framing the global risk debate (MacLurcan, 2005) - is imperative. The importance placed on the image of the nano divide in emerging industrialized countries counters the hierarchy put forward presently in 'global debate'.

4 References

- Altmann, J., 2005, *Military Nanotechnology: potential applications and preventive arms control*. London/New York: Routledge.
- Anderson, A., Allen, S., Petersen, A., & Wilkinson, C. (2005). The Framing of Nanotechnologies in the British Newspaper Press, *Science Communication*, 27, 200-220.
- Boje, D.M., Rosile, G.A., & Gardner, C.L. (2004). *Antenarrative Theory*. In: *Actionable Knowledge as the Power to Narrate*. [Showcase paper symposium accepted by three divisions, Critical Management Studies, Organizational Change and Development and Research Methods]. Academy of Management Meeting, August. New Orleans.
- Court, E., Daar, A.S., Martin, E., Acharya, T., & Singer, P.A. (2004). Will Prince Charles, et al. diminish the opportunities of developing countries in nanotechnology? Available at: <http://www.nanotech.web.org/articles/society/3/1/1>.
- Crichton, M. (2002). *Prey*. New York: Harper Collins.
- Drexler, K.E. (1986). *Engines of Creation; The Coming Era of Nanotechnology*. New York: Anchor Press/Doubleday.
- ETC Group. (2002). No Small Matter! Nanotech Particles Penetrate Living Cells and Accumulates in Animal Organs. (www.etcgroup.org).
- ETC Group. (2004). Nanotech in Living Colour: An Update on White Papers, Red Flags, Green Goo, Grey Goo (and Red Herrings). (www.etcgroup.org).
- Hebden, S., (2005). China skips 'small talk' but tops nano patents in South. November. Available at: <http://www.scidev.net/quickguides/index.cfm?fuseaction=qguideReadItem&type=1&itemid=2455&language=1&qguideid=5>.
- Hett, A. (2004). Nanotechnology: Small Matter, Many Unknowns. May, Zürich: Swiss Re, Switzerland (www.swissre.com).
- International Risk Governance Council (2006). *Conference on: 'The Risk Governance of Nanotechnology: Recommendations for Managing Global Issue'*. 6 and 7 July, Rüschiikon, Switzerland. Available at: <http://www.irgc.org/irgc/events/conferences/>.
- Joy, B. (2000). Why the future doesn't need us. *Wired*, 8 (4) Available at: <http://www.wired.com/wired/archive/8.04/joy.html>.
- Kary, T., (2002). *Newsmaker Nanotech's Call to Arms* [online] March. Available at: <http://news.com.com/2008-1082-869330.html>.
- MacLurcan, D.C. (2005). Nanotechnology and Developing Countries; Part 1: What possibilities? *AzoNano Online Journal of Nanotechnology* (www.azonano.com).
- Mnyusiwalla A., Daar A.S., Singer P.A. (2003). "Mind the Gap": Science and Ethics in Nanotechnology. *Nanotechnology*, 14, 9 – 13.
- Moore, J., (2003). New technologies: The Public is Listening but are Scientists Talking? USG Paper presented at USG Interagency Meeting on Nanotechnology & the Environment: Applications & Implications. National Science Foundation. 15 September.
- Munich Re Group (2002). *Nanotechnology; What's in store for us*. January. Munich. Available at: http://www.munichre.com/publications/302-03533_de.pdf.
- Murdock, G., Petts, J., & Horlick-Jones, T. (2003). After amplification: Rethinking the role of the media in risk communication. In: Pidgeon, N., Kasperson, R., & Slovic, P. (eds.) *The Social Amplification of Risk*, pp. 159 – 174. Cambridge: Cambridge University Press.
- Renn, O., & Roco, M.C. (2006). Nanotechnology and the Need for Risk Governance. *Journal of Nanoparticle Research*, 8 (2), 153 – 191.
- Royal Society and the Royal Academy of Engineering, 2004. *Nanoscience and Nanotechnologies: Opportunities and Uncertainties*. July, London, UK. (www.royalsoc.ac.uk)
- Scott, I.M. (2000). Green Symbolism in the Genetic Modification Debate. *Journal of Agricultural and Environmental Ethics*, 13 (3-4), 293 – 311.
- UNESCO (2006). *The Ethics and Politics of Nanotechnology*. July. Paris. 22 pp. <http://unesdoc.unesco.org/images/0014/001459/145951e.pdf#search=%22UNESCO%2C%20nanotechnology%20ethics%22>
- Van Amerom, M., & Rip, A. (2006). Actor Strategies and Actor Constellations in the Nanotech Risk Debate. Paper presented at the European Association for the Study of Science and Technology

Second International Seville Seminar on Future-Oriented Technology Analysis: Impact of FTA Approaches on Policy and Decision-Making – SEVILLE 28-29 SEPTEMBER 2006

(EASST) Conference. Reviewing Humanness: Bodies, Technologies and Spaces. University of Lausanne, Switzerland 23rd-26th August 2006