Democratizing Technologies:

Assessing the Roles of NGOs in Shaping Technological Futures

Conference Report | June 2015

Democratizing Technologies: Assessing the Roles of NGOs in Shaping Technological Futures
Conference Report | June 2015

Authors

Xueying Han
Postdoctoral Scholar
Center for Nanotechnology in Society
University of California, Santa Barbara

Cassandra Engeman
Senior Research Fellow, Center for Nanotechnology in Society
PhD Candidate in the Department of Sociology
University of California, Santa Barbara

Richard Appelbaum
Research Professor and MacArthur Chair of Global and International Studies
Research Professor of Sociology
Research Group Leader at the Center for Nanotechnology in Society
University of California, Santa Barbara

Barbara Herr Harthorn
Director of the Center for Nanotechnology in Society
Professor of Anthropology
University of California, Santa Barbara

Key Sponsors

Overview

The responsibility for safeguarding the environment, human health, and community livelihoods is often considered the realm of governments. However, to the extent that governments have not or cannot keep pace with technological innovations and respond to concerns regarding their societal impacts, non-governmental organizations (NGOs) have attempted to fill this void as representatives of publics and public interests. The degree to which NGOs are shaping, or even replacing, state governance – and the consequences of such trends – is subject to much debate, and was the central concern of this conference. In addition, the conference was designed as a public engagement and participation experiment specifically involving diverse NGOs as key publics in debating technological futures.

Democratizing Technologies was convened by the Center for Nanotechnology in Society (CNS) at the University of California, Santa Barbara (UCSB) on November 13-15, 2014. It focused on NGOs with environmental and social justice concerns regarding new technologies and asked two key questions: **How can NGOs produce more equitable and sustainable outcomes of emerging technologies? What are the implications of NGO participation in governance for democracy and technological advancement?**

Global in scope, the conference brought together social scientists, science experts, government regulators, and NGO leaders to consider how NGOs – by engaging broader publics, media and policy makers – can and should influence technological

investment, advancement, and regulation within a rubric of "responsible development," exploring questions such as:

• To what extent, and in what areas, are NGOs attempting to fill the governance roles traditionally provided by states – and with what results?

• What are the views and priorities of NGOs regarding diffusion of new technologies?

• When are the agendas and policies advocated by NGOs adopted by states or in international agreements? When do industries or companies comply with NGO-advocated standards?

• How do NGOs, especially those that are local- or nation-based organizations, advocate public interests with respect to technologies that have global implications?

• How do NGOs help shape the science and technology-related areas in which scarce public resources are invested?

• What are the challenges for NGOs in the global media environment? How do NGOs manage a media landscape where attention is unpredictable?

• Which NGOs gain access as participants in science and technology (S&T) governance-related issues – and how is such participation determined?

• How are new media changing the landscape for NGO engagement, participation, recruitment and dissemination?

Participants explored these questions as they related to a range of new technologies: nanotechnology, synthetic biology and biotechnology, information technology, spatial analytic technology, and robotics.

Sessions were organized to discuss how these new technologies related to societal needs; NGO humanitarian efforts, organizing, and upstream work on social and health issues; workplace safety, employment, and the quality of work; corporate social responsibility; and governance in the context of rapid, global change. Plenary speakers provided context to issues that were broken down into more specific topics in concurrent sessions where they were explored in finer detail.

The body of this report provides an overview of the conference sessions that address four main subtopics. The first, "Assessing Risks and Promises of New Technologies," introduces the conference, laying out key issues regarding new technologies. Second, "Does Better Technology Make Stronger Democracies?" explores how new technologies have been used to broaden the reach and efficacy of NGO work as well as some cautionary points for NGOs. Sessions in "Defining and Achieving Social Responsibility" question meanings of social responsibility, who is and should be ultimately responsible for safeguarding human health and the environment, and how industry can play a role. Lastly, the fourth subtopic, "Responsible Development, Responsible Innovation: Global Gover-
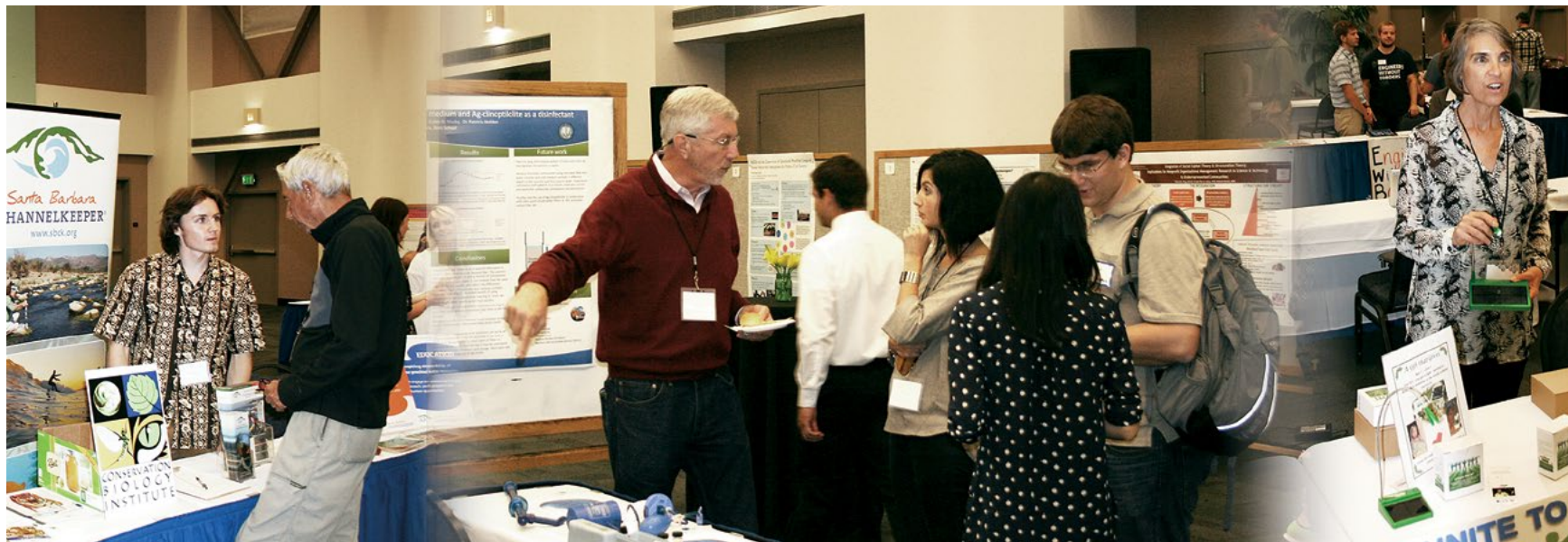
The 'NGO Marketplace' provided undergraduate and graduate students from the University of California, Santa Barbara with a unique opportunity to engage with NGO activists and learn about NGO career paths and opportunities. The Marketplace featured twenty-two local, national, and international NGOs.

nance of New Technologies," addresses some of the challenges for governing new technologies for states and NGOs. Adopting a format similar to the conference, each section starts with an overview provided by the plenary speakers and then delves into more specific issues in the breakout sessions.

Conference Objectives

Democratizing Technologies was organized to bring attention to the role of civil society organizations (CSOs) or nongovernmental organizations (NGOs) in shaping new technologies. Such organizations influence technological advancement by using new technologies, such as GIS or social media, in their own work or by directly engaging issues of science and technology research and development – its agendas, investment, and governance. This nexus of organized civil society and new technologies has received little scholarly attention, and this conference in many respects charted new territory.

As an exploratory public participation endeavor, the conference recruited heavily from NGOs for its program. Because NGO leaders bring on-the-ground experience, their perspectives are particularly valuable at this early stage investigation of their work and impacts. In addition to exploring these issues, the conference contributed to the outreach efforts of all participants – academic researchers, government, and NGO representatives – and facilitated cross-institutional dialogue and cultivation of international networks of organizations with interests in the nexus of technology and society. The conference also connected the NSF Center for Nanotechnology in Society at UCSB and its researchers with broader communities.

To this end, the conference featured a poster session to broaden participation and representation of diverse early-career researchers and graduate students. Poster participants were able to present their research and findings on the role of NGOs, technology, and society to the larger conference audience. Presenters came from a wide range of geographical locations ranging from California, New York, Virginia, and North Carolina to Canada, China, and India. Poster presenters also took part in the poster competition in which conference participants voted on the best three. First place went to Dr. Patrick Roberts, Associate Professor at Virginia Tech on his study of "The Cavalry versus an Electronic Militia: Comparing the IAEA and CTBTO's Response to Fukushima." Second place went to Poonam Pandey, doctoral student from Jawaharlal Nehru University in India, on her work in "The Changing Terrains of Regulatory Science in Developing Countries: NGOs, Controversies and 'Opening up' of Regulatory Governance." Third place went to Galen Stocking and Ariel Hasell, both social science graduate fellows at CNS-UCSB, on their collaborative work on "Nano Twitter: Can Social Media Provide a Means for Public Engagement about Emerging Technologies?"

Another unique feature of our conference was the "NGO Marketplace," a networking event in which local community members, and UCSB graduate and undergraduate students were able to speak to NGO representatives about working in the NGO sector. Twenty-two local, national, and international NGOs participated in the Marketplace and represented a broad spectrum of sectors from technology to safe water to environmental law.

Pulitzer Prize-winning New York Times journalist Nicholas Kristof in a private meet-and-greet session with invited participants from the conference.

Keynote Address

Pulitzer Prize-winning New York Times journalist Nicholas Kristof gave the opening keynote address for the conference on the evening of November 13. Speaking before a packed audience of nearly 800 faculty, students, and community members, Kristof painted a promising picture of the many roles that NGOs are playing locally and globally. Drawing on examples from his recent co-authored book (with Sheryl WuDunn), Kristof argued that The Path Ahead (the book title) is ultimately

blazed by many people: a faint trail today becomes a clear, well-trodden path when others follow. His talk was followed by an on-stage discussion with conference co-organizer Richard Appelbaum, who asked about the role of technology in creating a path ahead that might improve the lives of the world's poor. Kristof argued that technology has a significant, transformational role to play. Mobile phones, he argued, may ultimately trump all other technologies, in that they improve communication and foster greater accountability.

Section 1: Assessing Risks and Promises of New Technologies

The opening plenary and subsequent breakout sessions introduced some main issues and concerns regarding new technologies and their societal implications. A key issue, introduced by opening plenary speaker, Vivek Wadwha, is the exponential growth of technological advancements. **The rapid pace of such advancements contributes to an ever-widening gap between the use of new technologies and the ability of states and civil society to assess potential consequences and if necessary, intervene**. Another issue is the introduction of new technologies to the market without sufficient research or knowledge of potential human health outcomes and long-term environmental consequences. Widening this socio-technical gap further are the unintended consequences of new technologies and our lack of knowledge about them. Drawing examples from her own investigations, journalist Elizabeth Grossman, speaking also in the opening plenary, noted that food additive chemicals make pizza boxes grease-proof but remain long after their intended use, raising yet-unanswered questions about their potential environmental impacts. Too often, she argued, we focus on technologies' intended performance without mindfulness of full life cycle consequenc-

"The conference did a great job of bringing together a set of important complex themes - technology, NGOs, and democratization - in an original and thoughtful way. This made it possible to start new conversations, even if some of these conversations arise from very different starting positions and are not always easy."

— David Lewis, Professor of Social Policy and Development

es, assuming nature will be able to absorb chemical output harmlessly. The global characteristic of new technologies – their supply chains, uses, and potential unintended consequences – poses challenges for effective governance.

To address uncertainties surrounding rapid technological advancements, some civil society organizations have advocated a precautionary approach to governance. This approach, as it applies to new technologies, requires the producers or developers to prove that a new technology is safe before it is used or introduced to the market. An appeal of this approach, as noted by David Azoulay, is its applicability across a diverse array of new technologies. Azoulay explained how one working group of the International POPs Elimination Network (IPEN) – a network of over 700 organizations united under the moniker of a "toxic free future" – are advocating such an approach with regard to nanotechnology. IPEN recognizes international regulation of nanotechnology as a far-off goal and adopts a strategy to raise public awareness of nanotechnology – where awareness is low. It involves national champions to lead policy discussions regionally with an

eventual goal of making the European Union an example for nanotechnology regulation globally.

An important motivation for a precautionary approach is the lack of knowledge or research on potential environmental or human health impacts of new technologies. Such research can lag behind technological innovation and the introduction of new technologies to the market. Linsey Shariq spoke of her efforts to understand the potential risks associated with repurposing and reusing wastewater from petroleum production operations. As a graduate student of civil and environmental engineering, she is studying how fracking chemicals can be transmitted into the edible portions of wheat grain when wheat is irrigated with water contaminated with trace amounts of fracking fluid chemical components. She hopes her work can be used to inform publics and policymakers, and she noted that the increased public awareness and interest in fracking-related issues opens opportunities for action.

Like Shariq, many speakers drew on their unique expertise to contribute change. Concerned with the adverse effects

of hydraulic fracturing, Katie Davis drew on her background as a community organizer in her work with the Santa Barbara Water Guardians. This organization introduced the first ballot initiative in the United States that would ban oil extraction by fracking, acidizing, and steam injection. Had the initiative passed, it would have only applied to Santa Barbara County, but the campaign received national attention. Speaking one week after the election, Davis explained that grassroots organizations play an important role in educating and empowering people to act locally to influence changes with global implications. She anticipated that policy action would be required for impacting the trajectory of oil recovery activities. However, to influence policy, she noted, organizations must engage in politics, and she suggested that lobbying activities will be an important aspect of her group's strategy moving forward.

While noting some societal challenges, Vivek Wadwha found potential in technological advancements. He provided numerous examples of advancements in synthetic biology, robotics, 3D printing, and computing and their abilities to address problems related to health, food, water, and energy. The problem-solving potential of new technologies was evident in the work of two Santa Barbara-based organiza-

tions: Safe Water International (SWI) and Unite to Light, organizations that provide, respectively, safe water and energy to rural communities in Africa. Dawn O'Bar spoke of how Unite to Light has distributed over 16,000 cheap and robust solar-powered light sources to children and families without access to electricity. These devices have had the anticipated benefit of enabling children to study at night as well as some unanticipated benefits. For example, one village was using these lights to scare lions away from livestock. Both O'Bar and Siegel demonstrated how small organizations, using established, easy-to-use and -distribute technologies can produce meaningful outcomes.

A recurrent theme of the conference was the imperative for technologies to meet societal needs. Speakers Sheila Davis, Jose Gomez Marquez, and Moses Kizza Mousazzi, each challenged what they saw as a narrow focus on technology distribution as a solution to problems in developing countries and argued for a different approach, starting with product design. Marquez noted that 90% of the medical devices in the developing world are donated by well-meaning programs but tend to fail within six months, because they are not designed for use in local contexts. As one solution, Marquez – a leader

> "[The conference] contributed significantly to developing common understanding across the academic community and nonprofit sector - and how each might contribute new knowledge to the other in addressing real world problems."
>
> —Kirk Jalbert, PhD Candidate in Science and Technology Studies

Barbara Harthorn, Director of the Center for Nanotechnology in Society, and Professor of Anthropology at the University of California, Santa Barbara.

of the Little Devices Lab at MIT's International Design Centre – created the MEDIKit project. Designed to be hacked, the project is a series of reconfigurable building blocks that enable doctors, nurses, and patients to construct drug delivery systems, modular lateral flow immunoassays, low cost microfluidics, and other basic instrumentation with real-time applications for dengue, Ebola, listeria, and other tropical diseases. Marquez questioned the need for major advancements of new technologies in preference for technologies that can be scaled-up and reconfigured to meet needs in specific and changing contexts.

Similarly, Mousaazi emphasized the importance of distributing technologies based on actual needs, some of which do not require path-breaking technological advancements. A Ugandan inventor with a PhD in Electrical Engineering, Mousaazi founded Technology for Tomorrow, Ltd. to innovate "appropriate technologies," such as sanitary pads and construction materials. His organization trains people in making bricks that are more durable with the purpose of building long-term, safe housing and a means to make a living. With an eye toward product end-of-life and waste management, his organization created biodegradable sanitary pads, which are easy to produce and made of papyrus, a native plant.

Davis shared this forward-thinking mindset with regard to life cycles and waste management in her work to develop a Sustainable Off-Grid Solar Recycling Incubator in Africa, where solar panel use is rapidly expanding, particularly in communities disconnected from electrical grids. Noting that many African countries are targeted for lower quality products, resulting in more waste, she argued the need to innovate for sustainability rather than consumption. The Incubator is being developed to promote the market expansion of off-grid solar products while innovating waste management systems. Rather than focusing on technology distribution, the Incubator encourages reverse distribution – retrieving products for recycling or repairing to maintain their use-value.

Meeting societal needs also requires local partners. Siegel and O'Bar noted the need to collaborate closely with the communities their organizations aimed to serve. Romanus Berg spoke of how the structure of Ashoka: Innovators for the Public is designed to draw from local expertise. His organiza-

Cassandra Engeman, Senior Research Fellow at the Center for Nanotechnology in Society at the University of California, Santa Barbara.

tion supports over 3,000 fellows who are social entrepreneurs in 87 countries, mostly in Asia and Latin America. The fellows address a broad range of topics but constitute Ashoka's "ecosystem" approach – where stakeholders become owners of solutions. Berg said the critical mass of fellows help to anticipate problems and patterns and enable them to "see the global village from the rooftops."

Importantly, the process of democratizing technologies goes well beyond technologists. Democratizing participation in the creation, dissemination, and direction of technological solutions has important roles for experts, community organizers, and members of the general public. The diversity of backgrounds, interests, and expertise yielded diverse approaches: advocating regulation; researching technological impacts;

designing durable, sustainable, and adaptable technologies; and partnering with local communities to address societal needs. In some cases, speakers questioned the need for path-breaking technological advancements and instead advocated smarter use of existing technologies. Regardless of his/her specific approaches, each speaker emphasized the need to be pro-active.

Section 2: Does Better Technology Make Stronger Democracy?

Much technologically optimistic rhetoric that accompanies national level research and development (R&D) programs in the U.S. and abroad assumes or asserts that technological progress will lead to societal progress. Focusing analytic attention on the means for realization of such parallel development or "co-evolution" of science and society is one of the main purposes of the Center for Nanotechnology in Society at UCSB and this conference. This session posed a key question about the range of intended and unintended consequences of new, technically better technologies on societal betterment, asking our speakers to reflect on whether better technologies do indeed make for stronger, more robust democracies? Under what conditions does better technology lead to stronger democracy, enhanced means for citizen participation and dialogue, and co-development of the path toward societal progress? And does this framing issue inform NGO leaders in their work? Taken from another direction, the session also asks how NGOs have worked to enhance regulatory, governance approaches.

Plenary speakers Lisa Parks and Thomas Tighe addressed how technologies can provide both opportunities for societal good as well as pose new, unanticipated societal challenges.

A common assumption in developed worlds is that introducing information and communication technologies (ICTs) to developing countries would improve their standards of living, particularly in areas of governance, health care, education, and agriculture. Parks challenged this premise through her research in rural Zambia, where she found that there is a large potential for mismatch between post-industrialized actors' intentions and goals with ICT development and the needs and desires of community members in developing countries for integration of ICT in their lives. Such mismatches include misunderstandings about presumed public lack of technological knowledge, presumed community desire for outside assistance and intervention, different priorities in technological needs and infrastructure development (e.g., access to water versus ICT), and failure to recognize the potential for surveillance represented by ICTs.

Tighe also noted mismatches between who has the technology and who needs the technology and how such mismatches often result in many people not receiving the help they need even when there are technological solutions to their ailments. A mismatch also occurs when high-end market information and technologies are extended to places where there is no commercial rationale to extend these services. Tighe argues that the measure of **how successful a technology is should depend on whether or not it makes people's lives better**. Tighe emphasized that the role of Direct Relief is to democratize technologies, particularly medical and health innovations, for all sectors of society and provide access to those who might never have the money to buy them.

In a concurrent session, speakers Kristen Kulinowski, Todd

Richard Appelbaum, Research Professor and MacArthur Chair in Global & International Studies and Sociology, and Research Group Leader at the Center for Nanotechnology in Society, University of California, Santa Barbara.

Kuiken and Lotte Krabbenborg examined the role of NGO influence on governance of nanotechnology and synthetic biology. Drawing on case studies from the International Council on Nanotechnology (ICON), the Woodrow Wilson Center, and the collaboration between DuPont and the Environmental Defense Fund (EDF), the speakers offered insights into how NGOs succeed or fail in influencing governance of emerging technologies.

According to all three speakers, **the most successful strategy for NGOs influencing governance of emerging technologies has been incorporating stakeholders into deliberations**.

Michael Witherell, Vice Chancellor of Research and Professor of Physics at the University of California, Santa Barbara.

Kulinowski argued that **NGOs with scientific expertise had the biggest influence on governance**. Such experts understood the science research implications, respected the integrity of scientific models, and produced targeted policy recommendations rather than staging spectacular protests. Focusing on the emerging world of do-it-yourself synthetic biology, Kuiken argued that the flexible self-governance model proposed by the Woodrow Wilson

Center responded well to the emerging technology of the DIY biology community. The Woodrow Wilson Center played an important role in establishing governance structures that allowed outsider communities to thrive. Krabbenborg drew from case study research of a joint effort between DuPont and the Environmental Defense Fund (EDF) to argue that such collaboration created a forum where emerging technologies were included as a topic for deliberation.

The problem of studying unknown risks has been difficult for the NGO community's influence on governance. Along the same lines, the DIY biology community has become a scape-goat for anticipated problems that the community is not yet even capable of producing. Similarly, DuPont worried that the EDF would lack sufficient understanding of the science to be an effective partner.

In a separate breakout session, panelists tackled ways in which new media and other technologies affect how NGOs achieve their goals. Discussions ranged from general exam-inations of NGO strategies and outcomes to a case study of labor activists in China. Jenny Chan provided an overview of how activists exposed poor labor conditions at Foxconn, a Taiwanese electronics contract manufacturing company known mainly for producing Apple products. Distributing a documentary about the company's labor practices online, activists used social media to successfully pressure Apple to crack down on labor abuses.

Jennifer Earl framed the case of new media in terms of the new models of power between social movements and sourc-es of authority as well as movement supporters who have

> "I thought the conference was superb. It brought together a very interesting group of people - highly intelligent practitioners from the NGO world and extremely interesting and methodologically sound academics, all pushing forward on important policy issues. I particularly appreciated the geographic range of the speakers and therefore the breadth of perspectives presented, and the empirically grounded cross-disciplinary approach."
>
> —Aashish Mehta, Associate Professor of Global & International Studies

emerged as a consequence of new media. She described a distribution model for potential activists, in which NGOs utilize a variety of modes of engagement with activists and levers of influence over sources of power. This model, then, is not about converting potential activists and mobilizing them in a certain way but offering them multiple modes of engagement and allowing them to select the most appropriate one.

Finally, Karen Reilly showcased how NGOs can pursue their goals while protecting the privacy of their users. This is particularly important, she said, for NGOs who might store or communicate with users about personal information, such as voting habits, sexuality, health conditions, and a host of other characteristics. While she demonstrated a few tools, she emphasized that technology is not the only solution – that **NGOs need to update their mindset to include privacy in their choices**.

Another panel in this session focused on spatial analysis and technological advancements, particularly surrounding inno-

vations in Geographic Information Sciences (GIS). Emerging GIS technology gives unparalleled access to spatial data and allows more parties or actors to be involved in data collection, management, and analysis. However, structures need to be in place to facilitate the use of these data for environmental, humanitarian, political or legislative action. Speaker Andrew Schroeder discussed the changing definition and expansion of humanitarian space due to advances in spatial analysis technology. Agencies are able to access detailed and accurate information in real-time to identify what is happening during a crisis.

John Gallo discussed how emerging technologies, specifically spatial analysis, are evolving and how we can shape them to improve land-use planning and management. He described a spatial decision support system that acts as a data cloud supported by citizen scientists collecting data on-the-ground that is then analyzed and used for planning conservation. This process has already been used through the Desert

Renewable Energy Conservation Plan, in which members of the public can review the Environmental Impact Report and add spatially explicit comments through an accessible data cloud called Data Basin.

Lastly, Kirk Jalbert discussed how knowledge is curated when expert and non-expert groups come together using GIS technologies. He found that non-expert data can be marginalized within these data systems. In order to fulfill governmental organization guidelines, data frameworks must tier the data in such a way that data coming from research scientists rank above data from grassroots monitoring groups. Jalbert concluded by arguing that **mobilizing data for environmental advocacy needs accompanying structural support and political action**. All of these speakers described how advances in spatial technology has led to more actors becoming involved in spatial data collection and analysis, but the real utility of this new technology will only be discovered with structures in place that facilitate humanitarian aid or political action for environmental care.

Section 3: Defining and Achieving Social Responsibility
The third session focused what is meant by "social responsibility," particularly in the corporate sector and how it can best be achieved. Businesses have long professed concerns with worker rights and environmental stewardship, but the track record in terms of success has not been encouraging. Advanced industrial countries did achieve progress in some areas throughout much of the 20th century, largely as a result of what the UN International Labor Organization (ILO) terms a "tripartite" approach involving

(Main) Vivek Wadhwa, Director of Research at the Center for Entrepreneurship and Research Commercialization at the Pratt School of Engineering, Duke University. (Inserts from top to bottom) Todd Kuiken, Senior Program Associate in the Science and Technology Innovation Program, Woodrow Wilson Center. Thomas Woodson, Assistant Professor in the Department of Technology and Society, Stony Brook University. Xueying Han (left), Postdoctoral Scholar at the Center for Nanotechnology in Society, University of California, Santa Barbara with Jenny Chan (right), Lecturer of Contemporary Chinese Studies at the School of Interdisciplinary Area Studies, University of Oxford.

workers (and their unions), employers (and their business organizations), and government.

In their plenary presentations, both David Lewis and Andrew Stirling addressed the issue of achieving equitable, sustainable development. Both argued that it is not enough simply

to talk about how innovation may result in better development outcomes. If we hope to improve NGO effectiveness, it is necessary to examine the discourse around innovation. **We need to avoid buzzwords such as "empowerment" and "resilience," and avoid falling into the trap of thinking that only innovative solutions are needed: sometimes low-tech solutions are better suited to a community's needs than high-tech ones.** David Lewis emphasized the fact that NGOs have emerged as development actors, but they are often caught up in neoliberal thinking, more concerned with efficiency – rather than equitable – solutions. NGOs have a role to play in democratizing technology – one example being the use of social media to achieve workers' rights, discussed below. Andrew Stirling argued that **sustainability is about effective citizen engagement and participation** and reminded us that historically this has been achieved by decades of political struggle by social movements. He also warned that **technological innovation need not result in social progress; we need to question where we are going and broaden our discourse of choices: consider alternative pathways, experiment, engage in participatory deliberations**. Following the plenary, three concurrent sessions addressed the question of defining and achieving social responsibility.

The first breakout session focused on worker safety in the nanomaterials industry in three different contexts: Latin America, Europe, and the United States. A discussion on workers is important, because workers in the industry face greatest exposure to nanomaterials. Add to that, as Noela Invernizzi did, that most of those workers are unaware that they even handle nanomaterials. Further add, as Aida Ponce del Castillo did, that waste management is the sector of production where workers are most exposed while we know the least about the science of aging nanomaterials. In fact, all three speakers called for more research into the safety and health effects of nanomaterials. They also spoke to a deficit in resources for attaining and disseminating such knowledge. Darius Sivin pointed out that in the U.S., the Environmental Protection Agency's (EPA's) budget is about half that of a single aircraft carrier (which happens to be $20 billion). The Occupational Safety and Health Association's (OSHA) budget is one fortieth of that number. Sivin explained, technology threatens democracy because workers are not experts, and while they sometimes are able to identify workplace hazards, they must rely on their union leadership, government agencies, and other researchers for accurate information. Similarly, the ETUI plays an important supportive role by providing expert guidance to unions regarding preventative actions that can be taken in the workplace. With the uncertainty surrounding nanomaterials and the dearth of health and safety research, all three speakers agreed on the importance of the precautionary principle.

The second session focused on the issue of corporate social responsibility and workers' rights. Speakers Richard Appelbaum and Ari Olmos provided an overview of working conditions over the past few decades. Inflation-adjusted wages in most apparel-exporting countries have decreased in the past 10 years. Worker deaths by fire and building collapse are common, and unrest among labor groups is increasing. Two decades of corporate self-regulation have not had a positive impact on workers' rights, and prospects look unpromising

as long as there continues to be no legal responsibility linking businesses to the people and places involved in their manufacturing. However, while detailing how these dynamics have arisen and are being perpetuated, speakers in this session also highlighted positive actions: in particular the 'Bangladesh Accord on Fire and Building Safety' now signed by 189 major brands and retailers to establish a principle of 'joint liability' between companies and their labor suppliers; and an initiative, LaborVoices, that collects data on labor conditions directly from workers, returning a degree of control over monitoring to those most directly affected, and turning these data into predictive and preventative analytics.

Three linked themes emerged: (i) the "distribution of responsibility" for guaranteeing workers' rights (among brands, retailers, consumers, manufacturers, factory owners, workers, NGOs, trades unions, national governments, regulatory bodies); (ii) the roles played by different kinds and sources of data in related policy change and activism; and (iii) unresolved tensions around the in/ability of market-based solutions to improve labor conditions. These themes together emphasized

a key issue: transparency. Significant changes could be introduced, it was argued, if factory conditions were made public – to consumers, suppliers, competitors – and LaborVoices and others are tackling corporate resistance to releasing such data. Another issue raised in discussion, and highlighted as a focus for future research, addressed "bringing the state back in": when major labor agreements are between suppliers and retailers (and require legal accountability and enforcement), what role should national governments play?

The last session focused on NGO-government interactions. A consistent thread throughout this session is the idea that **even when NGOs are successful in promoting transparency and social justice**, **governments and industries should not be exempt from their responsibilities or actions**. In this panel, we heard from presenters on how governments and industries are working with NGOs to keep all parties accountable.

Rachel Parker talked about her development lab at USAID. She is working on two initiatives, Partnership for Enhanced Engagement in Research (PEER) and Seeding labs. Both of

"The conference experience was very enriching for me as it brought together a very rare group of participants which included, along with academicians and researchers, many grassroots as well as global NGOs, members from important government funding bodies and journalists."

— Poonam Pandey, Doctoral Student at Jawaharlal Nehru University

these initiatives essentially act as facilitators, linking governments, industries, and NGOs with one another to increase research capacity and connecting business interests with those working in development who have related goals and needs.

Relatedly, Flavio Plentz's presentation showed how the Brazilian government is working with pan-European and international nano-researchers to standardize and make nano-research available to others working in the field. In the case of nanotechnology, the definitions and chemical properties of nanomaterials can change with simple manipulations of the materials' surface and structure; this means research results are inconsistent, creating difficulties for policymaking. The Brazilian nano initiative is working with other governments, including the EU, international research collectives, labor groups, consumer groups, and corporations to try to standardize this research to produce efficient and necessary regulations.

(Clockwise starting from top left) Andrew Stirling, Professor of Science and Technology Policy, University of Sussex. David Lewis, Professor of Social Policy and Development, London School of Economics and Political Science. Noela Invernizzi, Federal University of Parana, Brazil. Flavio Plentz, General Coordinator at the Brazilian Ministry of Science, Technology and Innovation. Javiera Barandiaran, Assistant Professor in the Global and International Studies department, University of California, Santa Barbara. Cynthia Stohl, Professor in the Department of Communications, University of California, Santa Barbara.

Panel discussion during the conference.

Bhavna Shamasunder's research presented another side of the regulation story. Her work focuses on how industry and industry scientists have manufactured doubt in scientific data to resist regulation. She discussed how biomonitoring has revealed alarming amounts of chemicals in the human body, but the burden of proof of harm is often not placed on industry, but rather on consumer advocates, making regulation on chemicals across many industries an uphill battle in the U.S.

Each of these presentations demonstrates that governments can play an instrumental role in the effectiveness of NGOs.

Parker was able to point to very positive and effective results, while Shamasunder pointed to the cultural and institutional difficulties in getting governmentally instituted regulation, and Plentz described an enormously complex undertaking with many stakeholders, which hopefully will lead to effective and fair nano-policy in Brazil and elsewhere.

Closing Plenary: Responsible Development, Responsible Innovation: Global Governance of New Technologies

In the closing plenary, speakers focused on responsible development and innovation and the role of NGOs and civil

society organizations on the global governance of new technologies. **A central point emphasized repeatedly throughout the conference is the crucial role non-governmental and civil society organizations play in addressing issues of public concern that are inadequately regulated or overlooked by national and international bodies of government.** Speakers of the closing plenary highlighted not only the governance and regulatory challenges such organizations face when dealing with the global, social, and environmental implications posed by rapid changes in technology but also provided suggestions on how best to move forward. The following summary provides insight into a number of social and global issues raised by our speakers.

Technological advancements have been touted as both the solution to our environmental and social problems and as the main driver of society's new ethical, governance, and regulatory dilemmas. How do we, as scientists and as citizens, decide and evaluate the conditions and circumstances in which a technology should or can be used?

Speaker Peter Asaro took a definitive stance on whether certain technologies are inherently good or bad. Asaro spoke to the dangers that fully autonomous weapons (i.e., weapon systems that can select and fire upon targets on their own, without human intervention) pose to civilians and human rights. The biggest such danger emphasized during his talk was the lack of accountability that goes hand-in-hand with these systems, because there is no individual who is responsible for making targeting decisions. Who is responsible if a fully autonomous weapon makes a wrong decision? Is it the government, the military? Or is it the manufacturers and engineers? Asaro argued that there are numerous serious ethical, legal, political, technical, and moral concerns regarding fully autonomous weapons that warrant a pre-emptive ban on this type of technology. The Campaign to Stop Killer Robots is one such organization that is actively working through international treaties, national laws, and other measures to prevent this technology from ever being utilized.

As evidenced from many talks throughout the conference, NGOs have often stepped in to fill gaps in governance and regulatory frameworks of new technologies. Jennifer Kuzma focused specifically on the role and influence of NGOs on the governance of genetically engineered organisms (GEOs) in the U.S. GEOs are regulated by the USDA, FDA, and EPA under the framework of biotechnology, because it was deemed that GEOs do not pose any additional threats than traditionally bred organisms. Products are, therefore, regulated under their intended uses rather than the process in which they were engineered. Kuzma noted that NGOs have played a major role in the governance and regulation of GEOs in a context of active regulatory avoidance by government and industry. Kuzma further stated that the success of NGOs in bringing breakthroughs in GEO regulation was mainly achieved through a series of legal suits. As we look towards the future and consider the roles of NGOs in governance and regulation of new technologies, Kuzma stresses that despite the legal successes of NGOs in the past, what really is needed is a fundamental shift in mindsets and values. Kuzma underlined that there are many different models of governance (e.g., post-normal science, responsible research and innovation) that may be more effective than the current model

but that these require a fundamental shift in overcoming the paradigm that technology necessarily equates social good.

Speaker Chris Newfield strongly argued that governments should financially support promising emerging technology innovations, especially those that are not sufficiently developed, to attract private venture capital. Using solar energy as a case study, he showed how U.S. government policies, which exclusively favor market-based approaches rather than public investment, hindered the development of solar energy—particularly in comparison with the industrial policy approaches of Germany and China. By way of comparison, the German government has established policies resulting in large cost reductions and mass public acceptance of renewable energy as a central energy source. The Chinese government flooded its energy sector with cheap money for low cost development and manufacturing, resulting in a global drop in price that severely disadvantaged U.S. firms. Newfield's conclusion: U.S. energy policy fails to provide essential public funding to firms that are willing to take risks in hopes of making clean energy accessible and affordable. If we hope to truly democratize technology, he argues, we need to stop marketizing it.

Simone Pulver spoke to both the challenges faced by civil society organizations and the ways in which these organizations have been able to create opportunities of influence in the international arena. Using climate change as an example, Pulver provided three examples in which civil society organizations were able to create opportunities of influence on how this issue would be governed in the international sphere. First, civil society groups are able to engage in issues

Elizabeth Grossman (Left), journalist and author with Cassandra Engeman (Right), Senior Research Fellow at the Center for Nanotechnology in Society at the University of California, Santa Barbara.

that have long term social and environmental consequences, such as climate change, by creating decision making arenas that function as public spheres (i.e., a political arena in which decision making is based on rational discussion of the common good). Second, civil society groups push the decision making process into the public view, for example, by engaging in public protests when closed-room decision making and discussions are occurring. Third, civil society groups can successfully frame their interest is for the public good and highlight the narrower interest of their opponents. Pulver also

pointed out that civil society groups are, however, vulnerable to counter strategies—for example, when issues are removed from public discussion in deference to expert opinions, or when political problems (requiring public discussion) are redefined as economic issues (that are best left to the market).

Tarun Wadhwa spoke about India's ambitious identification program in which the country aims to provide each individual residing in India with a unique identification number. The program is intended to help marginalized individuals by providing them with greater and more equitable access to social services and goods. The biometrics technology used in this vast undertaking allows Indian authorities to link an individual's name to his or her photo, iris scan, and fingerprints. Despite the social good promised by this project, Wadhwa noted that identification systems are still largely about control and power. He argued that whether this project will do actual good is dependent on whether the people in power will use this technology correctly or if they will abuse the information provided to them. Wadhwa noted in his closing remark that technologies are the same but it is the intentions in which they are used that are different.

Conclusions and Future Directions

Rapid technological advancements offer exciting opportunities to enhance everyday health and well-being, facilitate community involvement and activism, and address current and future world problems – potential crises in food, water, health, and energy. Yet such rapid advancements also compel careful attention to potential unknown, adverse, or

unintended consequences of new technologies. Especially in light of such uncertainty, involving multiple stakeholders in discussions about technological futures is key to achieving comprehensive assessments.

This conference brought together academics, journalists, government officials, and NGO representatives. It drew heavily from this latter group and adopted a unique focus on organized publics and their roles in shaping technological futures. Taking this inclusive and focused approach led to rewarding observations. It yielded surprising examples of on-the-ground uses and consequences of new technologies. It identified societal needs and revealed potential solutions that employ new technologies but also existing ones. It also demonstrated the complexity of views and interests held by NGOs, challenging the dichotomy of pro-technology and anti-technology perspectives.

Although the questions that framed the conference remain open, they facilitated fruitful deliberation of complex issues. The theme of 'Democratizing Technologies' proved to be a highly effective rubric for interdisciplinary engagement and unifying discussions spanning a diverse array of new technologies – nanotechnology, synthetic biology and biotechnology, information technology, spatial analytic technology, and robotics. Despite the diversity of organizations and topics represented at the conference, several recurrent themes emerged. A resounding point among participants was the need to develop and support technologies that meet societal needs. Technology is not a silver bullet. Participants emphasized uncertainty with regard to technological impacts, and many expressed concern about the introduction of

products prior to sufficient risk assessments and safeguards. In particular, many participants called for mindfulness of product end-of-life issues and waste management. However, the creative ways in which NGOs use new technologies to achieve their missions called attention to the promises and benefits of new technologies as well.

This conference provides a validated model for stakeholder engagement. Often stakeholders called to engage include a tripartite – government, industry, and publics. This conference added organized publics – NGOs – and brought them to the forefront. As demonstrated by these participants, NGOs, even across considerable difference in size, scope and focus, can work effectively to co-contribute grounded and nuanced approaches to new technologies and their societal implications for both research and policy purposes. NGOs innovate uses for new technologies, facilitate technological distribution, provide crucial links to communities, lend expertise in policy discourses, and provide guidance to consumers and resources to activists.

Lead Organizers

Barbara Herr Harthorn, Director, Center for Nanotechnology in Society; Professor, Anthropology, University of California, Santa Barbara

Richard Appelbaum, Research Professor and MacArthur Chair, Global and International Studies and Sociology; Research Group Leader, Center for Nanotechnology in Society, University of California, Santa Barbara

Cassandra Engeman, Senior Research Fellow, Center for Nanotechnology in Society; PhD Candidate, Department of Sociology, University of California, Santa Barbara

Invited Speakers and Participants

Richard Appelbaum, Research Professor and MacArthur Chair, Global and International Studies and Sociology; Research Group Leader, Center for Nanotechnology in Society, University of California, Santa Barbara (Santa Barbara, USA)

Peter Asaro, Assistant Professor and Director of Graduate Programs, New School in New York City; Affiliate Scholar, Center for Internet and Society at the Stanford Law School; Fellow, Center for Information Technology Policy at Princeton (New York City, USA)

David Azoulay, Managing Attorney, Center for International Environmental Law (Geneva, Switzerland)

Javiera Barandiaran, Assistant Professor, Global and International Studies, University of California, Santa Barbara (Santa Barbara, USA)

Edwina Barvosa, Associate Professor, Feminist Studies, University of California, Santa Barbara (Santa Barbara, USA)

Melissa Bator, PhD Candidate, Department of Communication, University of California, Santa Barbara (Santa Barbara, USA)

Romanus Berg, Leadership Group Member and CIO, Ashoka: Innovators for the Public (Arlington, USA)

Bruce Bimber, Professor, Political Science and Communication, University of California, Santa Barbara (Santa Barbara, USA)

Jenny Chan, Departmental Lecturer, Contemporary Chinese Studies, School of Interdisciplinary Area Studies, University of Oxford (Oxford, England)

Katie Davis, Santa Barbara County Water Guardians (Santa Barbara, USA)

Sheila Davis, Executive Director, Silicon Valley Toxics Coalition (Silicon Valley, USA)

Jennifer Earl, Professor, Sociology, University of Arizona (Tucson, USA)

Cassandra Engeman, Senior Research Fellow, Center for Nanotechnology in Society and PhD Candidate in the Department of Sociology, University of California, Santa Barbara (Santa Barbara, USA)

John Gallo, Senior Scientist, Conservation Biology Institute (Corvallis, USA)

Jose Gomez-Marquez, Director, Little Devices Lab, Massachusetts Institute of Technology (Cambridge, USA)

Geoff Green, Executive Director, Fund for Santa Barbara (Santa Barbara, USA)

Elizabeth Grossman, Journalist and author (Portland, USA)

Xueying (Shirley) Han, Postdoctoral Scholar, Center for Nanotechnology in Society, University of California, Santa Barbara (Santa Barbara, USA)

Barbara Herr Harthorn, Director, Center for Nanotechnology in Society; Professor, Anthropology, University of California, Santa Barbara (Santa Barbara, USA)

Ariel Hasell, Graduate Fellow, Center for Nanotechnology in Society; PhD Candidate, Department of Communication, University of California, Santa Barbara (Santa Barbara, USA)

Patricia Holden, Professor, Bren School of Environmental Science and Management, University of California, Santa Barbara (Santa Barbara, USA)

Noela Invernizzi, Professor, Anthropology, Education and Public Policy programs, University of Parana in Brazil (Curitiba, Brazil)

Kirk Jalbert, PhD Candidate, Science and Technology Studies, Rensselaer Polytechnic Institute (Troy, USA)

Lotte Krabbenborg, Postdoctoral Researcher, Radboud University (Nijmegen, Netherlands)

Nicholas Kristof, Pulitzer Prize-winning columnist, The New York Times (New York City, USA)

Todd Kuiken, Senior Program Associate, Science and Technology Innovation Program, Woodrow Wilson Center (Washington D.C., USA)

Kristen M. Kulinowski, Research Staff Member, Science and Technology Policy Institute (Washington, D.C., USA)

Jennifer Kuzma, Distinguished Professor, School of Public and International Affairs and Co-Director of the Genetic Engineering and Society Center, North Carolina State University (Raleigh, USA)

David Lewis, Professor, Social Policy and Development, London School of Economics and Political Science (London, England)

Aashish Mehta, Associate Professor, Global and International Studies, University of California, Santa Barbara (Santa Barbara, USA)

Miriam Metzger, Professor of Communication, Education Director of the Center for Nanotechnology of Society, University of California, Santa Barbara (Santa Barbara, USA)

Moses Kizza Musaazi, Senior Lecturer, Department of Electrical and Computer Engineering, Makerere University in Uganda (Kampala, Uganda)

Chris Newfield, Professor, Literature and American Studies, University of California, Santa Barbara (Santa Barbara, USA)

Dawn O'Bar, President, Unite to Light (Santa Barbara, USA)

Ari Olmos, Vice President of Operations, Labor Voices (Sunnyvale, USA)

Rachel Parker, Senior Research Advisor, U.S. Agency for International Development (Washington D.C., USA)

Lisa Parks, Professor, Film and Media Studies; Director, Center for Information Technology in Society, University of California, Santa Barbara (Santa Barbara, USA)

Tristan Partridge, Postdoctoral Scholar, Center for Nanotechnology in Society, University of California, Santa Barbara (Santa Barbara, USA)

Flávio Plentz, General Coordinator, Micro and Nanotechnology Department, Brazilian Ministry of Science, Technology and Innovation (Belo Horizonte, Brazil)

Aida Ponce Del Castillo, Senior Researcher, European Trade Union Institute (Brussels, Belgium)

Simone Pulver, Associate Professor, Environmental Studies, University of California, Santa Barbara (Santa Barbara, USA)

Karen Reilly, Development Director, The Tor Project (Cambridge, USA)

Linsey Shariq, PhD Candidate and Floyd and Mary Schwall Fellow, Department of Environmental Engineering, University of California, Davis (Davis, USA)

Andrew Schroeder, Director of Research and Analysis, Direct Relief (Santa Barbara, USA)

Bhavna Shamasunder, Assistant Professor, Urban and Environmental Policy, Occidental College (Los Angeles, USA)

Linsey Shariq, Doctoral Candidate, Department of Civil and Environmental Engineering, University of California, Davis (Davis, USA)

Larry Siegel, Executive Director, Safe Water International (Santa Barbara, USA)

Darius Sivin, Health and Safety Department, International Union, UAW (Washington D.C., USA)

Andrew Stirling, Professor, Science and Technology Policy, University of Sussex (Brighton, United Kingdom)

Galen Stocking, Graduate Fellow, Center for Nanotechnology in Society; PhD Candidate, Department of Political Science, University of California, Santa Barbara (Santa Barbara, USA)

Cynthia Stohl, Professor of Communication, University of California, Santa Barbara (Santa Barbara, USA)

Thomas Tighe, President and CEO, Direct Relief (Santa Barbara, USA)

Tarun Wadhwa, Journalist and author, Researcher at the Hybrid Reality Institute (San Francisco, USA)

Vivek Wadhwa, Director of Research, Center for Entrepreneurship and Research Commercialization at the Pratt School of Engineering, Duke University (Durham, USA)

Barbara Walker, Director, Research Development for the Social Sciences, Humanities, and Fine Arts, University of California, Santa Barbara (Santa Barbara, USA)

Poster Presenters

Lucy Diep, Graduate Student, Department of Community Health Sciences, Program of Community Rehabilitation and Disability Studies, University of Calgary (Calgary, Canada)

Matthew Harsh, Assistant Professor, Centre for Engineering in Society, Concordia University (Montreal, Canada)

Ariel Hasell, Graduate Fellow, Center for Nanotechnology in Society; PhD Candidate, Department of Communication, University of California, Santa Barbara (Santa Barbara, USA)

Sheron Nicole King, NSF-IGERT Fellow; Doctoral Student, Public Administration; Research Assistant, Genetic Engineering and Society Center, North Carolina State University (Raleigh, USA)

Nathalie Marechal, Doctoral student, Annenberg School for Communication and Journalism, University of Southern California (Los Angeles, USA)

Andie Diane Palmer, Associate Professor, Department of Anthropology, University of Alberta (Edmonton, Canada)

Poonam Pandey, Doctoral student, Centre for Studies in Science Policy, Jawaharlal Nehru University (New Delhi, India)

Patrick S. Roberts, Associate Professor, School of Public and International Affairs, Virginia Tech (Blacksburg, USA)

Mark Robinson, Assistant Professor, Department of Anthropology and Science and Technology Studies/Ethics, DePaul University (Chicago, USA)

Galen Stocking, Graduate Fellow, Center for Nanotechnology in Society; PhD Candidate, Department of Political Science, University of California, Santa Barbara (Santa Barbara, USA)

Thomas Woodson, Assistant Professor, Department of Technology and Society, Stony Brook University (Stony Brook, USA)

Yanxiang Zhang, Associate Professor, Department of Science Communication, University of Science and Technology in China (Hefei, China)

NGO Marketplace Participants

The NGO Marketplace provided an interactive experience for both conference participants and UCSB students. NGO representatives hosted tables showcasing current projects and past achievements. UCSB students were invited to meet with NGO conference participants to learn about opportunities and what it is like to work in the nonprofit sector.

Ashoka: Innovators for the Public

Center for International Environmental Law

Conservation Biology Institute

Chad Relief Foundation

Direct Relief

DIYbio.org/Woodrow Wilson Center

Engineers Without Borders (UCSB Chapter)

European Trade Union Institute

FracTracker Alliance

Hands 4 Others (H4O)

International Committee for Robot Arms Control and the Campaign to Stop Killer Robots

Safe Water International

Santa Barbara Bicycle Coalition

Santa Barbara Channelkeeper

Santa Barbara County Water Guardians

Silicon Valley Toxics Coalition

Surgical Eye Expeditions (SEE) International

Students and Scholars Against Corporate Misbehavior (SACOM)

Technology for Tomorrow

The TOR Project

Unite to Light

Vitamin Angels

Organizing Committee Members

Richard Appelbaum, Research Professor and MacArthur Chair, Global and International Studies and Sociology; Research Group Leader, Center for Nanotechnology in Society, University of California, Santa Barbara

Edwina Barvosa, Associate Professor, Feminist Studies, University of California, Santa Barbara

Melissa Bator, Doctoral Candidate, Department of Communication, University of California, Santa Barbara

Bruce Bimber, Professor, Political Science and Communication, University of California, Santa Barbara

Mary Collins, Postdoctoral Fellow, National Socio-Environmental Synthesis Center, University of Maryland

Brandon Fastman, Education and Outreach Coordinator, Center for Nanotechnology in Society, University of California, Santa Barbara

Xueying (Shirley) Han, Postdoctoral Scholar, Center for Nanotechnology in Society, University of California, Santa Barbara

Bridget Harr, Doctoral Candidate, Department of Sociology; Graduate Research Fellow, Center for Nanotechnology in Society, University of California, Santa Barbara

Patricia Holden, Professor, Bren School of Environmental Science and Management, University of California, Santa Barbara

Nelson Lichtenstein, Professor and MacArthur Chair, History, University of California, Santa Barbara

Aashish Mehta, Associate Professor, Global and International Studies, University of California, Santa Barbara

Miriam Metzger, Professor, Communication, University of California, Santa Barbara

Bonnie Molitor, Assistant Director, Center for Nanotechnology in Society, University of California, Santa Barbara

Lisa Parks, Professor, Film and Media Studies; Director, Center of Information Technology in Society, University of California, Santa Barbara

Cynthia Stohl, Professor, Communication, University of California, Santa Barbara

Rapporteurs

Brandon Fastman, Education and Outreach Coordinator, Center for Nanotechnology in Society, University of California, Santa Barbara

Matthew Gebbie, Graduate Fellow, Center for Nanotechnology in Society; PhD Candidate, Department of Materials Science, University of California, Santa Barbara

Ariel Hasell, Graduate Fellow, Center for Nanotechnology in Society; PhD Candidate, Department of Communication, University of California, Santa Barbara

Luciano Kay, Postdoctoral Scholar, Center for Nanotechnology in Society, University of California, Santa Barbara

Tristan Partridge, Postdoctoral Scholar, Center for Nanotechnology in Society, University of California, Santa Barbara

Louise Stevenson, Graduate Fellow, Center for Nanotechnology in Society; PhD Candidate, Ecology, Evolution, and Marine Biology, University of California, Santa Barbara

Galen Stocking, Graduate Fellow, Center for Nanotechnology in Society; PhD Candidate, Department of Political Science, University of California, Santa Barbara

Brian Tyrrell, Graduate Fellow, Center for Nanotechnology in Society; PhD Candidate, Department of History, University of California, Santa Barbara

Staff

Shawn Barcelona, Center Administrator, Center for Nanotechnology in Society, University of California, Santa Barbara

Brandon Fastman, Education and Outreach Coordinator, Center for Nanotechnology in Society, University of California, Santa Barbara

Valerie Kuan, Travel and Purchasing Coordinator, Center for Nanotechnology in Society, University of California, Santa Barbara

Bonnie Molitor, Assistant Director, Center for Nanotechnology in Society, University of California, Santa Barbara

Photography Credit

Brandon Fastman, Education and Outreach Coordinator, Center for Nanotechnology in Society, University of California, Santa Barbara

Tony Mastres, Producer and Director, Photographic Services, University of California, Santa Barbara

About CNS-UCSB

The NSF 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 U.S. and abroad. The Center addresses education for a new generation of social science and nanoscience professionals, and conducts research on historical context of the nano-enterprise, on innovation processes and global diffusion of nanotech, and on risk perception and the public sphere. CNS-UCSB researchers address a linked set of social and environmental issues regarding the domestic U.S. and global creation, development, commercialization, production, consumption, and control of specific kinds of nanoscale technologies.

The intellectual aims of CNS-UCSB are twofold: to apply knowledge of human behavior, social systems, and history to identify societal implications of nanotechnologies; and to deepen basic knowledge about the global human condition in a time of sustained technological innovation through close examination of the emergence of nanotechnologies.

The Center aims to disseminate both technological and social scientific findings related to nanotechnology in society to the wider public and to facilitate public participation in the nano-technological enterprise. It does this through public engagement in dialogue between academic researchers from diverse disciplines with regulators, educators, industrial scientists, and policy makers, as well as community-based organizations and NGOs. The Center's education and outreach programs, which are central to its mission, include a diverse range of students and participants, and engage industry, government, and NGO partners.

Thank you to our sponsors!

Key sponsors:

CNS~UCSB
Center for Nanotechnology in Society

NSF

DirectRelief
Deliver a world of good.

THE FUND
FOR SANTA
BARBARA

UCSB

Other sponsors:

Office of the Chancellor, Office of the Executive Vice Chancellor, Office of the Vice Chancellor for Research, Bren School of Environmental Science and Management, College of Engineering, College of Letters and Science and Divisions of Humanities and Fine Arts, Mathematical, Life and Physical Sciences, and Social Sciences, California NanoSystems Institute at UCSB, Center for Information Technology and Society, Department of Anthropology, Department of Communication, Department of English, Department of Film and Media Studies, Department of Geography, Department of Global and International Studies, Department of History, Department of Political Science, Department of Sociology, Hull Chair in Women's Studies, MacArthur Foundation Chair of History, MacArthur Foundation Chair of Global and International Studies, Materials Research Laboratory, Orfalea Center for Global and International Studies, Technology Management Program

CNS~UCSB
Center for Nanotechnology in Society

Center for Nanotechnology in Society
Mail Code 2150
University of California Santa Barbara
Santa Barbara, CA 93106-2150
www.cns.ucsb.edu
@CNSUCSB