

Understanding Nanotechnology Anthropologically

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Nanotechnology is currently enjoying a period of immense attention, and with this, very large amounts of funding. Most of this research money has been directed to basic scientific and engineering studies of phenomena at the nanoscale (1-100 nanometers, or the size range of atoms, molecules and viruses).

Some describe nanotechnology as a materials revolution, some discuss the possibility of “molecular manufacture,” and still others are focused on new forms of cancer treatment, drug delivery or biosensing. All of these areas are continuous with older research across scientific and technical fields, but “nanotechnology” provides a new and convenient, if not quite yet coherent, frame through which to understand it all. Along with this flourishing of a new science have come a variety of calls for social, ethical, cultural and legal research on nanotechnology—and even more unusually—increased funding. NSF has funded a number of small grants in nanotechnology. Recently it announced a competition for a center devoted entirely to cultural, social and ethical research on nanotechnology. The budget for this single center will dwarf most other coordinated projects in anthropology and science studies.

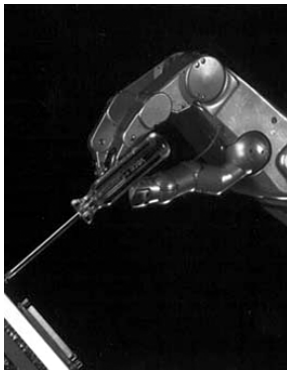
Nanotechnology and Social Sciences

With this influx of funding, finding innovative ways to make anthropology relevant to nanotechnology has suddenly become very appealing—though certainly not easy. During the past semester, I experimented in just this kind of relevance-seeking. Together with colleagues at Rice, anthropologist Hannah Landecker and Kristen Kulinowski, the director of the university's Center for Biological and Environmental Nanotechnology (CBEN), I developed a course to integrate some basic scientific, technical and medical teaching with history, anthropology and sociology of science (<http://kelty.rice.edu/235/>). The course was funded by the NSF's Nanoscale Science and Engineering Education program. The course provided two things for those of us involved as social scientists: first off, a chance to learn the details of some of the science and engineering involved—to effectively do a bit of short-term fieldwork in the area. Second, to teach students to think about sci-

ence and engineering in more than simply instrumental terms, and in particular to investigate what kinds of social and political contexts are relevant to current research in nanotech.

The “Center Model”

One of the most interesting findings in our fieldwork concerns not the science, but the institutions of “mediation” emerging alongside nanoresearch itself. CBEN, for example, is one of 14 NSF-funded centers devoted to nanotechnology, and represents the emergence of a “center model” in which particular interdisciplinary con-



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cerns are managed outside the traditional disciplinary and organizational structures of universities and corporations.

CBEN is focused on environmental and health issues, what are sometimes awkwardly called by scientists the “wet-dry interface.” Researchers in this center study the environmental and medical benefits of nanomaterials, as well as the toxicity, hazard and exposure risks of nanoparticles. Some scientists have opposed CBEN, fearing that too strong a focus on potential dangers of nanotechnology will endanger their funding, but at the same time, the center has no shortage of scientists willing to investigate just these issues.

Part of the background to CBEN is the specter of genetically modified foods in Europe in the 1990s. Most interested industries, start-ups and venture firms cite Monsanto's perceived public relations disaster as something they wish to avoid. Hard evidence about the safety of nanotech, along with a concerted effort in education, they believe, will

help reassure the public about new products. So in addition to scientific research, CBEN also recently announced the formation of the International Council on Nanotechnology (ICON), a coalition of university, industry and NGOs. The three invited environmental NGOs declined to participate, however, as they perceive ICON and CBEN to be too closely tied to industry—companies concerned about public perception of nanotechnology, like DuPont, Loreal and SwissRe, are participating in the project.



Teaching Critical Thinking

Our participation in CBEN as anthropologists has been hesitant, and mostly as observers, not active participants. The call to conduct research in this area is often coded as an implicit endorsement of the project of nanoscience and nanotechnology.

Yet it is becoming clear through our work that criticisms and concerns about nanotechnology are based in poor reasoning, and more importantly, an almost complete lack of clear understanding of the scientific and technical issues at stake.

Effective criticism, like effective proof of the benefits of nanotechnology, needs to be based in sounder thinking. My students, for instance, explored popular perspectives on nanotechnology. They discussed the “grey goo” scenarios of self-replicating entities promulgated by scientists like Eric Drexler and Bill Joy; and considered Michael Crichton's novel, *Prey*, about self-sustaining, self-reproducing micro-robots; and questions of posthumanism, or the movement to move beyond the human form, raised by Francis Fukuyama.

While students found these science fiction prognostications intriguing, they were also very quick to point out how they failed to engage both with the scientific details of nanotechnology and with the details of social organization, culture or economics. The students' intuition here is probably the best indicator of what kind of research is most needed—research that carefully integrates fieldwork in science with critical thinking about the socioeconomic, ethical and political issues in a changing society. Hopefully the influx of funding available to social scientists studying issues relevant to nanotechnology will encourage more careful reasoning and investigation than the work done to date by journalists, scientist-pundits or science fiction writers. □

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