

Center for Nanotechnology in Society

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The Center for Nanotechnology in Society at UCSB serves as a national research and education center, a network hub among researchers and educators concerned with societal issues concerning nanotechnologies, and a resource base for studying these issues in the US and abroad. The work of the CNS-UCSB is intended to include diverse communities in the analysis of nanotechnology in society and to engage in outreach and education programs that include students and teachers and that extend to industry, community and environmental organizations, policymakers, and the public.

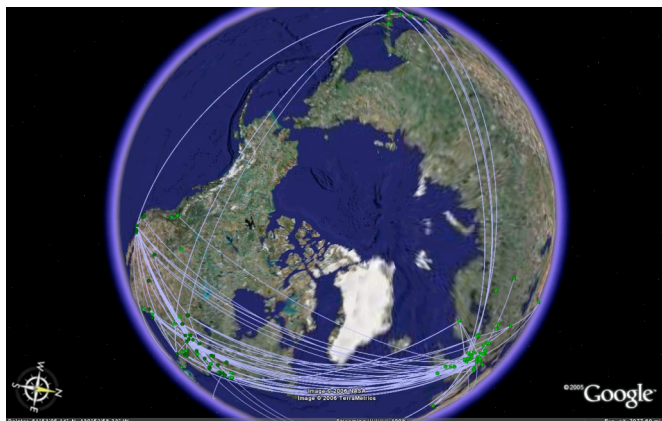
The center addresses questions of nano-related societal change through research that encompasses three areas: **Historical Context of Nanotechnologies** seeks to develop an understanding of the past and current landscape of the nano-enterprise. **Innovation, Intellectual Property, and Globalization** uses mixed quantitative and qualitative methods to examine the institutional and industrial processes of technological innovation of nanotechnologies along with their global diffusion and comparative impacts, with a particular focus on China and Taiwan. **Risk Perception and Social Movements** uses similarly mixed methods to focus on public perception and social intelligence about nanotechnologies, social amplification and attenuation of risk, methods for deliberation, and collective action in response to nanotechnologies. The Center's three interdisciplinary working groups combine expertise in many fields: technology, culture, health, environment, spatial analysis, and science and engineering. In combination, these three efforts address a linked set of issues regarding the domestic US and global creation, development, commercialization, production, and consumption, and control of specific kinds of nanoscale technologies. Important features of our collective approach are an integrated, participatory relationship with nanoscientists; a focus on specific nanotechnologies such as nanoelectronics and nanoparticles; comprehensive consideration of their applications in industries like electronics, energy, environmental, and health; and employment of spatial analytic methods and a global framework for analysis. The research also develops methods for public participation in setting the agenda for nanotechnology's future.

The Center draws on UCSB's renowned interdisciplinary climate to integrate the work of nanoscale engineers and physical and natural scientists with social and environmental scientists from over a dozen disciplines and programs studying nanotechnology in society. Close ties with the nanoscale researchers at the California NanoSystems Institute (CNSI) and with social science research centers at UCSB focused on relations among technology, culture, and society is enhanced by social science collaborators in the US at UC Santa Cruz and UC Berkeley, Duke University, and the Chemical Heritage Foundation, and internationally at the Australian National University (ANU), Cardiff University (Wales), University of British Columbia (UBC), and University of Edinburgh. The Center also is a lead partner in the NSF Network for Nanotechnology in Society, which includes partners at Arizona State University (CNS-ASU), Harvard University, and University of South Carolina. UCSB is also a member of the National



Nanotechnology Infrastructure Network (NNIN), providing additional inter-institutional connections with other NSECs and leading nano R&D sites. A CNS visiting scholar program supports travel for students, faculty, and staff among these institutions to encourage collaborative research and synthesis, and a specialist meeting program will convene working groups across these institutions.

Understanding future societal implications of nanotechnology is predicated on a clear, coherent, and comprehensive understanding of its historical and social context. The **Historical Context of**

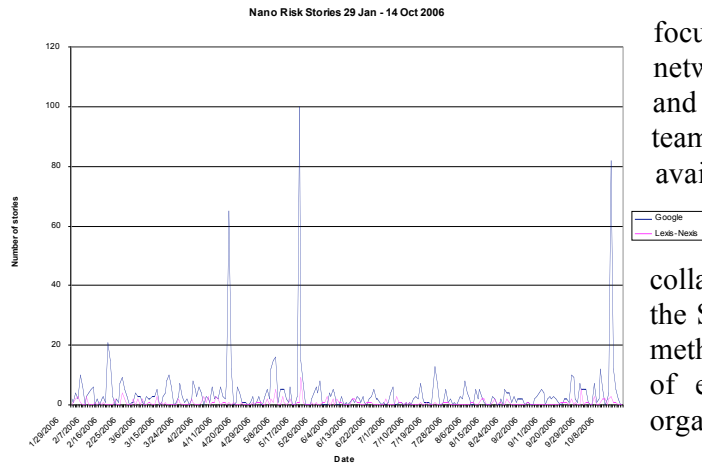


Global Spintronics Collaborations 2005
McCray, Gianelli, and Lenoir 2006

Nanotechnologies working group (WG1) is currently carrying out research on the history of nanoelectronics, beginning with the field of *spintronics* (which exploits electron spin instead of its charge). In addition to doing formal oral histories with key scientists in this field, they have initiated an extensive effort that will allow data mapping and visualization of the growth of spintronics at academic, commercial, and government laboratories. Another research focus is historical overlap between US pro-space exploration and pro-nanotechnology movements in order to trace public and commercial interest in nanotechnology to futurist imaginings of nano's potential applications.

The **Innovation, Intellectual Property, and Globalization (WG2)** team combines two streams of research to develop a comprehensive understanding of the processes of innovation, diffusion, and commercialization of nanotechnology. The Innovation Group involves interdisciplinary collaboration among three UC campuses and seeks to add to scholarly knowledge and public discussion by examining core elements of the nanoscale innovation system in the *university-industry interface*. They are examining the institutional mechanics by which technology is transferred from the university to industry; the effects of intellectual property rights in the context of new and emerging hybrids of ownership, conditional use, and open access; and the research communities that emerge (or fail to emerge) across a range of different institutions. A second area of research in WG2, a collaboration of UCSB with Duke University, focuses on Global Diffusion of Nanotechnologies, with a strong emphasis on the role of international collaboration in nano R&D in China and Taiwan. A team of faculty and student researchers worked in China and Taiwan in summer, 2006, and their first external research report is in preparation.

The teams working in **Risk Perception and Social Movements (WG3)** are pursuing several streams of integrated research. In 2006 the interdisciplinary international risk perception team from UCSB, Cardiff U, and UBC initiated a study of nanoexperts' risk perceptions among academic and industry nanoscientists and engineers, nanotoxicologists, and regulators, an important prelude to public risk perception studies and future public – scientist engagement. They have developed and piloted in two sites a public deliberation protocol for concurrent implementation in the US, Canada and the UK early in 2007. This study will provide the first systematic comparison of US public deliberation on nanotechnologies' futures with engagement efforts in the UK and Canada, providing a comparative framework within which to examine issues of trust. The team also has initiated development of a decision analytic survey instrument to study public risk perception in the US. The Nano-Networks component of WG3's research examines "elite" reaction to nanotechnology in global civil society, by



Global Nano Media Risk Stories Jan-Oct 2006
Bimber and Weaver 2006

focusing on media framing and activities of networks of activists, advocacy organizations, and other non-governmental organizations. The team has collected the most exhaustive database available anywhere that tracks English-language media coverage of societal implications of nanotechnologies. This team also collaborates with ANU's Virtual Observatory for the Study of Online Networks (VOSON) to pilot methods for creating network maps in web-space of environmental groups and other advocacy organizations active on nanotechnology issues.

Education and Public Engagement – The goal of our Education and Public Engagement activities is to nurture an interdisciplinary

community of researchers, students, educators, and the general public who collaboratively engage in the study of nanotechnology and society. During its first year, the CNS-UCSB developed two fellowship programs for graduate students. The CNS-UCSB recruited five full-time social science graduate students from the UCSB campus to participate in the research programs. Four part-time science students, also from UCSB, were also recruited to assist in integrating CNS research with the scientific community on campus. The Center initiated a 10-week Undergraduate Research Internship program in Summer 2006. This was advertised on the UCSB campus as well as throughout community colleges on California's Central Coast. Three UCSB undergraduates and two community college undergraduates participated in the internship program and, due to its success, four of them are continuing their work with CNS during the 2006-2007 academic year. To foster interdisciplinary communication and enhance exposure to issues and research relevant to CNS, we instituted a regular Fellows meeting/seminar series which meets once a week. The CNS Graduate Fellows also help coordinate our Visiting Speakers series. The partnership of the CNS with the CNSI has enabled it to recruit students from underrepresented groups for research internships; these students will be drawn from community colleges, state universities and research universities. Finally, the CNS has established a clearinghouse for public engagement through its website and is actively developing it as a resource tool for diverse audiences.

International Collaborations – The CNS sees international collaboration as a key part of its work. Formal collaborations are in place with universities in Canada, Wales, Scotland, and Australia; additional connections with academic institutions in China and Taiwan are in development. Through our Cardiff partner, CNS-UCSB has representation on the influential International Risk Governance Council (IRGC) and connection to many leading EU risk researchers. In addition, the International Nanotechnology and Society Network (INSN), on whose executive committee CNS-UCSB serves, is fostering dialogue among nano and society researchers in North America, the EU, Central and South America, and East Asia.

Collaborations with Industry and other Institutions are actively encouraged. A National Advisory Board consisting of leading figures in social science and nanoscience, science and technology policy, science education, and industry evaluates the Center's programs for research and education.

References [1] For further information about this project please see our website at <<http://cns.ucsb.edu>> or email <harthorn@isber.ucsb.edu>