

Book review

A still small voice

Rosalyn W. Berne. 2006. *Nanotalk: Conversations with Scientists and Engineers about Ethics, Meaning, and Belief in the Development of Nanotechnology* (Lawrence Erlbaum Associates, Publishers: Mahwah, NJ).

Nano-scale science and engineering (NSE) has been, perhaps with the exception of space travel, the most anticipated of modern technologies. For space travel, the trajectory of exploration – from journeys over the hills, then over the horizon, then around the globe, and finally journeys free of the globe – has had a familiar quality of extension, even if the specific technologies, or their financial bases, were absent.

Although NSE in some sense represents our ancient ability to manipulate matter, extended in just the opposite direction as space travel, ‘the strange new worlds’ that we might encounter at the nano-scale are more critical than those we might encounter in space for at least two reasons. First, the nano-scale is the interface between the weird quantum world and our own more classical world, and tapping into that weirdness may lead to technologies that transform not only materials but also biologies – and, as material, biological entities, ourselves as well. Second, these transformations are on our doorstep – or at least opening the gate and headed down the path.

The anticipation of NSE is expressed by a variety of sometimes competing technological visions – from Feynman to Drexler to Smalley, along with a host of other optimistic and even techno-utopian perspectives (McCray, 2005; Selin, 2006). The financial basis for this journey to the bottom is patent in the \$4.1 billion spent by the United States’ National Nanotechnology Initiative (NNI) from fiscal years 2001 to 2005 (Roco, 2005, Table 4).

Part of the framing for this vast initiative is the claim, proffered in a series of NNI budget documents, that nanotechnology represents the ‘next

industrial revolution’. But what NNI’s metaphor fails to express is that the Industrial Revolution was revolutionary not because our technological capability became so pervasive and profound, but because that capability evolved hand-in-hand with pervasive and profound societal changes – from work to communities to family life to art and existential meaning.

Such technocratic myopia is not unusual, and Rosalyn Berne’s provocative new book should serve as some corrective. Given that the scientific and technological are intertwined with the social and the ethical,¹ it is critical to discuss, at the very least, the societal issues raised by new knowledge-based technologies as they emerge. But, Berne asks, where among the technological for NSE is the moral vision that will guide change? Where are the voices discussing what we *should* do with this emerging capacity, rather than what we *could* do?

A professor at the University of Virginia, Berne has a background in religious studies and teaches in the Science, Technology, and Society (STS) department, which is part of Virginia’s School of Engineering and Applied Science. *Nanotalk* is itself a product of the modest vision for a moral perspective on emerging technologies the US has managed to institutionalize: to conduct this research, Berne received a CAREER award from the National Science Foundation’s Program on the Societal Dimensions of Engineering, Science, and Technology.² Her in-depth interviews with three dozen NSE researchers, repeated with two dozen of them, presages the research to be conducted by NSF’s newly funded Centers for

¹This is a general statement of the perspective of scholars in the field of science and technology studies. See Jasanoff et al., (1995).

²NSF recently reorganized SDEST into ‘Science and Society’, with programs in history and philosophy of science, social studies of science, ethics and value studies, and policy studies.

Nanotechnology in Society.³ The result is a probing meditation on technology and the human condition, framed on one hand by a learned discussion of the STS literature and, on the other, by NSE researchers themselves.

Nanotalk does more than argue for greater attention to ethical issues in NSE (and, by extension, other areas of emerging technologies). It provides a modest stage for the researchers Berne interviewed to rehearse their moral visions and voices around NSE – a platform she believes she must construct because the researchers' voices have been stilled by their need for resources. Scientists who are trying to catch 'the wave' of nanotechnology have little motive or opportunity, let alone incentive, for reflection. She fears that such scientists have been cast as amoral, and by styling her book with extended transcripts of her conversations with these scientists, Berne does her best to amplify her subjects' moral voice – even if she cannot deliver for them moral agency.

Having spoken in detail with them, Berne confirms that researchers do not feel expert in ethical matters, and the transcripts demonstrate why scientists and engineers alone are not capable of leading this discussion even though they urgently need to participate in it. The opening dialogue, for example, reveals Berne speaking with a theist nanoscientist called 'Russell'. Russell preaches the need for a 'stewardship' of nanotechnology, drawn from Brigham Young's beliefs (5). But Russell also rationalizes that because the true dangers of nanotechnology will not arise in his lifetime, he can safely ignore them – more technocratic myopia.

Another scientist, 'Nathan', argues that nanotechnology offers nothing new over chemistry other than a 'sanitized' neologism, even while proclaiming that his own research comes out of no clearly defined intellectual tradition (185). He argues for continuity between chemistry and nanotechnology with reference to activities of 50, 500, or 5000 years ago. One wonders what

³In October 2005, NSF announced funding for Centers for Nanotechnology in Society at Arizona State University and at the University of California, Santa Barbara, and large projects at the University of South Carolina and at Harvard. Berne's scientists show a deep ambivalence toward such research. One, "Carolyn," sees it as important but necessarily intrusive (63). Another, "Nathan," jokes that if NSF will spend \$10 million on ethics, then there really must be billions of dollars for NSE (197).

historians of technology, who scrutinize claims of novelty, demonstrate the contextual contingencies of innovations, and document the emergence of new social arrangements for innovation, would make of his arguments. To expound on social truths, he draws on fiction, a source Berne approves of, but which has not been a common reservoir of ideas sanctioned by science. By eliciting such responses, Berne demonstrates that even NSE researchers accept ethics, history, fiction, and other more obviously social forms of argument as appropriate, but also that they do not perform well with these forms. It is an ironic yet clarion call for a broader dialogue about nanotechnology, from the mouths of the nanotechnologists.⁴

These extended excerpts of interviews close each chapter and punctuate other parts of the *Nanotalk*. They often flow well, and I felt a voyeuristic pleasure reading them, particularly when Berne breaks tradition to reveal some of her personal experiences, and her subject responds in kind. Other times, they flow too well, and I felt lost in the intimacy of the conversation. Sometimes I felt the interviews were forced, that there was some shoe-horning to fit naturally disjoint conversations into a less natural analytical framework. Nevertheless, the desire Berne stokes in the reader to engage the researchers in conversation and debate, even more so at times than she does herself, is one of *Nanotalk's* real joys.

Beyond revealing the moral voice of some NSE researchers and providing the opportunity for at least an imagined dialogue between them and the reader, *Nanotalk's* primary contribution is Berne's formulation of three dimensions of ethics. First Dimension Nanoethics (79) are about explicit and widely held standards, protocols of safety and integrity, and related public policy issues like risk assessment. An example of First Dimension Nanoethics is the *primum non nocere* – the principle of 'first, do no harm'. It is often – and minimally – to First Dimension principles that the 'societal implications' of new technologies attend, e.g., the inclusion by NSF of the study of the environmental effects of nanotechnologies under the societal implications rubric.

⁴Sometimes the NSE researchers are just goofy. 'Kent', for example, speaks with some reverence for the cloistered utopian community of Damnhur (281) and with some air of authority that 'the US and the Soviets have...for years [had the capacity to] make tornadoes go' (282).

Second Dimension Nanoethics (82) are about contestable and negotiable moral claims that are subject to the vagueries of will, power, and persuasion. Examples might include questions about the distribution – rather than the magnitude – of risks and benefits from nanotechnological innovation, or the competing values in military nanotechnology for enhancing the survivability of individual soldiers but altering the dynamics of the battlefield and warfare in general. The 21st Century Nanotechnology R&D Act (P.L. 108–153) implies that such questions should be on the societal implications agenda, especially when it suggests that public engagement for decision-making purposes (as opposed to merely educational purposes) is important for nanotechnology development.

But Berne prefers to concentrate on Third Dimension Nanoethics (88), which are about understandings of the purposes of human life, beliefs about existence and self-hood, and similar big-think questions that she labels ‘meta-ethical’. Here, ethics is about making meaning, and Berne’s idea of ethics involves public dialogue, narrative, and metaphor to engage the moral imagination and provide purpose beyond the thinly articulated ‘pseudovalues’ that disguise attention to real motivations (174–175). In particular, she focuses on metaphors of design, progress, and (yes) revolution. Only if ‘authentic attention [is] given to the nature, tenor, and function of human values and beliefs embedded in’ the nanotechnology initiative can we achieve Berne’s larger goal, the ‘conscientious pursuit of nanotechnology’ (75).

Instead of finding conscientiousness, however, she encounters something more like resignation. Many of her interview subjects believe that we as a society will do what is technologically possible and then deal with the consequences. Berne encourages both her scientists and her readers to emerge from their dream state in which the technological is pre-destined and pre-ordained and awake to the possibility of a conscientious, humanitarian nanotechnology.⁵

⁵Berne draws on the French technology critic Jacques Ellul for her metaphor of dream state, although she does not adopt his technological determinism broadly. Her view is more in line with Langdon Winner’s (1977) description of ‘technological somnambulism’ in which we are so inattentive to technology, as if we were sleepwalking, that it appears to be beyond our control.

Berne senses a change in both her subjects and herself over the course of the interviewing. Her subjects do stir a bit, becoming more alert to the ethical and moral questions involved in their work. She prods them and her readers with at least one scientist, Freeman Dyson, who likewise sees ethics as guiding technology (288). Berne, one imagines, reciprocates, for although she might have been more worried about nanotechnology before her inquiry, she reports that she does not advocate a moratorium ‘at this time’ (as, for example, the ETC Group does⁶), because there is too much to learn (51). Yet she couples that support with the unassailable assertion that reflection on what NSE researchers are learning is a ‘moral imperative’ (58).

Nanotalk is inspired, but it might have been somewhat better crafted. Berne’s writing style is clear, with the exception of some odd usages and her distracting avoidance of the literary present. She includes helpful appendices on her interview protocol, the history of the NNI, and a summary of P.L. 108–153. There were, however, too many copy-editing oversights, with my particular favorite being a rendering of ‘Jung’, on whose theories of myth Berne draws, once as ‘Jugs’ (290).

Of course, imperfections of this sort can be taken as an object lesson. No one set out to craft an imperfect book, just as – we assume, excluding criminals and terrorists – no one sets out to create societal ills through NSE. Yet ills happen, as the result of misunderstandings, incapacities, failures of imagination, and incomplete deliberations, among other causes. As Berne insists, nanotechnology (or any other technology) is not a force but a product of human will. It is not ‘a matter of time. It is a matter of intention’ (166). Berne therefore concludes that the ‘[r]esponsibility for nano-scale science and engineering development belongs to us all’ (312).

This claim could be taken as meek – that if everyone is responsible, then no one is. But I do not believe she means to risk accountability through diffusion of responsibility. Rather, she believes that

⁶ETC Group (the Action Group on Erosion, Technology and Concentration) addresses issues of new technologies, among others, from the perspective of human and economic rights. The group (ETC, 2003) has called for a moratorium on the use of synthetic nanoparticles in laboratories and commercial products.

we all have a moral vision and a moral voice, and it is the responsibility of each of us to exercise them as the first step to conscientiousness. There are steps to follow this first one that *Nanotalk* does not plot. Specifically, we must redesign the innovation system to enable such reflexive visions and voices to alter the trajectories of knowledge-based innovation as its products are emerging (Guston and Sarewitz, 2002; Willis and Wilsdon, 2004). *Nanotalk* amplifies the still small voice of conscientiousness, but we need to do more than listen.

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