

Annual Report for Period:10/2005 - 10/2006

Submitted on: 07/21/2006

Principal Investigator: Guston, David H.

Award ID: 0531194

Organization: Arizona State University

Title:

NSEC: Center for Nanotechnology in Society at Arizona State University

Project Participants

Senior Personnel

Name: Guston, David

Worked for more than 160 Hours: Yes

Contribution to Project:

As PI and director, Guston is chair of the Executive Committee; he provides overall supervision for the Center and represents the Center publicly. In YR 1, in particular, he has chaired the hiring of one faculty member, two professional staff, several post-doctoral fellows, and many graduate and undergraduate students working with CSN-ASU, and he provides direct supervision to many of them. He has created one undergraduate class (POS 426) on nanotechnology in society and will participate in the creation of the Nanotechnology in Society Learning Community in SP 07.

Name: Miller, Clark

Worked for more than 160 Hours: Yes

Contribution to Project:

Miller has been co-PI and PI on the University of Wisconsin subcontract, providing overall guidance and oversight for his Wisconsin colleague's activities. In August 2006, Miller will leave Wisconsin and join the faculty of ASU. As of this report, we are negotiating his continuing role in CNS-ASU.

Name: Carlson, Marilyn

Worked for more than 160 Hours: No

Contribution to Project:

In her role as co-PI, Carlson serves on the Executive Committee and, as director of the Center for Research on Education in Science, Mathematics, Engineering and Technology, provides supervision to the pre-college outreach program involving post-doctoral fellow Bennett and CNS-CRESMET graduate students Hisamura and Garay.

Name: Sarewitz, Daniel

Worked for more than 160 Hours: Yes

Contribution to Project:

In his role as co-PI and associate director, Sarewitz has been a member of the Executive Committee. As co-leader of the RTTA 3 Deliberation and Participation activities, he has led the scenario development activity. He has also provided direct supervision for graduate student Panjwani for her project on mathematical models of privacy and security with nano-sensors.

Name: Poste, George

Worked for more than 160 Hours: No

Contribution to Project:

In his role of co-PI, Poste has been a member of the Executive Committee and has facilitated collaboration between CNS-ASU and The Biodesign Institute, which he directs. He provided a keynote talk at the CNS-ASU launch on 30 January and provides overall guidance for the collaborative role of Biodesign researchers in CNS.

Name: Allenby, Braden

Worked for more than 160 Hours: No

Contribution to Project:

Allenby is a member of the Executive Committee. He has participated in a number of collaborative activities, including as co-PI for the 'nanoethics shop' Ethics Education in Science and Engineering proposal (with PI McGregor and co-PIs Wetmore and Guston) and as a participant in the Trading Zones and the Human Cognitive Enhancement workshops.

Name: Shapira, Philip

Worked for more than 160 Hours: Yes

Contribution to Project:

Shapira is the PI on the GA Tech subcontract and leader of RTTA Research and Innovation System Analysis activity.

Name: Bozeman, Barry

Worked for more than 160 Hours: No

Contribution to Project:

Bozeman is leader of the RTTA 1 activity, Public Value Mapping.

Name: Van Horn, Carl

Worked for more than 160 Hours: No

Contribution to Project:

Van Horn is the PI on the Rutgers University subcontract and leader of the RTTA 1 activity, Workforce Assessment.

Name: Scheufele, Dietram

Worked for more than 160 Hours: Yes

Contribution to Project:

Scheufele is co-leader of RTTA 2, Public Opinion and Values (POV) and its public opinion survey activity, which he has planned and fielded in YR 1 with the collaboration of E Corley and the Institute for Social Science Research at ASU.

Name: Corley, Elizabeth

Worked for more than 160 Hours: Yes

Contribution to Project:

E Corley is co-leader of the RTTA 2 activity, public opinion survey, and co-leader of the RTTA 4 activity, reflexivity assessment. In the former capacity, she has been collaborating with Scheufele to design and field a survey of public knowledge of and attitudes toward nanotechnology. With Scheufele, she has also planned a comparable survey of nanoscientists. In the latter activity, she has assisted E Hackett and K Corley (no relation) in mounting field work on the identity, knowledge, and practice of Biodesign scientists regarding nanotechnology in society.

Name: Dunwoody, Sharon

Worked for more than 160 Hours: No

Contribution to Project:

Dunwoody is the leader of the RTTA 2 activity, Media Influence.

Name: Hamlett, Patrick

Worked for more than 160 Hours: No

Contribution to Project:

Hamlett is the PI on the North Carolina State University subcontract and is leader of the RTTA 3 activity National Citizens' Technology Forum. Although there are no funded activities in YR 1 for NCTF, Hamlett has established an electronic workspace for the several institutional participants in the activity.

Name: Boradkar, Prasad

Worked for more than 160 Hours: Yes

Contribution to Project:

Boradkar leads the RTTA 3 activities InnovationSpace and CriticalCorps. In Su 06, he is preparing for the debut of the undergraduate InnovationSpace course in AY 06-07. He is also PI on the Design for Environmentally and Socially Integrated Nanotechnologies (DESIN) NUE proposal in Sp 06.

Name: Hackett, Ed

Worked for more than 160 Hours: Yes

Contribution to Project:

Hackett, as co-director of RTTA 4, Reflexivity Assessment and Evaluation, has supervised the effort to study the identity, knowledge, and practice of Biodesign researchers regarding nanotechnology in society, conducted by K. Corley and Konz.

Name: Corley, Kevin

Worked for more than 160 Hours: Yes

Contribution to Project:

K Corley performs research in RTTA 4, Reflexivity Assessment and Evaluation, on the identity, knowledge, and practice of Biodesign researchers. He has taken on co-leadership of that activity due to Hackett's leave from ASU.

Name: Monahan, Torin

Worked for more than 160 Hours: No

Contribution to Project:

Monahan has been the co-leader of TRC 1, Freedom, Privacy and Security, but he will no longer serve in that capacity in YR 2. He is planning research into the development of nano-sensor applications at ASU and within the larger research network and is overseeing the work of graduate student Wall.

Name: Hogle, Linda

Worked for more than 160 Hours: No

Contribution to Project:

Hogle is the co-leader of Human Identity, Enhancement, and Biology Thematic Research Cluster. She has been collaborating in this research program with Robert.

Name: Robert, Jason

Worked for more than 160 Hours: Yes

Contribution to Project:

Robert is the co-leader of the Human Identity, Enhancement, and Biology Thematic Research Cluster. He has been collaborating in this research program with Hogle.

Name: Pielke, Jr., Roger

Worked for more than 160 Hours: No

Contribution to Project:

Pielke is PI on the University of Colorado, Boulder subcontract and supervised Fisher's dissertation work.

Name: Mahajan, Roop

Worked for more than 160 Hours: No

Contribution to Project:

Mahajan supervised Fisher's participant-observation in his nano-materials laboratory.

Name: Fujimura, Joan

Worked for more than 160 Hours: No

Contribution to Project:

Fujimura, working within the Human Identity, Enhancement, and Biology theme, is also supervising Leung's dissertation field work on nano-scale science and engineering in China.

Name: Privateer, Paul

Worked for more than 160 Hours: No

Contribution to Project:

Privateer had recently completed a book on the social history of human intelligence and is now exploring issues of NBIC and transhumanism, including through a class he has prepared for Fa 06 entitled 'Studies in Transhumanism: Genetics, Robotics, Information Technology, Nanosciences, and the Human Future(s)' (FMS 494).

Name: Lindsay, Stuart

Worked for more than 160 Hours: No

Contribution to Project:

Lindsay, director of the Center for Single Molecule Biophysics at the Biodesign Center at ASU, is learning how to build atom by atom at the nanoscale, manipulating and seeing results through a variety of new instrumentation. He offered the first Science Cafe in March on 'Humankind's Future On the Head of a Pin: Nanotechnology - What is it? What can it do?' and in May he presented, with CNS undergraduate intern Taylor Jackson, an historical review on the occasion of the 20th anniversary of scanning probe microscopy at ASU. Lindsay also supervises two of the CNS-Biodesign graduate student fellows.

Name: Woodbury, Neal

Worked for more than 160 Hours: No

Contribution to Project:

Woodbury, director of the BioOptical Nanotechnology Center at the Biodesign Institute at ASU, builds arrays of nano-scale sensors using techniques of molecular evolution. In addition to being a frequent collaborator on other nano-related grant applications (EASE, IGERT, etc.), Woodbury offered the May 06 Science Cafe speaking on the topic: 'Evolution on a Chip: Making Molecules Work for Us.' He also supervises one of the CNS-Biodesign graduate student fellows.

Name: Wetmore, Jameson

Worked for more than 160 Hours: Yes

Contribution to Project:

Wetmore (ASU) as a post-doctoral fellow funded by CSPO co-taught (with Bennett) 'Science, Technology, and Societal Outcomes' (BIO 598, POS 598, JUS 598) in Sp 06. In F 06, he will join the ASU faculty with an appointment in the School of Human Evolution and Social Change and an affiliation with CNS-ASU and CSPO. He will organize, with post-doctoral fellows Selin and Fisher, the monthly seminar series and its related Yearbook, among other tasks.

Name: He, Jiping

Worked for more than 160 Hours: No

Contribution to Project:

He, director of the Center for Neural Interface Design at the Biodesign Institute at ASU, is creating nano-neural implants for the brain that have the capacity to perform motor and/or cognitive functions while monitoring brain activity. In addition to other collaborative activities, especially working closely with Robert's research group on TRC 2, Human Identity, Enhancement, and Biology, He participated in the June 06 Science Cafe on 'Brain-Machine Interface: Science Fact or Science Fiction?' with Robert.

Name: Porter, Alan

Worked for more than 160 Hours: Yes

Contribution to Project:

Porter has worked extensively on RTTA 1/1 Research Program Mapping activities and provided guidance to several GA Tech graduate and undergraduate students assisting those activities.

Name: Devitt, Terry

Worked for more than 160 Hours: No

Contribution to Project:

Terry Devitt (Wisconsin) edits The Why Files.

Name: Farwell, Tricia

Worked for more than 160 Hours: No

Contribution to Project:

Tricia Farwell (ASU) investigates the impact of public relations materials on the reporting of science-based articles in the mass media.

Name: Ramakrishna, B

Worked for more than 160 Hours: Yes

Contribution to Project:

Ramakrishna (ASU) explores public understanding of NSE and is involved in NSE education at the secondary and college levels. He teaches the undergraduate course, 'Nanotechnology Perspectives and Entrepreneurial Opportunities.'

Name: Ingram, Helen

Worked for more than 160 Hours: No

Contribution to Project:

Ingram (UC Irvine) studies the relationship between science and management and policy decisions and is working with RTTA 4, Reflexivity, Assessment and Evaluation, particularly with co-PI Schneider on comparing the functions of different boundary organizations in managing 'ways of knowing.'

Name: Reiter, Wellington

Worked for more than 160 Hours: No

Contribution to Project:

Name: Cobb, Michael

Worked for more than 160 Hours: No

Contribution to Project:

Cobb (NCSU) will become active in YR 2 working with senior investigator Hamlett on the preparations for the National Citizens' Technology Forum (RTTA 3/4) in YR 3.

Name: Cozzens, Susan

Worked for more than 160 Hours: No

Contribution to Project:

Cozzens (GA Tech) will become active in YR 2 preparing to host a site of the National Citizens' Technology Forum in YR 3.

Name: Crone, Wendy

Worked for more than 160 Hours: No

Contribution to Project:

(Wisconsin) Crone oversees a highly regarded web site for K-12 and informal science education on NSE.

Name: Marchant, Gary

Worked for more than 160 Hours: No

Contribution to Project:

Marchant (ASU) has collaborated with CNS-ASU in organizing conferences, particularly 'Forbidding Science,' and in supervising students, particularly those in the Applied Research Seminar hosted by CNS and CSPO.

Name: Youtie, Jan

Worked for more than 160 Hours: Yes

Contribution to Project:

Youtie has contributed to the RTTA 1/1 Research Program Mapping activity.

Name: Iacopetta, Maurizio

Worked for more than 160 Hours: Yes

Contribution to Project:

Iacopetta has contributed to the RTTA 1/1 Research Program Mapping activity.

Name: Graham, Stu

Worked for more than 160 Hours: No

Contribution to Project:

Graham (GA Tech) is a faculty member in Management, funded by the Harvard-UCLA-NBER nano-in-society project. He has

been collaborating with RTTA 1 on patent data set development.

Name: Picreux, Tom

Worked for more than 160 Hours: No

Contribution to Project:

Picreux (DOE), formerly of ASU, is research director at the DOE's Center for Integrated Nanotechnology user facility and host of CNS-ASU's outreach effort to provide societal implications training to CINT users.

Post-doc

Name: Bennett, Ira

Worked for more than 160 Hours: Yes

Contribution to Project:

Bennett, a PhD nano-chemist from Woodbury's previous IGERT group, has worked extensively on the RTTA 3 activity, scenario development, and developed, with broad assistance from other NSE collaborators, a set of plausible nanotechnological scenarios. He has also taken the lead of the working group, under Carlson's supervision, that is developing the nanotechnology-in-society course for pre-college teachers.

Name: Conz, David

Worked for more than 160 Hours: Yes

Contribution to Project:

Conz, a recent doctoral awardee (Hackett, supervisor), is assisting Hackett and K Corley in the RTTA 4 activity, reflexivity assessment, to study the identity, knowledge, and practice of Biodesign scientists in regard to nanotechnology in society. Conz has conducted some of the field work, much of the data preparation, and will contribute to the analysis.

Name: Selin, Cynthia

Worked for more than 160 Hours: No

Contribution to Project:

Hired in Sp 06, Selin will begin a post-doctoral fellowship with CNS-ASU in Fa 06, working primarily with RTTA 3/1 Scenario Development, but also coordinating with (new) senior investigator Wetmore and (new) post-doctoral fellow Fisher the monthly seminar series and the Yearbook derived from it.

Name: Kim, Eun Sung

Worked for more than 160 Hours: No

Contribution to Project:

Kim, who recently completed a dissertation in Science and Technology Studies at RPI, will work with co-leader Linda Hogle and other faculty at Wisconsin on the Human Identity, Enhancement, and Biology theme beginning in F 06.

Graduate Student

Name: Spadola, Quinn

Worked for more than 160 Hours: Yes

Contribution to Project:

Spadola, a PhD student in Lindsay's lab, is a CNS-Biodesign fellow who has taken the CNS-related course, 'Science, Technology, & Societal Outcomes' (POS/BIO/JUS 598) taught by Wetmore and Bennett and, among other activities, has spear-headed the establishment of CNS's Science Cafe.

Name: Lappe, Jason

Worked for more than 160 Hours: Yes

Contribution to Project:

Lappe, a graduate student in Woodbury's lab, is a CNS-Biodesign fellow who has taken the CNS-related graduate course, 'Science, Technology, and Societal Outcomes' (POS/BIO/JUS 598) and participated in the nano-science fiction writing workshop offered by collaborator Berne, among other activities.

Name: Panjwani, Azra

Worked for more than 160 Hours: Yes

Contribution to Project:

Panjwani, a master's student in the mathematics department, is working on a mathematical model of surveillance that is adaptable to the context of innovation in nano-sensing and surveillance.

Name: Tosi, Justin

Worked for more than 160 Hours: No

Contribution to Project:

Tosi (ASU) is a PhD student in political science researching privacy and rights considerations in the context of NBIC innovation in human physical and cognitive enhancement. He worked in Sp 06 under the direction of Guston and in collaboration with fellow graduate student Parsi. In Su 06 he is contributing time to the project and in F 06 he will work on it under political science funding.

Name: Karinen, Risto

Worked for more than 160 Hours: Yes

Contribution to Project:

Karinen, a political science PhD student, has performed research on the governance of nanotechnology, and he served as a teaching assistant (on departmental funds) for PI Guston in POS 426.

Name: Hisamura, Nate

Worked for more than 160 Hours: Yes

Contribution to Project:

Hisamura, a PhD student in the mathematics department, is a CNS-CRESMET fellow working under the direction of Carlson and Bennett to assist in the creation of a nano-in-society course for pre-college educators.

Name: Fisher, Erik

Worked for more than 160 Hours: Yes

Contribution to Project:

Fisher (University of Colorado, Boulder) completed in YR 1 his doctoral dissertation as an embedded humanist in the nano-materials laboratory of Mahajan, testing ideas of 'midstream modulation' that are crucial to RTTA. He worked under the direction of Pielke. He also began an education/outreach project with Picreaux at DOE's Center for Integrated Nanotechnology. In Fa 06, Fisher will come to ASU to be a post-doctoral fellow with the Center, where he will continue working with CINT, developing his ideas about RTTA, and co-organizing the monthly seminar series with Selin and Wetmore.

Name: Leung, Ricky

Worked for more than 160 Hours: Yes

Contribution to Project:

Leung, a PhD student in sociology at University of Wisconsin, conducted fieldwork in China, interviewing NSE researchers and administrators, under the supervision of senior investigator Fujimora.

Name: Wheelock, Roxanne

Worked for more than 160 Hours: Yes

Contribution to Project:

Wheelock has been assessing the organizational development and communications function of CNS-ASU under CSPO funds and Guston's supervision.

Name: Parsi, John

Worked for more than 160 Hours: Yes

Contribution to Project:

Parsi (ASU) is a doctoral student in political science and has been working, under the direction of Guston and in collaboration with fellow graduate student Tosi, on issues of

privacy and other rights in the context of human nano-biotechnology. He has been working on the project under political science department funding in Sp 06, CNS funding in Su 06, and department funding in F 06.

Name: Jackson, Taylor

Worked for more than 160 Hours: Yes

Contribution to Project:

Jackson (ASU), an undergraduate in biology and society, was supported in Sp and Su 06 to conduct research on the history of nanotechnology at ASU and assist other research projects.

Name: Hays, Sean

Worked for more than 160 Hours: No

Contribution to Project:

Hays (ASU) is a doctoral student in political science who will be a fully funded graduate assistant with CNS-ASU in AY 06-07. Hays will be working in support of RTTA 1/2 Public Value Mapping and other activities making use of his methodological skills. He also attended the nano fiction writing workshop and produced a story for it.

Name: Hillback, Elliott

Worked for more than 160 Hours: No

Contribution to Project:

Hillback (Wisconsin) has been working on both the content analysis and survey preparation for RTTA 2 under the direction of senior investigator Scheufele.

Name: Wang, Jue

Worked for more than 160 Hours: No

Contribution to Project:

Wang (GA Tech) is a doctoral student in public policy and primarily engaged in RTTA 1/1 activities.

Name: Bhaskarabhatla, Ajay

Worked for more than 160 Hours: Yes

Contribution to Project:

Bhaskarabhatla (GA Tech) is a master's student in public policy, engaged primarily in the RTTA 1/1 activity.

Name: Tang, Li

Worked for more than 160 Hours: Yes

Contribution to Project:

Tang (GA Tech) is a doctoral student public policy, engaged primarily in the RTTA 1/1 agenda.

Name: Lamos, Erin

Worked for more than 160 Hours: Yes

Contribution to Project:

Lamos (GA Tech) is a master's student public policy, engaged primarily in RTTA 1/1 activities.

Name: Malani, Uttam

Worked for more than 160 Hours: No

Contribution to Project:

Malani (GA Tech) -- not funded by CNS-ASU -- has been a collaborator on RTTA 1/1 related writing projects.

Name: Slanina, John

Worked for more than 160 Hours: No

Contribution to Project:

Slanina (GA Tech) is partially supported by CNS and involved primarily in the RTTA 1/1 activities.

Name: Stephens, Alexa

Worked for more than 160 Hours: No

Contribution to Project:

Stephens (GA Tech), not funded by CNS, is a collaborator on RTTA 1/1 related writing projects.

Name: Shanley, Lea

Worked for more than 160 Hours: No

Contribution to Project:

Shanley (Wisconsin), a graduate student in Environmental Remote Sensing, has expertise in tribal sovereignty and ownership of data and will be working with senior investigator Suchman on the Freedom, Privacy, and Security theme beginning in F 06.

Name: Gallo, Jason

Worked for more than 160 Hours: No

Contribution to Project:

Gallo, a graduate student in the Media, Technology, and Society Program in School of Communication at Northwestern, will be supported in F 06 for work on his dissertation, which looks at the history of NSF's funding of NSE in the context of economic and security discourses.

Name: Tsung, Jen Shih

Worked for more than 160 Hours: No

Contribution to Project:

Tsung, a graduate student in the Journalism School at Wisconsin, will work with co-leader Dietram Scheufele on RTTA 2/2 Public Opinion and Values.

Name: Libaers, Dirk

Worked for more than 160 Hours: No

Contribution to Project:

Libaers (GA Tech) has been working in support of the RTTA 1 activities under the supervision of Bozeman but not on CNS funds. He will be hired by CNS for RTTA 1 work in F 06.

Undergraduate Student

Name: Pirtle, Zachary

Worked for more than 160 Hours: Yes

Contribution to Project:

Pirtle (ASU), a major in mechanical engineering, has been working in support of a number of research tasks, including the Human Identity, Enhancement, and Biology theme, and pursuing an undergraduate honors thesis on the evolution of ELSI funding in the US that resulted in the nano-in-society network.

Name: Abdullah, Kalil

Worked for more than 160 Hours: Yes

Contribution to Project:

Abdullah (ASU) has worked in support of a variety of research activities, including background on the NNI and the source of attention to human and artificial intelligence in the 2003 Nanotechnology R&D Act.

Name: Choi, Josh

Worked for more than 160 Hours: No

Contribution to Project:

Choi (ASU) has supported work in RTTA 3/1 Scenario Development and other activities.

Name: Young, Brian

Worked for more than 160 Hours: Yes

Contribution to Project:

Young (ASU) has worked in support of scenario development and other activities oriented toward wiki participation and dissemination.

Name: Omer, Sidra

Worked for more than 160 Hours: No

Contribution to Project:

Omer (ASU) has prepared brief case studies in 'forbidding science' and worked in support of a number of CNS administrative and research activities.

Name: Anderson, Derrick

Worked for more than 160 Hours: Yes

Contribution to Project:

Catalog governing activities re: nano. Attend weekly researcher meetings.

Name: McCloud, Charles Luke

Worked for more than 160 Hours: Yes

Contribution to Project:

McCloud (GA Tech) is an undergraduate major in public policy, serving as a research assistant primarily with the RTTA 1/1 activity. He has worked for the project with institutional funding in Su 06 but will be funded by the Center come F 06.

Name: Finney, Sharyn

Worked for more than 160 Hours: Yes

Contribution to Project:

Finney (GA Tech) is an undergraduate major in public policy and economics, assisting with the RTTA 1/1 activity.

Name: Bhalla, Nidhi

Worked for more than 160 Hours: No

Contribution to Project:

Bhalla (ASU) is a political science major who worked under the supervision of Robert in the TRC 2 HIEB activity in Sp 06.

Technician, Programmer**Other Participant**

Name: Schneider, Anne

Worked for more than 160 Hours: Yes

Contribution to Project:

Scheider, co-PI and co-leader of RTTA 4 Reflexivity Assessment and Evaluation, is a member of the Executive Committee and has begun collaborative work w/ consultant Ingram to investigate the role of public participation and the role of boundary organizations like CNS in managing multiple 'ways of knowing.' With Ingram and other colleagues, she is planning a workshop to investigate these themes, which will also include a recently NSF-funded project at Harvard on boundary organizations and the international agricultural system.

Name: Fischer, Heidi

Worked for more than 160 Hours: No

Contribution to Project:

Fischer, co-director of InnovationSpace, is working in summer 06 to prepare for the nanotechnology sections of the course in AY 06-07. She also was co-PI in the NUE proposal led by Boradkar.

Name: Wolbring, Gregor

Worked for more than 160 Hours: No

Contribution to Project:

Wolbring (Calgary) is commissioned to write a white paper on persons with disabilities and nanotechnological therapies and enhancements.

Name: DiNapoli, Shannon

Worked for more than 160 Hours: Yes

Contribution to Project:

DiNapoli (ASU) is currently a post-baccalaureate student working under the supervision of TRC 2 leader Robert on issues in nano-ethics. DiNapoli started her work with CNS in Sp 06 as an undergraduate intern and will continue as a fully funded graduate assistant in AY 06-07 after enrolling in a master's program in the School of Life Sciences. She will also be working in the laboratory of senior investigator Woodbury.

Name: Smith, Rachel

Worked for more than 160 Hours: Yes

Contribution to Project:

Smith (ASU), a recent graduate in biology and society, has been working under the supervision of post-doctoral fellow Bennett and PI Guston on a survey of the activities of US states in nanotechnology development.

Name: Saludo, Amethyst

Worked for more than 160 Hours: No

Contribution to Project:

Saludo (ASU), a recent graduate from design, is providing design assistance to CNS-ASU web, presentation, and other visual displays.

Name: Schoeneck, Dave

Worked for more than 160 Hours: Yes

Contribution to Project:

Schoeneck (GA Tech) is a recent physics graduate who has been working on RTTA 1/1 activities prior to applying to graduate school.

Name: Fichtner, Aaron

Worked for more than 160 Hours: No

Contribution to Project:

Fichter is the research director at Rutgers' Heldrich Center for Workforce Development and a principal in the subcontract to Rutgers for the nano workforce assessment.

Name: Reynolds, Scott

Worked for more than 160 Hours: No

Contribution to Project:

Reynolds is a project director at Rutgers' Heldrich Center for Workforce Development and involved in the nano workforce assessment subcontract.

Name: Laird, Frank

Worked for more than 160 Hours: No

Contribution to Project:

Laird has collaborated with consultant Barben in writing a paper on 'Acceptance Politics' commissioned by CNS-ASU.

Name: Barben, Daniel

Worked for more than 160 Hours: No

Contribution to Project:

Barben has collaborated with consultant Laird in writing a paper on 'Acceptance Politics' commissioned by CNS-ASU.

Research Experience for Undergraduates

Organizational Partners

The Biodesign Institute.

The Biodesign Institute at ASU is our major NSE partner, and Biodesign director Poste is a co-PI in CNS-ASU. This partnership is manifest in a number of formal and informal relationships, including:

- ò a co-funded staff person (15% CNS), Melissa Cornish, who is a senior analyst in the Biodesign Institute's department of strategy and research alliances and serves as CNS's liaison to Biodesign;
- ò three co-funded (33%) graduate students (Spadola, Lappe, and Brelsford), designated CNS-Biodesign fellows, who take societal implications coursework, assist in outreach activities (especially the Science Caf ), provide technical advice to projects including RTTA 1/RISA and scenario development, etc.;
- ò applications for other external funds, including a NSF Graduate Ethics Education grant with the collaboration of Biodesign center heads Woodbury and Lindsay, an IGERT pre-proposal under Woodbury's leadership, etc.; and
- ò use of Biodesign space for CNS-ASU seminars and other activities.

CRESMET

The Center for Research on Education in Science, Mathematics, Engineering and Technology (CRESMET) is another major partner on campus, and its director Carlson is a co-PI in CNS-ASU. In addition to co-funding (50%) two CNS-CRESMET graduate student fellows (Hisamura and Garay), CRESMET and CNS-ASU are partnering to develop a new course for pre-college teachers in nanotechnology in society. Post-doctoral fellow Bennett, co-funded between CNS and CSPO, leads this curriculum development activity.

ASU Hispanic Research Center

Hispanic Research Center (HRC). CNS-ASU co-funds (50%) a staff person, Raol Alcala, who serves as a point of contact between our two organizations. We are now in the process of establishing two programs to improve our ability to recruit graduate students from under-represented groups to ASU for nanotechnology and its societal implications. First, both CNS-ASU and HRC will contribute supplementary fellowship funds to recruit graduate students from under-represented groups. Second, we will collaborate in holding an undergraduate research conference for under-represented perspectives on nanotechnology and its societal implications. Although at an early stage of planning, the rest of the nano-in-society network (CNS-UCSB, USC, and Harvard/UCLA) have expressed interest in joining us in this activity. A draft description of the conference is included in the contributions to human resources development.

InnovationSpace

Led by CNS senior investigator Boradkar, InnovationSpace (IS) is a trans-disciplinary educational collaboration among the ASU schools of design, business, and engineering. After a preparatory year of background research and curriculum development, IS is adding three cross-functional student groups in nanotechnology to its curriculum for AY 06-07 and 07-08. IS will draw from RTTA 3/Scenario Development activities. Boradkar also led a NSF NUE proposal (submitted 5/06) on 'DESIN: Design for Environmentally and Socially Integrated Nanotechnologies' including CNS PI Guston and senior investigator Crittenden (Engineering) as co-PIs.

ASU East

In collaboration with environmental NSE researchers at ASU-East and ASU, CNS participated in the (unfunded) NIRT proposal, 'Understanding Societal Implications of Manufactured Nanomaterials in the Environment: An International Collaborative Approach.'

School of Human Evol and Social Cha

ASU's School of Human Evolution and Social Change (SHESC) shares with CNS-ASU the support of post-doctoral fellow Conz. With CNS, Conz supports RTTA 4 Reflexivity Assessment under the direction of senior investigator K. Corley. Conz will also be teaching in the Learning Community planned for Sp 07 (in the place of Hackett, who will be on leave with NSF). CNS-ASU and CSPO also share with SHESC newly hired (Aug 06) assistant professor Wetmore.

ASU Sandra Day O'Connor School of Law

CNS-ASU and CSPO assisted the Program in Law, Science, and Technology at ASU's newly renamed O'Connor School of Law in organizing a symposium on 'Forbidding Science,' which had a panel involving questions of nanotechnology û chaired by CNS co-PI Sarewitz and involving senior investigator Lindsay from ASU's Biodesign Institute and Patrick McCray from NSEC/CNS-UCSB û as well as panels on biosecurity, human cognitive enhancement, and rights to research. In conjunction with the meeting, primary organizer and CNS senior investigator Marchant has submitted a set of papers to Science and Engineering Ethics, including 'Science, Democracy, and the Right to Research' by Mark Brown (Cal State U., Sacramento) and CNS PI Guston. CNS and CSPO also served as a work site for three law students taking an Applied Research Seminar class. Two students wrote research papers on nano-related topics: 'The Asilomar Conference and its Application to Today's Technologies: Could an Asilomar Conference Help Manage Nanotechnology's Risks?' and 'Arizona State University's

Potential Liability for Nanotechnology Research.' The third paper 'Law and Research: Free Inquiry Absent a Recognized 'Right to Research' is more broadly applicable but relevant to nanotechnology research.

Sandia National Laboratory

CNS-ASU, CSPO, and the Advanced Concepts Group at SNL partnered to run a workshop on 'Policy Implications of Technologies for Cognitive Enhancement' at ASU in May 06. It was attended CNS co-PIs Guston and Sarewitz and senior investigators Allenby, Marchant, Privateer, and Robert, among two dozen other attendees. A draft report, written by Sarewitz, will be forthcoming by end of Su 06.

US DOE CINT

US DOE/Center for Integrated Nanotechnology (CINT). Primarily through supported graduate student (and soon to be post-doc) Fisher (Colorado), CNS-ASU has begun to develop a program to inform CINT users about the societal implications of nanotechnology. Our goal is to create a training program in societal implications that can be integrated into CINT's own training, that is portable back to the users' own institutions, and which can be replicated at DOE's other nano user facilities.

NISE Net

Nanoscale Informal Science Education Network (NISE Net). CNS-ASU has begun a number of contact activities with NISE Net, including: a plenary talk by PI Guston at the NISE Net launch in San Francisco in November (also attended by senior investigator Ramakrishna); a networking lunch among nano-in-society, NISE Net, and other interested parties during the AAAS annual meeting in February 06 in St. Louis; and a planned proposal to NISE Net with Anna Waldron of the Cornell Nanobiotechnology STC for a nano-in-society experiment in one of the large NISE museum exhibits.

International Nanotechnology in Society

International Nanotechnology in Society Network (INSN). With support from CNS and CSPO, INSN held its third meeting in Mar 06 in conjunction with the World Forum on Science and Civilization, hosted by the Martin Institute at Oxford University, England. INSN (www.nanoandsociety.org), with membership in a dozen countries, has created a governance structure, charted shared goals and projects, and is planning sub-group meetings at upcoming conferences of the European Association for the Study of Science and Technology (Lausanne, Aug 06) and the Society for the Social Studies of Science (Vancouver, Oct 06). CNS activities facilitated by INSN include Fisher's research trip to Twente and the IGERT European training, described elsewhere, and Guston's participation among the editors of volume on public engagement and nanotechnology. CNS support allowed the participation of post-doctoral fellow Bennett and two scholars from Brazil, Noela Invernizzi and Julia Guivant.

NSEC/CNS-UCSB

NSEC/CNS-University of California, Santa Barbara (UCSB). In addition to ongoing and regular conversations, CNS-ASU is arranging for an ASU undergraduate to work with data generated by CNS-UCSB co-PI Bruce Bimber on civil society groups involved in nanotechnology. CNS-ASU is also negotiating with CNS-UCSB to be the sixth site of the National Citizens' Technology Forum. CNS-UCSB co-director Barbara Harthorn attended the CNS-ASU launch, and CNS-ASU faculty member Wetmore attended the CNS-UCSB launch. CNS-UCSB co-director Patrick McCray participated in both the Forbidding Science workshop hosted by the ASU O'Connor College of Law and the Trading Zones workshop organized by UVA's Michael Gorman -- both of which CNS-ASU helped to organize and sponsor. CNS-ASU co-PIs Guston and Sarewitz have also traveled to Santa Barbara to visit with their CNS-UCSB colleagues, and GA Tech PI and RTTA 1 leader Shapira has met with his CNS-UCSB counterpart, Chris Newfield twice to discuss and coordinate their respective NSE research and innovation assessment activities.

Nanotechnology in Society PIs Group

Nanotechnology in Society PIs Group. CNS-ASU director Guston participates, along with CNS-UCSB co-director Barbara Harthorn and NSF-funded nano-in-society PIs Davis Baird and Richard Freeman, in a monthly teleconference to discuss common issues and activities. There have been a variety of networking outcomes, including an anticipated collaboration among the group in CNS-ASU's research conference for underrepresented students.

Georgia Institute of Technology

Georgia Institute of Technology is the recipient of a major subcontract from CNS-ASU, for which Shapira is the PI. The subcontract focuses on research in RTTA 1: Research and Innovation System Assessment, particularly research program assessment and public value mapping activities. GA Tech will also be a site for the National Citizens' Technology Forum.

North Carolina State University

North Carolina State University has a major subcontract with CNS-ASU (for which Hamlett is the PI), particularly for the National Citizens' Technology Forum activity in RTTA 3: Deliberation and Participation. There were no formal, funded activities in YR 1, but organizing activities will begin in YR 2 in preparation for holding the NCTF in YR 3 (March 08).

Rutgers, State Univ of New Jersey

Rutgers, The State University of New Jersey, and its Heldrich Center for Workforce Development, has a major subcontract with CNS-ASU (for which Van Horn is the PI). The Heldrich Center is responsible for conducting regional nano-workforce supply and demand assessments in years 2 (Phoenix), 3 (Madison), and 4 (Atlanta).

University of Colorado, Boulder

University of Colorado, Boulder, largely through its Center for Science and Technology Policy Research, has a major subcontract with CNS-ASU (for which Pielke is the PI). The subcontract focuses on the development of concepts in RTTA through the doctoral research of supported student Fisher, and the National Citizens' Technology Forum site located there in YR 3.

Consortium for Science, Policy and Outco

CNS-ASU and CSPO are tightly integrated but separate entities. CSPO contributes a significant share of the academic year time for CNS director Guston and associate director Sarewitz (who are, respectively, associate director and director of CSPO). CSPO co-funds post-doctoral fellow Bennett with CNS, and CNS personnel, particularly undergraduate interns, have been co-located with CSPO personnel. CSPO also provided significant in-kind support and training for the start-up of CNS, including web development. The two centers have collaborated on the Sandia and Trading Zones workshop and exist together as a nearly seamless collegial group with joint co-curricular activities.

Illinois Institute of Technology

CNS was a co-sponsor of the NanoWorld meeting, held in May 06 at the National Press Club in Washington, DC, organized by Nigel Cameron of the Kent School of Law and the Center for Nanotechnology and Society there. CNS-ASU director Guston served as moderator for two panels. CNS director Guston and IIT's Vivian Weil have co-organized a two-part symposium proposed for the 2006 annual meeting of the Society for Social Studies of Science on 'New Ethnographies of Nanotechnology.' CNS also hosted a brief visit by Michele Mekel of the Center for Nanotechnology and Society in July 06.

University of Wisconsin-Madison

University of Wisconsin-Madison is the recipient of a major subcontract from CNS-ASU. Center co-PI Miller was the initial PI of the subcontract, but with his move to ASU beginning AY 06-07, Scheufele will become the subcontract PI. The subcontract focuses on the performance of fundamental research in the two Thematic Research Clusters of Freedom, Privacy, and Security and of Human Identity, Enhancement, and Biology. The subcontract also provides significant resources for student training.

University of Georgia

Senior investigator and RTTA 1/2 Public Value Mapping leader Barry Bozeman has recently moved from GA Tech to U GA, and CNS-ASU will extend a subcontract to U GA to support Bozeman's PVM work.

Institute for Social Science Research

The Institute for Social Science Research (ISSR) at ASU provides research development and data support services across the university. It is also the umbrella unit for transdisciplinary research centers that span the university's colleges, schools, and departments. ISSR is conducting basic public opinion research and data collection for a national telephone survey launched in Mar 06 and expected to be completed imminently. The survey supports the work of RTTA 2, Public Opinion and Values.

Institute for Humanities Research

IHR supported senior investigator Robert's meeting on scenario development in nano-biotechnology.

UCLA/Harvard/NBER

CNS-ASU subcontractors at GA Tech are mostly faculty in the School of Public Policy there. They have developed collaborative relationships with several of their GA Tech colleagues -- mostly in the School of Management -- who are part of the NSF-funded NIRT and nano-in-society network project at UCLA/Harvard/NBER that includes GA Tech. Collaborators include management faculty member Graham.

Other Collaborators or Contacts

CNS-ASU is itself a network of institutions and individuals, and as a Nano-scale Science and Engineering Center (NSEC), CNS-ASU envisions itself at the hub of a broader nano-in-society network including other NSF-funded activities as well as individual scholars. The Center has an aggressive and generous partnering strategy, which basically amounts to saying 'yes' to any degree of relevant interaction for which the Center has the resources. CNS-ASU has collaborated with some of these individuals and groups in a variety of activities:

Michael Gorman, University of Virginia. CNS-ASU partnered with Gorman to host a workshop on 'Trading Zones' (based on Peter Galison's work) from an NSF proposal submitted by Gorman with CNS personnel Guston, Sarewitz, and Allenby included as senior investigators. Outcomes include a Wikipedia entry (http://en.wikipedia.org/wiki/Trading_zones) and ongoing discussions about research agendas for nanotechnology, metaphors, and interdisciplinarity.

Rosalyn Berne, University of Virginia. CNS was the pilot site for Berne's NSF-funded project on nano-ethics and science fiction. Seven CNS-ASU personnel (undergrads, grads, and post-docs) participated, and excerpts of their work will be made available on the CNS web site. CNS also engaged Berne's expertise for its Ethics Education in Science and Engineering proposal and hosted her as a seminar speaker in Oct 05.

Arie Rip, University of Twente. CNS-ASU sponsored a two-week long research trip (July 06) by supported graduate student Fisher (Colorado) to train and exchange research ideas with Rip who, at the University of Twente in the Netherlands, directs the societal portion of NanoNed, the large Dutch NSE project. Rip and colleagues at Twente are also involved in a two-week graduate training activity for students from Woodbury's IGERT (see international activities).

William Clark, Harvard University. Clark will be conducting an NSF-sponsored research project on boundary organizations and the international agricultural system, with Guston the PI on a subcontract to ASU that will include a research planning workshop to bring together Clark's group, CNS-ASU (and the group led by Schneider and Ingram), and other ASU boundary organizations.

Alfinio Flores, Professor of Mathematics Education in the Carey School of Education at ASU, will assist in advising the project on the values of Latino/Hispanic NSE researchers that graduate student Garcia-Mont is conducting.

To further extend its network and to learn from individual scholars with particular skills and knowledge, CNS-ASU works with a group of consultants and collaborators, including:

Gregor Wolbring (University of Calgary). CNS-ASU has commissioned from Wolbring a background paper entitled 'Nanotechnology and Disabled People.' A draft of the paper is currently under review by Sarewitz.

Daniel Barben (Wisconsin) and Frank Laird (University of Denver). CNS has commissioned from Barben and Laird a background paper entitled 'Acceptance Politics of Contested Technologies: A Comparison between Nuclear Power, Biotechnology, and Nanotechnology,' presented at the annual meeting of the Science & Democracy Network at Harvard University in June 06.

Anna Waldron (Cornell), education director at the Cornell STC on nanobiotechnology visited CNS-ASU in April 2006 and initiated a collaboration through which CNS and the STC will seek supplementary funding for a 'social implications intervention' in one of the large museum exhibits that the STC is contributing to.

Helen Ingram (UC-Irvine) is collaborating with CNS co-PI Schneider on work in RTTA 4 Reflexivity Assessment and Evaluation that would examine the role of CNS-ASU as a boundary organization in comparison with other similar organizations that manage different 'ways of knowing.'

CNS-ASU has begun to create a larger network of scholars in the societal implications of nanotechnologies through its monthly speaker series. Below are listed the first year's speakers, all of whom had collegial and small group meetings in addition to providing their talks. Abstracts of the talks may be found in the section reporting on outreach. In YR 2 and forward, these seminars will be the basis of a Yearbook of Nanotechnology in Society, to be published by Springer.

Gregor Wolbring (University of Calgary), 'Human Enhancement Medicine: The Final Frontier.' October 6, 2005.

Rosalyn W. Berne (University of Virginia), 'Conversations & Reflections with Researchers in Nanotechnology.' November 4, 2005.

Cynthia Selin (Copenhagen Business School), 'Expectations and the Emergence of Nanotechnology.' January 20, 2006.

Jennifer Kuzma (University of Minnesota), 'Tiny Things, Big Divides: Bridging Practice and Policy in the Study and Design of Oversight for Bio- and Nanotechnology.' January 24, 2006.

Michael Bennett (RPI), 'Techn? De Jure: Technological Legislation in a Nanotechnological Age.' February 3, 2006.

Andrew Jamison (Aalborg University, Sweden), 'Hubris and Hybrids: On the Cultural Assessment of Nanotechnology.' April 26, 2006.

Jeffrey Schloss (National Human Genome Research Institute, NIH), 'The Nanomedicine Roadmap Initiative: NIH's Interest in Nanotechnology and the National Nanotechnology Initiative.' May 2, 2006; and 'Nanomedicine in the NIH Roadmap: Priorities, Vision, & Implications' on May 3, 2006.

Activities and Findings

Research and Education Activities:

RESEARCH:

Decades before NSE's most important outcomes begin to unfold, complex social relations are now forming around it. CNS-ASU, with partnerships at five other major public universities — University of Wisconsin-Madison, Georgia Institute of Technology, North Carolina State University, University of Colorado-Boulder, and Rutgers, The State University of New Jersey — conducts fundamental and problem-oriented research on the cultural, ethical, legal, educational, and environmental ('societal') implications of nanotechnologies.

CNS-ASU implements an interdisciplinary program of research and engagement called 'real-time technology assessment' (RTTA), which consists of four methods of inquiry:

- ò mapping the research dynamics of the NSE enterprise and its anticipated societal outcomes;
- ò monitoring the changing values of the public and of researchers regarding NSE;
- ò engaging researchers and various publics in deliberative and participatory forums; and
- ò reflexively assessing the impact of the information and experiences generated by our activities on the values held and choices made by the NSE researchers in our network.

Through RTTA, CNS-ASU probes the hypothesis that trajectories of NSE innovation can be steered toward socially desirable goals, and away from undesirable ones, by introducing a greater capacity for reflexivity — that is, social learning that can expand the range of conscious choice — into knowledge-producing institutions.

We organize our research around two broad and cross-cutting Thematic Research Clusters: TRC 1, Freedom, Privacy, and Security; and TRC 2 Human Identity, Enhancement, and Biology.

Each 'Interdisciplinary Research Group' is described below. For tracking the progress of research, many groups have procedural milestones that are acknowledged in each section.

Research Title RTTA 1: Research and Innovation Systems Analysis (RISA)

Led by Philip Shapira (GA Tech)

Team Members See below.

Activities Underway and Planned: The goal of RTTA 1 RISA is to characterize the scope and dynamics of the NSE research enterprise, public and private, and the plausible linkages between it and public values and outcomes. RISA has three separate activities. See below for details.

Outcomes See below.

Research Title RTTA 1/1 RISA/Research Program Assessment (RPA)

Led by Philip Shapira

Team Members Faculty: Mauricio Iacopetta (GA Tech); Alan Porter (GA Tech); Jan Youtie (GA Tech).

Students: Ajay Bhaskarabhatla; Sharyn Finney; Erin Lamos; Charles (Luke) McCloud; Li Tang; Jue Wang (all GA Tech)

Activities Underway and Planned: The goal of RTTA 1/1 RPA is to develop empirically-based insights about the dynamics of the NSE enterprise, including its direction, velocity, developing synergies and linkages, as indicated by publications, patents, and other data sources. Milestones for the first and second years include defining an acceptable search algorithm, using it to create the bibliographic and patent databases, and analyzing and mapping data to undertake initial assessments.

In YR 1, RPA's primary activities have included: 1) identifying and validating the appropriate data sources for the project's subsequent methods of text and data mining; 2) exploring and developing bibliographic and patent search algorithms for NSE and their implications; and 3) vetting the definition and search protocol through a survey of NSE researchers and collegial interaction.

Outcomes: Through an iterative process of collegial consultation and a survey (19 expert respondents of 75), the RPA team has developed a revised bibliographic definition of nanotechnology. It is now in the process of constructing the comprehensive bibliographic and patent databases, with an expected completion date of Aug 06. Shapira and his team have already delivered several presentations on their methods and shared their emerging definition of nanotechnology with colleagues in the US and Europe. Once data cleaning and validation is complete, three initial analyses will be undertaken: (1) mapping emerging US and international NSE developments in research and early commercialization; (2) identifying and probing the drivers of leading NSE research and commercialization regional clusters (worldwide); and (3) assessing the extent to which NSE is emerging as a convergent general purpose technology, sharing data and working in collaboration with Stuart Graham (Georgia Tech and a member of the Harvard-UCLA-NBER NSE research group).

Research Title RTTA 1/2 RISA/Public Value Mapping (PVM)

Led by Barry Bozeman (University of Georgia)

Team Members Ira Bennett (ASU); grad student (UGA; TBD)

Activities Underway and Planned: The goal of RTTA 1/2 PVM is to assess the social outcomes, or 'public value' of NSE research activities. Much of the YR 1 work was anticipated to be conceptual development, and it has benefited from Bozeman's work during AY 05-06 on a book on developing PVM and related work under the sponsorship of the Kellogg Foundation. The PVM work was initially to have been supported by a post-doctoral fellow funded by ASU, but we have been unable to recruit a candidate with the appropriate skills. Instead, we will for YR 2 fund a social science graduate student under Bozeman's direct supervision at the University of Georgia and fund 50% of post-doc Bennett, a nano-chemist, to assist the project through ASU funds.

Outcomes None to report yet.

Research Title RTTA 1/3 RISA/Workforce Assessment (WA)

Led by Carl Van Horn (Rutgers)

Team Members Aaron Fichtner (Rutgers); Scott Reynolds (Rutgers)

Activities Underway and Planned: The goal of RTTA 1/3 WA is to conduct regional workforce supply and demand analysis in each of the three regional labor markets represented by major components of CNS-ASU - Phoenix, Madison, and Atlanta. Milestones include producing a detailed research plan to be completed and vetted by Aug 06, preliminary interviews to be conducted in late Aug/Sep 06 in the first regional field site (Phoenix), and the full regional assessment commencing in Sep with the production of a list of relevant nano employers and educators in the region. Field work in the other two regions following in subsequent years.

Outcomes None to report yet.

Research Title RTTA 2: Public Opinion and Values (POV)

Led by Dietram Scheufele (Wisconsin) and Elizabeth Corley (ASU)

Team Members See below.

Activities Underway and Planned The goal of RTTA 2 POV is to monitor, among both scientists and the lay public, the understanding of and values relating to NSE and its potential outcomes, track these variables over time, and examine the role of the media in reflecting and influencing them. POV has three separate activities. See below for details.

Outcomes See below.

Research Title RTTA 2/1 POV/Public Opinion Polling (POP)

Led by Dietram Scheufele (Wisconsin)

Team Members Elizabeth Corley (ASU), Pam Hunter (ASU-ISSR) Hooi-Hong Khor (ASU-ISSR); other ISSR staff

Activities Underway and Planned The goal of RTTA 2/1 is to conduct a national RDD telephone survey (N=1200) to understand the knowledge of and attitudes toward nanotechnology by the US public. This activity is conducted in cooperation with the ASU Institute for Social Science Research (ISSR) — particularly Hunter and Khor. Milestones met include drafting and pre-testing the survey in Sp 06, and fielding the survey in late Sp 06. As of this writing, ISSR has completed more than 1100 of the telephone interviews. Preliminary analysis should be available by the end of Su 06.

Outcomes Not only will this survey be the first to provide longitudinal data from comparison to previous surveys about nanotechnology, but it will also provide comparative data from questions taken from Eurobarometer about nanotechnology.

Research Title RTTA 2/2 POV/Media Influence (MI)

Led by Sharon Dunwoody (Wisconsin)

Team Members Faculty: Dietram Scheufele (Wisconsin)

Student: Elliot Hillback (Wisconsin)

Activities Underway and Planned The goal of RTTA 2/2 MI is to explore the complicated role of the media in reflecting and influencing public opinion around nanotechnology through experimental interventions involving the award-winning science web site, The Why Files (www.whyfiles.org). In Sp 06, Dunwoody and Scheufele began to develop an instrument for conducting a content analysis of media stories on nanotechnology. They expect to achieve this milestone in mid-Fa 06. A portion of the coding scheme will be coordinated with that used by CNS-UCSB for its coding of on-line materials. Scheufele will be meeting with CNS-UCSB co-PI Bimber in Su 06 to assure this coordination. In Fa 06, they will begin pursuit of the second milestone, the first round of data collection, to be completed by end of Sp 07.

Outcomes None to report yet.

Research Title RTTA 2/3 POV/Researchers' Values (SV)

Led by Elizabeth Corley (ASU)

Team Members Faculty: Dietram Scheufele (Wisconsin), Kevin Corley (ASU)

Post-doc: David Conz (ASU)

Student: Aixa Garcia-Mont (ASU)

Activities Underway and Planned The goal of RTTA 2/3 RV is to understand in a broad way the knowledge of and attitudes toward nanotechnology in society among NSE researchers. A mail survey of 400-500 NSE researchers is planned for Sp 07. This survey will help us triangulate between the public opinion poll (RTTA 2/1) and the more detailed interviews with NSE researchers at The Biodesign Institute at ASU. In Fa 06, researchers will begin developing the instrument and the bibliometric analyses for the sampling frame for this project. They will begin data collection in Sp 07 and analysis in Su 07.

Outcomes None to report yet.

Research Title RTTA 3: Deliberation and Participation

Led by Dan Sarewitz (ASU) and Patrick Hamlett (North Carolina State)

Team Members See below.

Activities Underway and Planned The goal of DP is to develop multiple, plausible visions of nanotechnology-enabled futures, elucidate public preferences — especially values from underserved communities — for various alternatives and, using such preferences, help further refine future revisions and enhance contextual awareness. DP has four separate activities. See below for details.

Outcomes See below.

Research Title RTTA 3/1 DP/Scenario Development (SD)

Led by Dan Sarewitz (ASU)
 Team Members Post-doc: Ira Bennett (ASU); Cynthia Selin (ASU)
 Students: Josh Choi; Zach Pirtle; Brian Young (all ASU)

Activities Underway and Planned The goal of RTTA 3/1 SD is to develop a variety of plausible, technically validated nanotechnological futures, this first year working within the frame of TRC 1: Freedom, Privacy, and Security. Milestones include the drafting of a set of ten scenarios, achieved June 06, and concrete plans for their vetting, to be achieved July 06. This vetting plan includes direct expert elicitation and the construction of a wiki site, to be completed by Sep 06. The wiki site will actually be a quasi-experiment: With an open, public site and a private site operating simultaneously, the team will assess the differences in visions of plausible nanotechnological futures between the 'experts' and the 'general public.'

Outcomes After vetting taking place through Su 06, scenarios will become grist for work by InnovationSpace, CriticalCorps, and other CNS activities.

Research Title RTTA 3/2 DP/InnovationSpace (IS)
 Led by Prasad Boradkar (ASU)
 Team Members Adelheid Fischer (ASU)

Activities Underway and Planned The goal of RTTA 3/2 IS is to create a track within a pre-existing, cross-disciplinary undergraduate course to explore constructive issues of design for nanotechnology products. That course, IS, involves seniors from the schools of design, engineering, and business. Three cross-functional teams will work with the scenarios developed in RTTA 3/1 SD to begin developing new venture proposals for nanotechnology products. Teams will reach out to potential users of such technologies through focus groups and 'rapid ethnographies' to help ensure the proposed products meet real needs.

Outcomes IS with this nano-focus will be taught in AY 06-07. Collaboration with the IS team over similar activities has also led to the submission of a Nano-scale Undergraduate Education (NUE) proposal, Design for Environmentally and Socially Integrated Nanotechnologies (DESIN; Boradkar, PI).

Research Title RTTA 3/3 DP/CriticalCorps (CC)
 Led by Prasad Boradkar (ASU)
 Team Members

Activities Underway and Planned The goal of RTTA 3/3 CC is to help illuminate the social significance and consequences of nanotechnological design concepts as they are developed. Applying the techniques of cultural criticism to the scenarios developed in RTTA 3/1 SD, as well as other similar sources, the CC team will situate artifacts, scenarios, and new venture proposals within cultural, social, political, environmental, and economic contexts. CC will begin when the scenarios are ready for analysis.

Outcomes None to report yet.

Research Title RTTA 3/4 DP/National Citizens' Technology Forum
 Led by Patrick Hamlett (North Carolina State U.)
 Team Members Michael Cobb (NCSU), Susan Cozzens (GA Tech), David Guston (ASU), Roger Pielke, Jr. (Colorado), Daniel Kleinman (Wisconsin), Tom Kelly (University of New Hampshire); Stacy van der Veer (University of New Hampshire)

Activities Underway and Planned There were no planned or funded activities for the NCTF in Yr 1 of the Center, although a collaborative workspace on the web has been established. Based on goals for demographics and representation, the team does need to recruit one additional site to the NCTF, and we have been in negotiation with NSF and with CNS-UCSB over the possibility of locating the sixth site at UCSB.

Outcomes Creation of a collaborative web-based workspace.

Research Title RTTA 4: Reflexivity Assessment and Evaluation (RAE)
 Led by Kevin Corley (ASU; replacing Ed Hackett) and Anne Schneider (ASU)

Team Members See below.

Activities Underway and Planned The goal of RAE is to understand how the knowledge generated by CNS-ASU influences the values and choices made by NSE researchers and others, and to assess and evaluate the impact of CNS-ASU activities more generally. RAE has two separate activities. See below for details.

Outcomes See below.

Research Title RTTA 4/1: RAE/Reflexivity Assessment

Led by Kevin Corley (ASU)

Team Members Faculty: Ed Hackett (ASU), Elizabeth Corley (ASU)

Post-doc: David Conz (ASU)

Students: Aixa Garcia-Mont (ASU)

Activities Underway and Planned In F 05, the research team assembled and began to develop a theoretical framework to examine the identity, knowledge, and practice of NSE researchers regarding nanotechnology in society and the interaction among those three variables. These interviews will serve as a baseline against which to measure changes among NSE researchers with which CNS-ASU interacts over time. In Sp 06, the team developed and tested a protocol to explore this framework and developed the sample. K Corley and Conz began conducting field interviews in late Sp and through Su 06. Interviews are being digitally recorded, transcribed, and cleaned. The preliminary round of interviews should be complete by the end of Su 06, and coding and analysis will commence in F 06. The second round of data collection will likely begin in Sp 07.

This activity is closely linked with RTTA 2/1 Public Opinion Survey and RTTA 2/2 Scientists' Values. The three activities can be used comparatively to develop a very detailed understanding of similarities and differences between the ways that lay citizens and scientists understand and value nanotechnology. In Su 06, CNS-ASU hired graduate student Garcia-Mont, who will be adapting K Corley's identity-knowledge-practice protocol to use specifically with Latino and Hispanic NSE researchers in the US. Garcia-Mont is performing background research, literature reviews, and attempting to construct a sample frame in Su 06 for data collection to begin in Fa 06. She will work under the supervision of RTTA 4/1 faculty, Guston, and faculty from the Hispanic Research Center and Professor Alfinio Flores from her home academic unit (Educational Leadership and Policy).

Outcomes By the end of Su 06, the team anticipates that some 30-35 interviews of local NSE researchers û faculty, post-docs, and grad students û will have been completed.

Research Title RTTA 4/2: RAE/Evaluation

Led by Anne Schneider (ASU)

Team Members Faculty: David Guston (ASU)

Students: Erik Fisher (Colorado); Risto Karinen (ASU); Kalil Abdullah (ASU); Zach Pirtle (ASU); Taylor Jackson (ASU)

Activities Underway and Planned A variety of activities in RAE/Evaluation are oriented toward understanding what the role of CNS-ASU is in the larger context of nanotechnology-in-society, how well its programs are conceived, and how well they are operating. On evaluation specifically, CNS-ASU has established a visiting committee to make two site visits during the first five years of the Center. We anticipate holding the first site visit in conjunction with an all-hands meeting to be scheduled for Sp 07.

Co-PI Schneider is collaborating with consultant Helen Ingram (Irvine) and colleagues Anne Khademian (Virginia Tech) and Martha Feldman (Irvine) on developing a broader, more comparative and robust understanding of boundary organizations as collaborative management tools for drawing together within an organization a variety of different 'ways of knowing.' In this project, CNS-ASU is one case study of a boundary organization, among other cases including juvenile crime, agriculture, neighborhood planning, and budgeting.

This reflexive study of the role of boundary organizations like CNS-ASU will be expanded through collaboration with a project, recently funded (NSF 0621004) at Harvard University, under PI William C. Clark, on 'Integrating Knowledge and Policy for the Management of Natural Resources in International Development: The Role of Boundary Organizations.' Center director Guston is PI of an ASU subcontract on the Harvard study, and through the Harvard study will organize a workshop on ways of knowing and boundary organizations that will draw together not only the variety of cases, including CNS, from Schneider et al. and the international development case, but also additional cases from the NSF-funded Decision-Making Under Uncertainty program û ASU's Decision Center for a Desert City (DCDC) and the collaboration between ASU and Colorado-Boulder, Science Policy Assessment and Research on Climate (SPARC).

During AY 05-06, graduate student Fisher completed a doctoral dissertation in the Environmental Studies Program at University of Colorado in the societal implications of nanotechnology. As an 'embedded humanist' in senior investigator Roop Mahajan's (Colorado) mechanical engineering laboratory, Fisher developed the idea of 'midstream modulation' of NSE — meaning the logically distinct period of time that innovative work and decision-making are occurring within the laboratory, rather than within political institutions setting broader upstream priorities or the variety of institutions that offer readily packaged downstream products. The clarification and, indeed, the success, of this concept are critical for the overall plan for the success of the Real-Time Technology Assessment that motivates the entire Center.

Outcomes Schneider et al. are developing their ideas in a paper recently accepted to Public Administration Review and in a panel to be proposed for the annual meeting of the American Political Science Association in Fa 07. The 'ways of knowing' workshop should be organized for Fa 06 and feed into a more standardized research perspective for CNS and for the Harvard project, as well as a more reflexive environment for practice at CNS, DCDC, and SPARC.

Fisher completed his doctoral dissertation, entitled 'Midstream Modulation of Technology: A Case Study in US Federal Legislation on Integrating Societal Considerations into Nanotechnology.'

Research Title TRC 1: Freedom, Privacy, and Security (FPS)

Led by Torin Monahan (ASU) (for YR 1)

Team Members Faculty: Mark Suchman (Wisconsin); Priscilla Greenwood (ASU)

Students: Tyler Wall (ASU); Azra Panjwani (ASU)

Activities Underway and Planned The goal of FPS is to develop theory and explore cases of surveillance and nano-sensing technologies, including issues of effectiveness, potential ubiquity and embeddedness, and impacts on practices of surveillance and on the individuals and communities subject to surveillance. Monahan and Wall have designed (and the IRB has exempted) a semi-structured interview and observation protocol to explore current and potential nano-sensor projects at the Biodesign Institute at ASU, at CNS-collaborating universities, and at other universities. The project will assess the assumptions and values underlying the design of these nano-sensors and explore anticipated conditions for their use, especially including uses on and in the human body. One underlying goal of this preliminary research is to probe how NSE-based sensor technologies may be applied in ways that may exceed their intended uses and proliferate in daily life. It is assumed that because existing policies for managing data from such sensors are lacking, systems of governance are ill-equipped to handle the exponential growth in personal information such sensors will generate. This area thus represents a strategic site for collaboration between CNS-ASU social scientists and NSE researchers to consider how and when to embed safety and access controls into the devices being envisioned or produced, and to identify areas where such safeguards cannot be assured. Field work at Biodesign has begun; the project anticipates two- to four-dozen respondents for the interview stage and four to six observational sites.

In another project, graduate student Panjwani is developing mathematical models of surveillance systems as they could be influenced by nanotechnology. Working under the direction of Greenwood (with the assistance of Sarewitz and Guston), Panjwani is surveying the literature on mathematic models of non-random methods of surveillance, e.g., profiling, and is creating linear, time-iterative models that take into account the increase in the number of individuals searched, and the increasing accuracy with which they are searched, presumed by advances in nano-sensing. This task proves more difficult than initially anticipated, forcing attempts to quantify variables such as the psychological impact of nano-surveillance on target populations. Panjwani is now looking for faculty in other social science departments to assist her in quantifying such measures. Future research may also incorporate costs into the models.

Outcomes None to report yet.

Research Title TRC 2: Human Identity, Enhancement and Biology (HIEB)

Led by Linda Hogle (Wisconsin) and Jason Robert (ASU)

Team Members Students: Shannon DiNapoli (ASU); Ricky Leung (Wisconsin); Zach Pirtle (ASU); Justin Tosi (ASU); John Parsi (ASU); Sean Hays (ASU)

Activities Underway and Planned The goal of HIEB is to explore the historical, philosophical, cultural, and political dimensions of the interactions between human biology and human values in the context of new nanotechnologies. Robert has already taken significant steps in pursuit of this goal, including the construction of bibliographic databases on neuroprosthetics and nanotechnology ethics, the solicitation of a potential research collaborator, ASU neuroscientist Steve Helms Tillery, and holding one research meeting and planning a second with Hogle and HIEB colleagues at Wisconsin. Conducting

regular research meetings with DiNapoli and Pirtle, Robert is targeting his attention to understanding the prospects for human nano-biotechnology in the context of his ongoing research on chimeras and hybrids. As an early part of this agenda, Robert organized and ran, with funding from ASU's Institute for Humanities Research, a meeting with colleagues from Michigan, Michigan State, and Cal State Sacramento to develop participatory methods for generating scenarios of nano-biotechnology. In addition to the collaboration with Tillery and the generation of scenarios, an important part of the interaction with NSE researchers that is critical for Robert's activities is the placement of graduate assistant DiNapoli in a nano-bio laboratory. Robert anticipates submitting a book prospectus for this project in Aug 06 and completing the database construction by Dec 06.

Tosi and Parsi are researching the political implications of human enhancement through convergent (NBIC) technologies, particularly issues of privacy and political equality. Through the Sp and Su 06, they have been reviewing literature and drafting text for a chapter contribution, to be co-authored with Guston, to a book on nano-ethics to be edited by Patrick Lin and Fritz Allhoff.

Less progress was made by Wisconsin contributors on the HIEB agenda as Leung found very little nano-bio in his field work in China. Expectations for progress are higher for AY 06-07, however, because Wisconsin has hired with its residual funds post-doctoral fellow Kim to work on this area.

Outcomes None to report yet.

EDUCATION:

CNS-ASU is proceeding apace with its goals in education, with one minor exception. At ASU, we have already offered two new, nano-related undergraduate courses in SP 06, and we anticipate offering our full complement of undergraduate courses in AY 06-07, including InnovationSpace and Learning Community (see below for details). We offered a new nano-related graduate course in Sp 06, to be offered again in Sp 07. Enrollment in the courses was substantially inter-disciplinary and should be more so in the coming year.

Undergraduate:

CNS-ASU has developed and offered two undergraduate courses related to nanotechnology, 'Elements of Public Policy - Science and Technology Policy (Nanotechnology in Society)' (POS 426) and 'Perspectives in Nanotechnology' (HON 394/BIO 394). For syllabi for these courses, please see <http://cns.asu.edu/program/training.htm>. Several of the students in POS 426, taught by Guston (e.g., Anderson), have followed up the interest generated by course by applying for internships with CNS for F 06 and by working with the Institute for Social Science Research on the RTTA 2/1 public opinion survey. Several of the students in HON/BIO 394, taught by senior investigator Ramakrishna, have followed up on their interest by approaching Guston about the possibility of his chairing potential undergraduate honors theses in nano-in-society.

CNS-ASU senior investigator Privateer will teach in F 06 'Studies in the Transhuman (ENG 598/FMS 494). The course will use perspectives from film and popular media to examine issues raised by convergent technologies, including nanotechnology, and possible transhuman futures.

CNS-ASU is developing a set of integrative courses for ASU's Learning Communities (LC) initiative, in which thematically linked courses, taught in different departments but taken simultaneously by a cohort of undergraduates, bring different disciplinary perspectives to bear on an important societal issue, e.g., 'Nanotechnology in Society.' Our LC, to be offered Sp 07, will be designed for sophomore or higher students and will include an introductory technical course focusing on nanotechnology (taught by Woodbury), a course on the societal aspects of nanotechnology (taught by Conz, in substitute for Hackett), and a politics- and policy-oriented course (taught by Guston). LC students will be able to observe and/or participate in the variety of CNS activities each year and in National Citizens' Technology Forums in year 3. LC will also serve as an important gateway for students to participate as interns and, potentially, graduate fellows for the Center.

CNS-ASU is also developing (for AY 06-07) a year-long, senior-level InnovationSpace course on NSE that provides design, business, and engineering training for a real-world product outcome. A joint venture among ASU's College of Design, the Fulton School of Engineering, and the Carey School of Business, InnovationSpace involves faculty and students from each school in a hands-on, product development laboratory to develop user scenarios, define new product offerings, build or conceive engineering prototypes, and create business plans and visual materials to communicate the end results. The nanotechnology InnovationSpace anticipates 3 teams of four students each year, pursuing a year-long project addressing one of the Center's cross-cutting research themes. In AY 06-07, students will work with the scenarios generated by RTTA 3/1 scenario development activities in freedom, privacy, and security.

Graduate

CNS-ASU has developed a graduate seminar, 'Science, Technology, and Societal Outcomes' (BIO/POS/JUS 598) that trains natural scientists, social scientists, and humanists in the methods of Real-Time Technology Assessment, as well as other theory and practice in the social studies of science and technology. For the syllabus for this courses, please see <http://cns.asu.edu/program/training.htm>. In Sp 06, ST&SO instructed 9 students (7 graduate and 2 undergraduate/honors from 6 different academic units and focused its case studies on nanotechnology. Two faculty members, one from Chemistry and another from the School of Life Sciences, attended regularly as well. The course will be offered again in Sp 07.

CNS-ASU intends to develop a second graduate seminar that will extend the InnovationSpace concept to the graduate level, involving students and faculty from the schools of engineering, design, and business, as well as liberal arts and sciences. We have not yet identified faculty willing to take on this task, and so we are delayed in implementation from the original plan.

Robert is developing for Sp 07 a graduate seminar on 'Bioethics and the Brain' which will include a significant amount of material from his HIEB research.

CNS-ASU is implementing the 'PhD plus' by supporting NSE doctoral students to include, as an element of their dissertations, a chapter on the societal context of their research. Students will be matched with a mentor, drawn from the network's social scientists or humanists, who will also serve on the student's thesis committee. When they reach the dissertation stage, the CNS-Biodesign fellows are the immediate candidates for the PhD+.

Below is a table describing the diversity of the students in the courses specifically developed by CNS-ASU. 'AF/A' refers to African-American, 'H/L' refers to Hispanic/Latino/a, and 'A/PI' refers to Asian/Pacific Islander. 'NA' refers to Native American. 'DIS' refers to disabled, in this case, mobility.

COURSE	SEM	N	M/F	AF/A	H/L	A/PI	NA	DIS
POS 426	Sp 06	56	35/21	5	3	3	0	1
BIO 394	Sp 06	11	11/0	0	0	3	0	0
POS 598	Sp 06	09	2/7	0	0	0	1	0

Education at Wisconsin:

In Sp 06, TRC HIEB co-leader Linda Hogle taught a graduate seminar on 'Neuroethics and Enhancement Technologies' to clinical neuroscience and bioengineering fellows. A brief description of the course may be found at <http://www.medhist.wisc.edu/HB%20734%20Spring%202006.pdf>. The course contained a unit on nanotechnology. In Sp 07, she plans on teaching a course on 'Enhancement Technologies,' including nanotechnology, to both natural and social science students.

Education at other subcontractors:

Although there are training activities occurring at other CNS-ASU subcontractors, there are no curricular activities to report.

INTERNATIONAL ACTIVITIES:

In recognition of the fact that both NSE research and the social science and humanist scholarship on its societal interactions are international endeavors, CNS-ASU engages in a number of ad hoc and organized international activities including:

- ò Research on the development of nanotechnology in China, conducted by Wisconsin doctoral student Leung (AY 05-06);
- ò Research on methods of technology assessment in the Netherlands, conducted by Colorado doctoral student Fisher (Su 06) -- see below for detailed report;
- ò Research on governance of nanotechnology, conducted by ASU doctoral student Karinen (Su 06) in preparation for a nano-governance wiki site;
- ò Collaboration and networking with nano-in-society researchers in more than a dozen other countries, through co-funded meetings and other activities of the International Nanotechnology and Society Network (www.nanoandsociety.org) (Jan 05; Oct 05; Mar 06; upcoming in Aug 06 and Oct 06);
- ò Education of US NSE graduate students in EU and US nano-policy, through a co-funded summer course on International Perspectives on Nanotechnology and Society (Su 06);
- ò Hosting students from other countries, including Rutger van Merkerk (a doctoral student at the University of Utrecht in the Netherlands, Fa 06)

and Brice Laurent (a doctoral student from Ecole des Mines in France, Sp, Su 07);

ò Inviting three of seven seminar speakers from non-US institutions; and

ò Editing a book volume on public engagement in nanotechnology with collaborators from the U.K. (Tee Rogers-Hayden, Nick Pigeon, Alison Mohr and Brian Wynne).

The CNS-ASU awarded recent grad student (Colorado) and prospective post-doctoral fellow (ASU) Erik Fisher a fellowship to study for two weeks in the Netherlands during July 2006. The fellowship was meant to strengthen intellectual ties with various counterpart academic networks in the Netherlands, and to allow Fisher to make comparisons between US and Dutch approaches to national nanotechnology policy and societal aspects research. Fisher spent ten days as a visiting scholar at the University of Twente and three days at Utrecht University. Fisher gave two presentations, including one for the second annual TA NanoNed day, organized by Arie Rip and attended by various NanoNed board members, TA NanoNed researchers, and visiting European scholars Alfred Nordmann (UT Darmstadt / Office for Interdisciplinary NanoTechnology Studies) and Robert Doubleday (University of Cambridge, Nanoscience Centre). Lively discussion followed Fisher's talk on 'midstream modulation' during the formal event and afterwards. He participated in a workshop on Vision Assessment, attended by 30 international researchers, and attended several groups of presentations on Dutch academic approaches to nanotechnology and society. During this time, Fisher met with several faculty members, including extensive meetings with Arie Rip. He also met in-depth with several graduate students, working extensively with one on his dissertation research design. In addition to exchanging knowledge, ideas, and publications, Fisher undertook several projects that build upon his existing research. These included a collaborative journal publication with Arie Rip on engineering research labs as protected spaces, and research with Rip's graduate student Haico te Kulve on a multi-level analysis of some of Fisher's prior empirical research. Several more projects were discussed and are likely to yield results in the future, including a follow-up visit by Fisher to the Netherlands to attend a scenario workshop on nanobiotechnology and various collaborations with other of Rip's graduate students (Doug Robinson, Frank van der Most, and Ali Parandian). Also discussed briefly were a possible visit to Shiraz University, in Iran, a possible collaboration with Bart Walhout of the Dutch Rathenau Institute, and a visit to ITAS in conjunction with Ulrich Fiedeler. Fisher also made arrangements for Rip and te Kulve to visit the CNS-ASU during March 2006, and discussed a possible visit by Fiedeler.

STUDENT ACTIVITIES:

Undergraduate Honors Theses. CNS intern Pirtle (Mechanical Engineering) began an undergraduate thesis on the evolution of ethical, legal and social implications research, with director Guston as director and HIEB co-leader Robert as 2nd reader. Robert's student Arielle Silverman (Biology in Society) will be writing an honors thesis on enhancement technologies and the visually impaired based on a survey she is constructing. Rob Davis (Political Science) is planning to write an honors thesis on data collected by Bruce Bimber and his CNS-UCSB colleagues on social activism and nanotechnology. One or two additional honors theses may be in the works.

Several CNS-affiliated students (Spadola, Lappe, Jackson, Hays), along with CSN/CSPO post-doc Bennett and two other students (Jeanine Cordova and Bradley Brennan) participated in the Nano Science Fiction Writing Workshop run by Berne (Virginia). Each attendee produced a story for the workshop that we are in the process of putting on the web site.

IGERT Trip: CNS-Biodesign fellow Spadola, along with eight other NSE students from ASU, attended the International Perspectives on Nanotechnology and Society (IPNS) trip to the Netherlands and England July 2-22, 2006. CNS/CSPO post-doc Bennett organized the trip and attended as well. The trip is patterned after the DC Summer Session but involves international partners.

CNS undergraduate intern Abdullah coordinated the founding of the ASU chapter of the Triple Helix: The International Journal of Science, Society, and Law. ASU's first edition is due out fall 2006. Guston serves as the principal faculty advisor.

PRESENTATIONS:

K. Abbott and S. Gopalan. 2006, March. 'Transnational Models for the Regulation of Nanotechnology.' Presented at the International Studies Association, San Diego.

I. Bennett. 2006, April. 'Teaching and applications of mathematics for Nanoscience and Engineering.' Presented at the Materials Research Society Symposium on Education in Nanoscience and Engineering, San Francisco.

M. Carlson. 2006, April. 'An Overview of a Project to Improve Mathematics and Science Education for a Technical Society: Cognitive Research Informs Curriculum Development and Instructional Support.' Presented at the Materials Research Society Symposium on Education in Nanoscience and Engineering, San Francisco.

E. Fisher. 2006, March. 'Integrating societal concerns into nanotechnology research.' Presented at the Center for Science and Technology

Policy Research, Boulder.

E. Fisher. 2006, April. 'Integrating Societal Concerns into R&D: The Midstream Modulation of Nanotechnology.' Presented at National Institutes for Standards and Technology, Boulder.

E. Fisher. 2006, April. 'Integrating Societal Concerns into Nanotechnology Research.' Presented at Cooperative Institute for Research in the Environmental Sciences (CIRES) annual symposium.

E. Fisher. 2006, May. 'Midstream Modulation of Technological Trajectories.' Presented at Trading Zones workshop, Tempe.

D. Guston. 2005, November. 'Center for Nanotechnology in Society at ASU,' launch of the Nanoscale Informal Science Education Network (NISE Net), San Francisco.

D. Guston. 2005, November. 'Societal Impact of Nanotechnology,' annual meeting of the International Congress on Nanotechnology, San Francisco.

D. Guston. 2005, December. 'Societal Dimensions of NSE,' Nanoscale Science and Technology Grantee Conference, Arlington, VA.

D. Guston. 2006, January. 'Center for Nanotechnology in Society at ASU,' brown bag seminar at University of Colorado, Boulder.

D. Guston. 2006, February. 'Societal Implications of Nanotechnology.' Purdue Discover Lecture Series, West Lafayette, Indiana.

D. Guston. 2006, February, 'The Center for Nanotechnology in Society at Arizona State University,' annual meeting of the American Association for the Advancement of Science, St. Louis.

D. Guston. 2006, May. 'CNS-ASU: Interdisciplinary Programs in a Self-Styled Boundary Organization,' Trading Zones workshop, Tempe.

D. Guston. 2006, May. 'What Do We Want to Learn from Public Participation in Nanotechnology,' NNCO's Public Participation in Nanotechnology Workshop, Arlington, VA.

R. Karinen (2006, April). 'Narratives of the Unknown: Societal Implications of the Next Industrial Revolution.' Presented at the Science and Technology in Society Graduate Student Conference, Washington, DC.

C. Lee, D. Scheufele, and B.V. Lewenstein (2005, October). 'The influence of trust and knowledge: A media effects model for public attitudes toward nanotechnology.' Presented at annual convention of the Midwest Association for Public Opinion Research, Chicago.

D. Libaers. 2006, May. 'Organizing for Scientific Performance: The Impact of Organizational Affiliation on Scientific Productivity in Nano Science & Technology.' At Atlanta Conference on Science and Technology Policy 2006: US-EU Policies for Research and Innovation.

G. Marchant. 2006, May. Participant and discussant at a symposium on 'Nanotechnology Governance: Environmental Management from a Global Perspective' at Vanderbilt University.

M. Moffitt (collaborative partner and industry liaison). 2006, March. 'Nanotechnology & Society: In Synchrony?' at the biweekly Nanotechnology Colloquium held by the Nanomaterials Applications Center at Texas State University.

T. Monahan. 2006, April. 'Nothing to Hide: Governing Mentalities of Everyday Surveillance.' Presented at Crime, Justice and Surveillance conference, Sheffield, U.K.

N. Newman. 2006, June. 'Research and innovation system assessment: a nanotechnology case study.' Presentation of work by Shapira, Porter, Youtie, et al., at Workshop on Advancing Measures of Innovation: Knowledge Flows, Business Metrics, and Measurement Strategies.' National Science Foundation, Arlington, VA.

J. Robert. 2006, March. 'Nanotechnology in Society: Ethical and Political Dimensions.' NABIS Conference, Chicago.

J. Robert. 2006, April. 'Brain Repair: Ethical, Clinical, and Social Issues.' Presented at the Barrow Neurological Institute, Phoenix.

- J. Robert. 2006, May. 'The Societal and Ethical Dimensions of Nanotechnology.' Presented at the Inaugural Emeritus College Symposium, Arizona State University, Tempe.
- D. Scheufele. 2006, February. 'It's still not about information: Our current understanding of attitudes toward nanotechnology.' Presented at the annual convention of the American Association for the Advancement of Science, St. Louis.
- D. Scheufele. 2006, March. 'Successful public communication about nanotechnology.' Talk at the Baldwin Nano Workshop for Journalists, Materials Research Science and Engineering Center on Nanostructured Interfaces, University of Wisconsin-Madison.
- D. Scheufele. 2006, April. 'Attitudes on science & technology' Lecture at the Science Communication Colloquium, Department of Life Sciences Communication, University of Wisconsin-Madison.
- D. Scheufele. 2006, April. 'It's not all about information: Exploring People's attitudes toward new technologies.' Lecture at the Science, Democracy, and Public Policy colloquium, La Follette School of Public Affairs, University of Wisconsin-Madison.
- D. Scheufele. 2006, May. 'Successful public communication about nanotechnology.' Presented at the Integration of Societal Implications into Science workshop, US Department of Energy, Washington, DC.
- D. Scheufele. 2006, May. 'Influences on public opinion about nanotechnology.' Presented at NNCO's Public Participation in Nanotechnology Workshop, Washington, DC.
- D. Scheufele and E. Kim. 2006, May. 'Public opinion, religiosity and nanotech: Examining processes of opinion formation on emerging technologies.' Presented to the annual convention of the World Association for Public Opinion Research, Montreal, Quebec.
- D. Scheufele. 2006, May. 'What do We Know about Public Opinion?' Presented at NNCO's Public Participation in Nanotechnology Workshop, Washington, DC.
- P. Shapira. 2006, February. 'Research and Innovation Systems Analysis at CNS-ASU.' Presented at the Nano-in-Society Network meeting, National Science Foundation, Arlington, VA.
- P. Shapira. 2006, March. 'The Evolution of the US Nanotechnology Enterprise: Research Production, Firms, and Emerging Regional Complexes.' Presented at PRIME Workshop on Mapping the Emergence of Nano-technologies and Understanding the Engine of Growth and Development. Grenoble, France.
- P. Shapira. 2006, May. 'Nanotechnology in Society: The Center for Nanotechnology in Society and the Implementation of Real-Time Technology Assessment.' National Science Foundation and National Nanotechnology Initiative Meeting at Second International Nanotechnology Conference on Communications and Cooperation, Arlington, VA.
- P. Shapira. 2006, May. 'Where is Nano Going? Explorations in Research and Innovation Systems Assessment.' At GA Tech Conference on Science and Technology Policy 2006: US-EU Policies for Research and Innovation, Atlanta.
- P. Shapira and T. Heinze. 2006, May. 'Identification of Creative Research Accomplishments: Methodology and Results for Nano S&T and Human Genetics.' Presented at GA Tech Conference on Science and Technology Policy 2006: US-EU Policies for Research and Innovation, Atlanta.
- P. Shapira, A. Porter, J. Youtie. 2006, June. 'Where is Nano Going? Explorations in Research and Innovation Systems Assessment.' Presented at NSF/SRS Workshop, Advancing Measures of Innovation: Knowledge Flows, Business Metrics, and Measurement Strategies. (Presented by N. Newman.)
- G. Wolbring. 2006, March. 'The Enhancement Debate: Able-ism Leads to Transhumanism.' At the James Martin Institute World Forum on Science and Civilization: 'Tomorrow's People: The challenges of technologies for life extension and enhancement,' University of Oxford.
- Future presentations:
- E. Corley and D. Scheufele. 2006, November. 'Factors impacting public support of federal funding for nanotechnology.' To be presented at the 28th Annual Association for Public Policy Analysis and Management Research Conference, Madison, Wisconsin.

- E. Fisher and R. Mahajan. 2006, November. 'Midstream Modulation.' International Mechanical Engineering Conference, Chicago.
- D. Guston. 2006, September. 'The Center for Nanotechnology in Society.' NanoTX Conference, Dallas.
- D. Guston. 2006, October. Keynote address. Nanoscience, Microsystems, and Materials, Annual Iberoamerican Research and Development Summit, Albuquerque, NM.
- D. Libaers. 2006, September. 'The Role & Contribution of foreign-born scientists & engineers to the US Nano Science & Technology research enterprise, 2006 Technology Transfer Society Conference, Atlanta.
- R. van Merkerk, D. Guston, and R. Smits. 2006, October. 'Tackling Collingridge Together.' Annual meeting of the Society for the Social Studies of Science, Vancouver, BC (proposed).
- A. Porter, D. Schoeneck, N. Newman, P. Shapira, J. Youtie, R. Kolar. 2006, September. 'Nano R&D Profiles: A Deeper Look.' To be presented at 2006 S&T Indicators Conference, Leuven, Belgium.
- A. Porter, D. Schoeneck, P. Shapira, J. Youtie, R. Kolar. 2006, September. 'Defining the Nanotechnology Domain in Realtime Technology Assessment.' To be presented at 2006 Technology Transfer Society Conference, Atlanta.
- J. Robert. 2006, August. 'Controversial Science, Controversial Scientists?' NABIS Conference, Chicago.
- J. Robert. 2006, October. 'Nanotechnology, Neurotechnology, and Society.' To be presented at Northwestern University, Evanston, IL.
- J. Robert. 2006, October. 'Forbidden Science û Boundaries on New Emerging Science and Technology.' To be presented at Jewish Women's Symposium, Tempe AZ.
- J. Robert. 2006, November. 'Brain Repair and Neural Enhancement.' To be presented at the Society for Social Studies of Science annual meeting, Vancouver, BC.
- J. Wang. 2006, September. 'Resource Spillover from Academia to High Tech Industry: Evidence from nanotech start-up enterprises.' 2006 Technology Transfer Society Conference, Atlanta.
- J. Youtie, M. Iacopetta, S. Graham. 2006, September. 'Long Views of Nanotechnology: Is it a General Purpose Technology?' 2006 Technology Transfer Society Conference, Atlanta.

ADDITIONAL ACTIVITIES.

Guston:

Nano-related service (advisory/editorial)

Member, advisory committee, Wisconsin NSEC for Templated Nano-Synthesis

Member, editorial board, NanoEthics

Manuscript reviewer, Journal of Nanoparticle Research

Manuscript reviewer, Public Understanding of Science

Manuscript reviewer, Research Policy

Book proposal reviewer (x2), Wiley & Sons

Meeting/Planning/Chairing

Organizer, 'Democratizing Nanotechnology: Research and Engagement for Societal Outcomes,' American Political Science Association, Washington, DC, September 2006.

Co-organizer, 'Forbidding Science,' Tempe, AZ, January 2006.

Co-organizer (w/ B. Lewenstein, Cornell NNIN). 2006, February, 'Symposium: Social Science Engages Nanotechnology,' annual meeting of the American Association for the Advancement of Science, St. Louis.

Panel chair (x2), 'NanoWorld: Toward a Policy for the Human Future,' National Press Club, Washington, DC, May 2006.

Co-organizer (with Vivian Weil), 'New Ethnographies of Nanotechnology,' Society for Social Studies of Science, Vancouver, BC, October 2006.

Organizer, 'Nanotechnology: Practices and Publics.' American Association for the Advancement of Science, San Francisco, CA, February 2007 (proposed).

Other personnel:

Allenby: attended AAAS Workshop on Enhancement Technologies

attended UVA/ASU Trading Zones workshop

attended Sandia/ASU Human Cognitive Enhancement workshop

Fisher: attended UVA/ASU Trading Zones workshop

attended NNCO Public Engagement in Nanotechnology Workshop

participated in focus group and follow-up for CO Nanotechnology Roadmap

Hogle: attended AAAS Workshop on Enhancement Technologies

Mahajan: participated in focus group and follow-up for CO Nanotechnology Roadmap

Monahan: attended Civic Forum on Societal Implications of Nanotechnology, hosted by UT Austin, Oct 05

Ramakrishna: attended NISE Net launch

Robert: attended Sandia/ASU Human Cognitive Enhancement workshop

organizing and moderating a Town Hall meeting on nanotechnology in society at NABIS conference, Aug 06

appointed to the Societal and Ethical Implications of Nanotechnology committee at Northwestern University

Sarewitz: attended Sandia/ASU Human Cognitive Enhancement workshop

Findings:

CNS-ASU received its funding in October 05 and spent a significant share of its first year of operation staffing up. The Center is therefore quite early in its development. As the project activities suggest, significant research is underway, but there are only limited findings to report at this time -- most from research activities that had already been underway when CNS funding began.

Findings: Fisher (Colorado) Doctoral Dissertation (Pielke, director): 'Midstream Modulation of Technology: A Case Study in U.S. Federal Legislation on Integrating Societal Considerations into Nanotechnology.'

The 21st Century Nanotechnology Research and Development Act of 2003 requires that nanotechnology development be conducted with more effective regard to societal considerations. Depending upon how it is implemented, the Act could mark a notable shift in science and technology policy, for it prescribes the integration of societal considerations into nanotechnology R&D. Efforts to address the societal dimensions of technologies tend to occur before (upstream) or after (downstream), but rarely during (midstream) R&D. There are thus no clear precedents for implementing the Act's prescription. To guide implementation, the concept of Midstream Modulation is developed, through which scientists and engineers, in concert with others, bring societal considerations to bear on their research decisions by means of reflecting on and expanding research decision options. A greater degree of reflexivity on the part of nanotechnologists is one of the primary aims of interactive approaches such as Real-time Technology Assessment. Practical possibilities for implementing Midstream Modulation within a university laboratory setting are investigated and tested by means of interactive empirical case studies involving an 'embedded humanist' and graduate nanoscale engineering researchers. Engineering research decisions do provide opportunities for modulation, and the process of reflecting on these opportunities can hold value from both technological and societal perspectives. Recommendations for implementing the Act's prescription within a university based laboratory setting are accordingly offered.

Findings: Bhaskarabhatla (GA Tech) master's thesis (Shapira, director): 'Nanotechnology Enterprises in the United States: Structure and Location.'

This thesis investigates the structure and location of the nanotechnology enterprise in the United States. Building on insights from theories of high-technology industrial evolution, this thesis examines contrasting hypotheses about the location of nanotechnology firms. Bhaskarabhatla finds that regional academic R&D and the availability of venture capital promote entry of nanotechnology firms.

Findings: Scheufele (Wisconsin), 'Five Lessons in Nano Outreach.' *Materials Today* (2006) 9:64.

Writing about his previous survey work with Bruce Lewenstein (Cornell), Scheufele identifies five important considerations for nanotechnology and the public: 1) while participatory mechanisms like consensus conferences may be important engagement tools, they are not particularly good education tools because they inform only a narrow segment of citizens; 2) it is rational for people to form opinions on obscure topics like nanotechnology even if they do not have a lot of information; 3) people use perceptual filters like religion, trust in institutions, etc., to form these low-information opinions; 4) interest groups and actors take advantage of such filters by using framing devices to influence public opinion; and 5) science communication needs to abandon the concept of 'scientific citizen' and use appropriate framing devices in entering the fray.

Findings: Fisher and Mahajan (Colorado), 'Contradictory Intent? US Federal Legislation on Integrating Societal Concerns into Nanotechnology Research and Development,' *Science and Public Policy* (2006) 33(1):5-16.

Studying the 21st Century Nanotechnology R&D Act, which in 2003 authorized large expenditures by the US federal government in nanotechnology as well as in its societal implications, Fisher and Mahajan find that the legislation embodies conflicting values of commercialization and social foresight and that, to the extent that the latter is possible, the legislation may represent the most radical shift in US science policy toward the outcomes of research. By requiring societal implications work and its integration with NSE research itself, Fisher and Mahajan argue, 'the US Congress has, wittingly or not, laid down a nascent vision towards which R&D policy seems slowly but steadily to be creeping.'

Findings: Rosalyn Berne's Nano Science Fiction Writing Workshop (Pilot)

Berne's Nano Science Fiction Writing Workshops will be offered to NSE graduate students and principle investigators in the US and abroad. CNS-ASU hosted the pilot workshop for the project in May 06. Five graduate students, one postdoctoral fellow and one undergraduate student wrote and discussed their own fictional stories about possible nanotechnology based futures. An excerpt from one story reads:

'Darlene awoke to a searing pain low down in her gut. She held her breath as her eyes welled up with tears, then squeezed them tightly to stop the shameful flow. She blew out a long, slow breath of slightly sour air and the pain passed. The antique art-deco clock on the night stand read 7:33am;...

'Nanite tk-426 was at that very moment coursing through Darlene's carotid artery, headed for grey matter. The searing pain in her gut had been the sensation of just under a billion surveillance team members burrowing their way into her uterine lining searching for the nearest engorged capillary, looking for north-bound flow. Several hundred thousand members of the team had fallen prey to the predatory instincts of Awad's furiously thrashing sperm, seeking to eliminate competing gametes in their quest to perpetuate the species. Awad's sperm count was low, but his swimmers were energetic enough; valuable data under certain circumstances, but naught more than a nuisance to tk-426 and his cohort. Ironically, the nanites on the team had been programmed with an algorithm modeled on the behavior of male sperm. They were extremely competitive in their efforts to be the first into the cerebral cortex; to be the first to settle into a synapse and start the relay.'

Each of the stories was unique and fascinating in its themes, settings and explorations. One was set in a Walmart store, another in a museum where cadavers were on display, a third took the reader to a Midwestern farm which survived a technological holocaust. Eventually the stories collected from around the world will be banked and available for open sources review and web-based discussion. Some will be published in an anthology. While the stories also serve as data for Berne's own research, she hopes that they will also become classroom material, and a source of public dialogue about our nanotechnology future.

Training and Development:

POST-DOCTORAL TRAINING:

CNS-ASU originally intended an ambitious training program for 4 post-doctoral fellows annually at ASU and 4 at Wisconsin. We had then cut back this ambition to one full-time post-doc because of the more limited funds that NSF awarded, but we have been able to expand on this number with some reprogramming of early savings and with collaboration from other units. CNS-ASU envisions both research and teaching responsibilities for post-doctoral fellows.

In YR 1 of the Center (roughly corresponding to AY 05-06 and the subsequent summer), CNS-ASU cofunded post-doctoral fellow Bennett with CSPO. Bennett, a former nano-chemist in transition to the social and policy studies of S&T, co-taught the graduate course Science, Technology, & Societal Outcomes with CSPO post-doctoral fellow (and incoming CNS faculty member) Wetmore, with significant supervision of curriculum development from Guston and Sarewitz. Bennett has also worked with the team from CRESMET that is developing curricular material for pre-college teachers in nanotechnology-in-society; after some personnel transitions, Bennett has recently become leader of that team. Bennett has also taken significant responsibility, under Sarewitz's leadership, in the RTTA 3/1 scenario development activities by soliciting appropriate input and drafting short scenarios for technical validation

and later societal scrutiny. Finally, Bennett has supervised undergraduate (and now post-baccalaureate) intern Smith in cataloguing the triple-helix of nano activities in US states.

Late in YR 1, CNS hired post-doctoral fellow Conz, a recent sociology PhD from ASU who had worked under the guidance of CNS senior investigator and RTTA 4 co-leader Hackett. With Hackett's decision to take a leave from ASU to work at NSF, CNS is co-funding Conz along with Hackett's home academic unit, the School of Human Evolution and Social Change, to fill in for many of his responsibilities. Conz is thus contributing field work and data analysis to RTTA 4/1 reflexivity assessment, under the leadership of K Corley. He is also contributing in Hackett's stead to teaching in the Learning Community on 'Nanotechnology in Society' planned for Sp 07.

For AY 06-07 (roughly, YR 2), CNS-ASU is hiring two new full-time post-doctoral fellows, Selin and Fisher. Selin, a recent PhD from the Copenhagen Business School, conducted her dissertation research on scenario development and other future-oriented techniques for nanotechnology, and she will be contributing to RTTA 3/1 scenario development activities. She will also be teaching a course in Sp 07 on future-oriented techniques, listed with the School of Justice and Social Inquiry.

With funds reprogrammed from personnel savings due to mid-year start-up and carried over to YR 2, we are hiring Fisher, a recent PhD from the University of Colorado-Boulder whose graduate work as an 'embedded humanist' in a nano-materials laboratory CNS-ASU supported in YR 1 (see below). Fisher will be continuing his research on 'mid-stream modulation' and its implications for RTTA as a spur for anticipatory governance. While not completely set yet, his educational role will include working with the DOE Center for Integrated Nanotechnology to develop a training program for the users of their facility (also see research and education activities/international activities for discussion of Fisher's sponsored trip to the Netherlands).

Post-doctoral fellows Fisher and Selin, together with assistant professor Wetmore, will take ownership of the CNS-ASU monthly seminar series. Under Guston's guidance, they are extending invitations to highly placed persons in academic, government, and private sector (both for- and not-for profit) to contribute to a thematically oriented seminar series and edit the seminar talks for publication in the Yearbook of Nanotechnology in Society, to be published by Springer.

CNS-ASU will also be co-funding in YR 2 Barben as a post-doctoral fellow. Currently at the University of Wisconsin, Barben will be relocating to ASU at the invitation of newly hired faculty member (and CNS co-PI) Miller. Part of Barben's work will continue to be in societal aspects of nanotechnology, particularly critical questions of technological adoption.

Using residual funds to be carried over into YR 2, Wisconsin will hire post-doctoral fellow Kim for AY 06-07 to work with TRC 2 co-leader Hogle on activities in Human Identity, Enhancement, and Biology. Kim has a PhD in Science and Technology Studies from RPI, where he completed a dissertation on the stem cell controversy.

GRADUATE TRAINING:

CNS-ASU provides research training to supported graduate students in the Center's RTTA and Thematic Research Cluster programs. At ASU, the Center funds three types of graduate students: First, CNS fully funds four graduate students in the social sciences and humanities who provide research support to CNS programs. Second, the Center provides 1/3 funding for each of three Biodesign-affiliated NSE graduate students, designated CNS-Biodesign fellows, who supplement their NSE training with a variety of nano-in-society training. Third, the Center provides 1/2 funding for each of two graduate students (from any background) who are shared with the Center for Research on Education in Science, Mathematics, Engineering, and Technology (CRESMET) -- CNS-CRESMET fellows -- who support educational outreach activities while learning about nano-in-society.

Because of the Center's 1 October start date, recruiting and hiring of graduate students in YR 1 at ASU was somewhat ad hoc and incomplete. After a competitive application process, CNS hired the three CNS-Biodesign fellows -- Spadola (Physics), Lappe (Biochemistry), and Brelsford (Biochemistry) -- for a one-year term in January 06. The Center hired one of the CNS-CRESMET fellows, Hisamura (Mathematics), at that time as well.

CNS-ASU also hired graduate students Panjwani (Mathematics) and Tosi (Political Science) during Sp 06. Panjwani worked on the TRC 1 FPS agenda, developing mathematical models for nano-surveillance systems, under the supervision of co-PI Sarewitz and senior investigator Greenwood. Panjwani continues her mathematical modelling work in Su 06 and be fully supported by the Center in Sp 07 again, after teaching in Fa 06. Tosi worked at the intersection of the TRC 1 FPS and TRC 2 HIEB agenda, exploring from the perspective of political theory the privacy issues inherent in human enhancement technologies and their societal context. Tosi worked under the supervision of PI Guston and, with fellow political science doctoral student Parsi -- who is supported in Su 06 performing similar research -- is preparing a chapter with Guston for an edited volume on nano-ethics.

CNS-ASU hired, at ASU, a variety of graduate students for Su 06, including Parsi (see above), Panjwani (see above), Karinen (doctoral student, political science), Wall (doctoral student, justice and social inquiry), and Garcia-Mont (master's student, educational leadership and policy).

Under the direction of PI Guston, Karinen began work on a catalogue of nano-governance activities in the US, in several other nations, and internationally. With the assistance of undergraduate intern Anderson (who had taken Guston's POS 426), Karinen has nearly completed the structure and preliminary data collection for the catalogue, which we hope will serve as the core of a wiki site we will create in Fa 06 to simplify ongoing data collection. Karinen is planning to write a dissertation in political science that will focus on international governing activities and which may include a case on nanotechnology. He will continue to be fully funded by CNS in Fa 06 before returning to his native Finland for his field research.

Under the direction of Monahan, Wall began performing research in SU 06. Most activities, e.g., literature reviews, development of protocol, etc., were preparatory to Monahan's field work in the Biodesign Institute, now beginning, which will focus on the design of nano-sensors, particular the nexus of in-body/on-body sensors and military funding of that research.

Garcia-Mont is fully supported for Su 06 and AY 06-07. With a pre-existing interest in language, identity, and education, Garcia-Mont will perform research on the RTTA 4/1 Reflexivity Assessment agenda, advised by several faculty from CNS (K Corley, E Corley, Guston) and from elsewhere at ASU (Hispanic Research Center, School of Education). Specifically, she will construct a sample of US Latino/a NSE researchers and interview them with a protocol similar to K Corley's identity-knowledge-practice protocol used for our Biodesign scientists. The working hypothesis is that Latino/a NSE researchers will present a differently constructed identity that can be related to a differently constructed set of practices regarding nanotechnology in society. If successful in this project with US-based Latino/a NSE researchers, Garcia-Mont could extend the sample to NSE researchers in Latin America (and take advantage, e.g., of contacts developed through the International Nanotechnology and Society Network, which is organizing a research meeting in Brazil in Sp 07).

As of this writing, CNS-ASU has staffed its graduate positions at ASU almost completely for AY 06-7. Spadola and Lappe will complete their calendar year (Sp 06 to Fa 06) as CNS-Biodesign Fellows, with possible renewal in Sp 07. CNS will seek a new fellow in the place of Brelsford, who is not continuing in her PhD program. Hisamura will continue through AY 06-07 as a CNS-CRESMET fellow, joined by Garay (School of Education). The fully funded students will be Karinen (Fa 06; see above) and Panjwani (Sp 07; see above), Garcia-Mont (AY 06-07; see above), DiNapoli (AY 06-07; see below for activities), and Hays (AY 06-07; see below). Hays, a doctoral student in political science, had worked Fa 05 through Su 06 under Guston's supervision on another NSF grant ('Public Value of Social Policy Research,' 0322505). He will be continuing to work on developing and applying the public value framework, articulated by RTTA 1/2 activity leader Bozeman, to nanotechnology, and he will also be pursuing research on education and enhancement technologies and citizenship, on the TRC 2 HIEB agenda.

Outside of ASU in the CNS network, one doctoral student working with CNS in AY 05-06, Fisher (Colorado), completed his dissertation on 'Midstream Modulation of Technology: A Case Study in U.S. Federal Legislation on Integrating Societal Considerations into Nanotechnology.' Fisher's work, under the supervision of senior investigator and Colorado PI Pielke and in the lab of senior investigator Mahajan, demonstrated the feasibility of important contributions by an 'embedded humanist' to the responsibility development of nanotechnology in an engineering laboratory.

A second doctoral student, Leung (Wisconsin), made significant progress on his field research in China under CNS sponsorship. Under the supervision of senior investigator Fujimura, Leung interviewed NSE researchers and those from related areas from several universities (including Peking, Tsinghua, and Shanghai) and from several institutes of the Chinese Academy of Sciences in Beijing and Shanghai. He has interviewed more than 60 scientists in China and the US (some on his earlier NSF support) and additional numbers of their post-docs, graduate and undergraduate students, and technicians. Leung expects to complete his dissertation based on these data by Sp 07.

Graduate training at Wisconsin also includes the work of doctoral student Hillback, who has been working under the supervision of Scheufele and Dunwoody in RTTA 2/2 studying the influence of the media on public opinion regarding nanotechnology.

Graduate training at Georgia Tech included the activities of the following students: Wang, a doctoral student in public policy who is researching a dissertation on 'Academic Researchers and the Development of New Nanotechnology Firms' under the direction of institutional leader and senior investigator Shapira; Bhaskarabhatla, a master's student in public policy, who completed in Sp 06 a thesis on 'Spatial Analysis of Nanotechnology Enterprises in the US: Structure and Location'; Tang, a doctoral student in public policy, who has provided general research support for the project through YR 1; and Lamos, a master's student in public policy, who provided general

research assistance in Sp 06. Bhaskarabhatla, Tang, and Lamos were engaged in nanotechnology search term definition and database development. GA Tech public policy doctoral student Libaers is researching his dissertation on 'The role of foreign-born researchers in the US Nanoscience and technology research enterprise,' under the supervision of senior investigator Bozeman.

POST-BACCALAUREATE TRAINING:

CNS-ASU currently employs two students recently graduate from ASU, Smith and DiNapoli. Smith, previously an undergraduate intern with CSPO, has been working on the catalogue of triple-helix activities in US states on nanotechnology in Su 06. DiNapoli, who will enter the master's program in the School of Life Sciences in Fa 06 and be a fully funded CNS graduate student, is working under the direction of TRC 2 HIEB co-leader Robert to develop a bibliography of nanoethics and human enhancement literature.

At GA Tech, Schoeneck, a recent BS physics graduate, has been engaged as a research assistant (he plans to enter a graduate program in AY 07) for the development of the definition of nanotechnology and the subsequent database creation.

UNDERGRADUATE TRAINING:

CNS-ASU undergraduate interns contribute a great deal to the Center substantively and socially. Through YR 1, CNS has employed nine undergraduates at ASU -- Abdullah, Anderson, Bhalla, Choi, Jackson, Omer, Pirtle, Saludo, and Young -- in varying capacities. Most of these students come from backgrounds in the sciences and are seeking information and experience about the social, ethical, and political side of these interests.

Abdullah (Molecular Biotechnology) has performed web-based research on the nano-in-society activities of the other NSECs (finding that little has apparently been done, or at least made available on the web), and has written a background paper on the origins of the computer and human intelligence amendment, offered by Representative Sherman (D-CA) to the National Nanotechnology R&D Act of 2003. Abdullah also led the founding of ASU's chapter of the Triple Helix: The International Journal of Science, Society and Law.

Anderson (Political Science) has performed research on the governance activities of academic, industry, governmental, and third sector organizations with respect to nanotechnology.

Bhalla (Political Science) performed research in Sp 06 for Robert in creating a bibliography for neural prosthetics.

Choi (Biomedical Engineering/Economics) has performed literature searches and reviews in service of the RTTA 3/1 scenario development activity, seeking mentions of nanotechnological futures relevant to the theme of freedom, privacy, and security from the literature broadly speaking.

Jackson (Biology) has researched the history of nanotechnology as ASU, particularly through instrumentation such as the scanning probe microscope built by Lindsay in 1986.

Omer (Journalism) has performed research on cases in contemporary science in which there is reasonable belief that such work should either not have been performed or not have been published, including the creation of the polio virus in vitro and the mouse pox experiment.

Pirtle (Mechanical Engineering) has performed research on the history of ethical, legal and social implications in US R&D policy under the supervision of Guston and is also working with Robert's HIEB lab group.

Saludo (Design) has assisted CNS-ASU in attempting to create logos and other visual signatures of its activities.

At Georgia Tech, undergraduate has included the activities of McCloud (Public Policy) and Finney (Public Policy and Economics). These students have been engaged in bibliometric database development for nanotechnology, including data cleaning and data analysis.

PRE-COLLEGE TRAINING AND DEVELOPMENT:

The Center for Research on Education in Science, Mathematics, Engineering, and Technology (CRESMET) is coordinating CNS-ASU activities with the ongoing work of Project Pathways, a five-year education research project funded by NSF through the Math & Science Partnership program (MSP). In Project Pathways, ASU researchers collaborate with high school mathematics and science teachers in five Phoenix metropolitan school districts, aiming to develop a new model to support teachers' continuing education in their disciplines and professional development as instructors. In our original research design, this new model included four graduate courses for teachers coupled

with ongoing professional learning communities. CRESMET's participation in CNS-ASU is enabling us to develop a fifth course, Nanoscience & Society: How Will We Guide and Be Guided by the New Science of Very Small Things? This fifth module of the MSP project aims to integrate the natural science that underlies nanotechnology with an inquiring look at how nanotechnology products might affect people, the environment, and social systems. The centerpiece of the module is a pair of three-week experiences in which teachers will follow a nanoscale phenomenon from an idea in the lab to a product marketed to the public. In the process, they will pursue questions ranging from research mechanics (should we publish or patent?) to engineering (does this work and work safely?) to marketing (what price point will attract the most buyers?). At every stage, the course instructors will prompt the teachers with questions that encourage them to discuss the social consequences of their products and who is responsible for anticipating and controlling them. The teachers will return to their classrooms with lesson planning for delivering an adapted version of the course to their high school students. The presentation of this course is planned for Sp 07. Post-doc Bennett leads the team developing this fifth course, which includes professor Horan (College of Education), assistant professor Nelson (College of Education), research scientist McKelvy (Center for Solid State Science), and CNS-CRESMET fellow Hisamura (mathematics). The second CNS-CRESMET fellow, Garay, will join the team in Aug 06.

DIVERSITY OF TRAINEES

Below is a table describing the diversity of the post-docs, graduate students, post-baccalaureate students, and undergraduates employed by CNS-ASU. 'Title' refers to rank status at time of reporting. 'Share' refers to whether CNS-ASU is the sole employer on campus ('1.0') or whether other units are sharing support (.50' or '.33'). 'YR' refers to the academic year of employment, although personnel will have been employed for neither the entire academic year in question nor for comparable periods of time (some will have worked 160 hours, some not). We report previous year (05-06) and prospective year (06-07) for post-docs and graduate students where available but not post-baccalaureate or undergraduate students, who have not been selected or confirmed for the prospective year. Under 'Ethnicity,' 'W' refers to White/Caucasian, 'H/L' refers to Hispanic/Latino/a, and 'A/PI' refers to Asian/Pacific Islander. We report ASU, GA Tech, Wisconsin and Colorado, but the list may not be comprehensive for shared or new personnel.

TITLE SHARE YR SEX ETHNICITY

ASU

POST-DOCS 05-06

Bennett .25 M W

Conz .33 M W

06-07

Bennett .25 M W

Conz .33 M W

Fisher 1.0 M W

Selin 1.0 F W

GRADUATE 05-06

Brelsford .33 F W

Lappe .33 M W

Spadola .33 F W

Hisamura .50 M A/PI

Garcia-Mont 1.0 F H/L

Karinen 1.0 M W

Panjwani 1.0 F A/PI

Tosi .33 M W

Wall 1.0 M W

06-07

Lappe .33 M W

Spadola .33 F W

Garay .50 M H/L

Hisamura .50 M A/PI

DiNapoli 1.0 F W
 Garcia-Mont 1.0 F H/L
 Hays 1.0 M W
 Karinen 1.0 M W
 Panjwani 1.0 F A/PI

POST-BACCALAUREATE 05-06

DiNapoli 1.0 F W
 Smith .50 F W

UNDERGRADUATE 05-06

Abdullah 1.0 M W
 Anderson 1.0 M W
 Bhalla 1.0 F A/PI
 Choi 1.0 M A/PI
 Jackson 1.0 M W
 Omer 1.0 F A/PI
 Pirtle 1.0 M W
 Saludo .33 F A/PI
 Young 1.0 M W

GA TECH

GRADUATE

05-06

Bhaskarabhatla 1.0 M A/PI
 Lamos 1.0 F W
 Slanina 1.0 M W
 Tang 1.0 F A/PI
 Wang 1.0 F A/PI

POST-BACCALAUREATE

Schoeneck 1.0 M W

UNDERGRADUATE

Finney 1.0 F AF/A
 McCloud 1.0 M AF/A

WISCONSIN

GRADUATE

05-06

Leung 1.0 M A/PI
 Hillback 1.0 M W

06-07

Gallo 1.0 M W
 Shanley 1.0 F W
 Tsung 1.0 F A/PI

COLORADO

GRADUATE

05-06

Fisher 1.0 M W

GOVERNANCE AND MANAGEMENT

CNS-ASU is headed by a director, Guston, and an associate director, Sarewitz. Their work is supported by two full-time staff members at ASU, a program manager Corrine (Cory) Dillon and an administrative associate Joi Trottier. There are weekly administrative meetings among the Director, program manager, and administrative associate.

CNS-ASU provides partial support for two other staff members: Melissa Cornish, a staff member at the Biodesign Institute, who serves as the liaison between CNS and its most important NSE research constituency on campus; and Raol Alcala, a staff member with the Hispanic Research Center, who helps coordinate the recruitment and retention of under-represented minorities, particularly the undergraduate research meeting scheduled for Sp 07. CNS-ASU also initially budgeted for a shared staff person with the Center for Ubiquitous Computing to serve in a similar role regarding the disability community, but we have been unable as of yet to find an appropriate person. CNS-ASU also employs, through CSPO funds at Guston's discretion, the graduate student Roxanne Wheeler as a communication coordinator (thus fulfilling a function that was eliminated with the reduction in the Center's budget from the requested \$13 million to the awarded \$6.2 million).

In addition to this professional staff, CNS management includes: an executive committee at ASU to advise and support the director; a set of leaders for each of the Center's major subcontracts; a set of leaders for each of the Center's major activities; a Board of Visitors; and a Nano-Industry Liaison Committee.

Executive Committee: The Executive Committee has consisted of the director, the four other co-PIs local to ASU (Sarewitz, Poste, Carlson, and Schneider), and senior investigator Allenby. It has met twice each semester in AY 05-06 to review Center progress in hiring, organizing, etc. The Committee has established a collegial and trusting manner of business and has been pleased to oversee a significant delegation of discretion to the director rather than to make decisions corporately.

Institutional Leaders: Each large subcontract has a principal investigator/institutional leader with whom the director keeps in regular (i.e., monthly) contact. Leadership for these subcontracts is illustrated below. Leadership for the Wisconsin subcontract has just passed from PI Miller to senior investigator Scheufele as the former is leaving Wisconsin effective mid-August and joining the faculty at ASU.

Wisconsin: Dietram Scheufele
 GA Tech: Philip Shapira
 North Carolina State: Patrick Hamlett
 Rutgers: Carl Van Horn
 Colorado: Roger Pielke, Jr.

Research Team Leaders: Each RTTA activity and each TRC have leaders with whom the director keeps in regular contact. Leadership for the various activities is illustrated below. There has been turn-over in one slot, as senior investigator K Corley has replaced senior investigator Hackett as co-leader of RTTA 4 with the latter's decision to take leave without pay from ASU to serve at NSF. There is currently one research team without an assigned leader, as the director and previous TRC 1 co-leader Monahan agreed that he should step down.

RTTA 1 RISA: Philip Shapira (GA Tech)
 RTTA 2 POV: Dietram Scheufele (Wisconsin); Elizabeth Corley (ASU)
 RTTA 3 DP: Daniel Sarewitz (ASU); Patrick Hamlett (NCSU)
 RTTA 4 RAE: Kevin Corley (ASU); Anne Schneider (ASU)
 TRC 1 FPS: George Poste (ASU); OPEN
 TRC 2 HIEB: Linda Hogle (Wisconsin); Jason Robert (ASU)

The original budget provided team leaders with significant course relief for up to three semesters during the first five years of the Center. After the budget was revised down, we had to limit course relief severely, and now only some of the leaders receive release time and others donate time to their team leadership activities. This necessity has made management much more difficult.

Board of Visitors. The proposed CNS-ASU budget contained funds sufficient for an annual meeting with an external advisory committee. The revised budget required a reduction of these funds to a twice-in-five years Board of Visitors. Membership on the Board of Visitors is illustrated

below. To date, we have only confirmed board members' interest in participating as members and had minor, informal contact otherwise. CNS-ASU will attempt to schedule its first Board of Visitors meeting in conjunction with the all-hands meeting to be organized in Sp 07 with residual funds from YR 1 carried over to YR 2.

Board of Visitors: Jonathan Fink (VP for Research and Economic Affairs, ASU); Lawrence Bock (NanoSys, Inc.); Diana Hicks (Georgia Tech); Steven Hilgartner (Cornell NNIN); Sheila Jasanoff (Kennedy School of Government, Harvard); Ray Kurzweil (Independent Inventor); Rachel Levinson (Director, Office of Government and Industry Liaison, The Biodesign Institute); Richard Nelson (Columbia University); David Rejeski (Woodrow Wilson Center); Mark Schapiro (Center for Investigative Journalism); Michael Small (Carnegie Mellon); Al Teich (AAAS); James Wilsdon (Demos).

Nano-Industry Liaison Committee. The original CNS-ASU proposal included a group of interested persons from nano-related industries to serve as contacts and advisors for the Center. The proposal did not foresee the Committee as one that met formally and face-to-face. The Center is currently reconsidering that decision and contemplating inviting the members of the Nano-Industry Liaison Committee, listed below, to the all-hands meeting anticipated for Sp 07. To date, we have only confirmed members' interest in serving in the originally stated capacity, although we have had more substantive interaction one-on-one with Moffit, who has given us some regular advice and contacts and made a formal presentation on the Center's behalf.

Nano-Industry Liaison Committee: Gary Bild (Director Analytical R&D, Pfizer); Larry Bock (Chairman, Nanosys, Inc); Ellen Feigal (Vice President, Clinical Services, TGen); Herb Goronkin (Board Member, NanoBusiness Alliance); Anatoli Korkin (President, Nano and Giga Solutions); Michael Moffit (Vice President, Western Technologies); Michael Tracy (Director, Strategic and Research Alliances, The Biodesign Institute); Fred Weber (Founding Principal, Next Step Management).

CNS-ASU will assess its progress toward goals in a variety of ways. In addition to oversight from the Board of Visitors and the Executive Committee, and active management by the institutional and research team leaders, the Center also measures its progress through one of its RTTA activities -- RTTA 4/1 Reflexivity Assessment -- and through adherence to a research timetable required by the interconnectedness of Center activities. RTTA 4/1 assesses over time whether the NSE researchers with whom we are working reveal any change in their identities, knowledge, and practices regarding NSE and its societal implications. The timetable, and milestones toward it, exist because, for example, the scenarios developed by RTTA 2/1 are necessary for input into the National Citizens' Technology Forum.

Progress toward the milestones is checked at regular research meetings. In YR 1, for example, Director Guston met weekly with post-docs, graduate students, and undergraduates. In the coming AY 06-07, Guston will meet with graduate students and undergraduates on alternate weeks, with a joint meeting every fifth week. In addition to monthly external seminars, Guston will also invite CNS-ASU faculty to report on their activities at occasional seminars. Guston also reviews monthly reports from subcontract PIs.

Because CNS-ASU is a direct expression of ASU's attempts to encourage new modes of operation, particularly the one referred to as 'intellectual fusion,' President Michael Crow and Vice President for Research and Economic Affairs Jon Fink take an active role in keeping abreast of the Center. The Center's tight relationship with CSPO and its important relationship with the Biodesign Institute reinforce its role as a campus leader in pursuing the broad university agenda and, indeed, many NSE groups on campus have sought out CNS as a collaborator.

CNS-ASU is now settling into its own physical space. In Sp 06, it moved into 6 offices and one work room (225H-225N) in the same building (Social Sciences) and floor as CSPO. There the Center houses the administrative associate Trottier, incoming faculty member Wetmore, post-docs Bennett and Conz, and the current crop of graduate students. CSPO continues to house the Director and the program manager. The Center expects to obtain the remaining seven offices of suite 225 (A-G) at the beginning of F 06, to expand its space for post-doctoral fellows and allow its undergraduates space as well. CNS-ASU has also made and will continue to make extensive use of conferring and convening space in the Biodesign Institute.

Outreach Activities:

LAUNCH:

On 30 Jan 06, CNS-ASU hosted its launch event. In addition to a set of meetings for CNS-ASU personnel from the six collaborating universities, the launch included a Public Forum on Nanotechnology in Society, held in the Great Hall of the Sandra Day O'Connor College of Law. The Forum included remarks from ASU President Michael Crow, CNS director David Guston, Biodesign Institute director (and CNS po-PI) George Poste, and invited guest Jonathan Moreno, a University of Virginia Professor of Biomedical Ethics and co-chair of the National Academies committee on human embryonic stem cell research. The Forum also included commentary from a panel of CNS researchers Jason Robert, Linda Hogle, Torin Monahan, and Anne Schneider, a lengthy question and answer period with the audience, and a public reception.

SCIENCE CAFE:

CNS-ASU has introduced to the Tempe area the 'Science Caf ' -- a casual event in an informal setting at which a scientist speaks for 15-20 minutes on a topic, and the audience has the opportunity to ask questions and interact with the scientist. Science Cafes are free and open to all interested community members.

CNS-ASU organized Science Cafes at Mill's End coffee house in Tempe in March, April and June of 2006. We are in the planning stages for next year's series and investigating other venues more embedded in Tempe and/or Phoenix. Two possible venues are Changing Hands Bookstore in Tempe and the Arizona Science Center. We have also confirmed our first Spanish-language Science Cafe for F 06. Spadola, a CNS-Biodesign fellow from Lindsay's lab, coordinates the cafes, which have attracted an average of 15-20 attendees, but we have no demographics as no formal record has been kept in these informal spaces.

Mar 06: 'Humankind's Future On the Head of a Pin: Nanotechnology - What is it? What can it do?' Senior investigator Stuart Lindsay made a short presentation and then engaged the audience in an informal discussion. Lindsay, director of the Center for Single Molecule Biophysics in the Biodesign Institute at ASU, is a world-renowned scientist, inventor and entrepreneur. Lindsay's lab is learning how to build atom by atom at the nanoscale, manipulating and seeing their results through a variety of new instrumentation. Specifically, Lindsay's research uses nanotechnology to investigate the role of single molecules in basic cellular processes. His interests include: how genes are switched on and off; how molecules can function as biosensors; how molecules move about and communicate inside an organism. Many of the goals of his work are aimed at speedier diagnosis and at medical breakthroughs needed to understand and cure a wide variety of diseases. Lindsay has 18 nanotechnology-related patents to his credit. As an entrepreneur, he co-founded a start-up company in 1993, Molecular Imaging, Inc., to produce scanning probe microscopes--the 'eyes' of nanotechnology. The Tempe-based company was recently acquired by Agilent Technologies, Inc.

Apr 06: 'Evolution on a Microchip: Making Molecules Work for Us.' Senior investigator Neal Woodbury gave a short talk and then held a discussion with the audience. As he studied photosynthesis--the way plants use sunlight, water and carbon dioxide (CO₂) to make oxygen and fuel for the plant--he realized the awesome potential of using the energy of light to control chemical reactions. Woodbury leads a team trying to make molecule-sized devices and hybrid electronics for use in biomedicine, environmental clean up and monitoring, threat detection and agriculture. Looking at the diversity of nature, Woodbury clearly sees that there must be a molecular cure for disease, a sensor for a toxin, and a complex molecular matrix for computing or display. You simply have to use the right set of chemicals and search until an answer is found. He is attempting to build synthetic systems that can speed up natural evolution. Woodbury believes in interdisciplinary science as a means of providing researchers greater vision in addressing real-world problems.

Jun 06: 'Wiring Brains to Machines: Science Fiction or Science Fact?' Senior investigator Jiping He, director of the Center for Neural Interface Technologies and Professor of Bioengineering, and Jason Robert, bioethicist and Assistant Professor of Life Sciences led a lively discussion of the ethical aspects of nanotechnology in human rehabilitation and performance enhancement. He's research involves developing brain-machine interfaces to help patients with neurological conditions and central nervous system problems. This kind of technology could also be used someday to improve the performance of healthy people. Dr Robert is interested in the how these technologies will be used--both in health care but also by the military. Should this research be taking place? How should we deal with dual-use technologies like these? Who should govern their development?

SPEAKER SERIES

CNS-ASU sponsored an external speaker series, hosting a new speaker roughly every month through AY 05-06. The abstracts appear below. In AY 06-07, the speaker series will continue on the third Friday of every month (or thereabouts), around the theme: 'Studying the Future of Nanotechnology: Establishing Empirical and Conceptual Foundations.' Contributions from speakers will be collected in a Yearbook of Nanotechnology in Society, to be edited by new faculty member Wetmore and post-docs Selin and Fisher, as part of a series edited by Director Guston and published by Springer. The list of AY -6-07 speakers should be set by Aug 06.

Gregor Wolbring (University of Calgary) (2005, October). 'Human Enhancement Medicine: The Final Frontier.' Advances in and converging of nanotechnology, biotechnology, information technology and cognitive sciences (NBIC) increases our abilities to change/modify, 'enhance' the human body (structure, function, capabilities) beyond species typical boundaries. An increasing number of people believe that we will and /should/ try to overcome the biological limitations of the human body. This lecture explored: a) the area of human performance enhancements beyond species typical boundaries; b) the consequences of the appearance of the transhumanist/ enhancement model of health, disease, disability and wellbeing, and the dynamic of medicalization; c) how the dynamics and arguments around the human performance enhancement debate as we have it today will make it very likely that a new field of Enhancement medicine will appear and flourish as the result of the new scientific and technological capabilities.

Rosalyn W. Berne, 'Conversations & Reflections with Researchers in Nanotechnology.' November 4, 2005. Rosalyn Berne discussed Nanotalk, her book of conversations and explorations with thirty-five individual research scientists and engineers sharing their ideas, experiences, perceptions and beliefs about their work, humanity, nature, chance and the future of the world with nanotechnology. These conversations are used as the basis of reflection and deliberation, about the possible significance of nanotechnology to humanity and how it might be pursued conscientiously, and ethically.

Cynthia Selin, 'Expectations and the Emergence of Nanotechnology.' January 20, 2006. While nanotechnology is often defined as operations on the 10 to the -9 meters, the lack of charisma in the scale-bound definitions has been fortified by remarkable dreams and alluring promises, which sparked excitement for nanotechnology. The story of the rhetorical development of nanotechnology reveals how speculative claims are powerful constructions that create legitimacy in this emerging technological domain. From its inception, nanotechnology has been more of a dream than reality, more fiction than fact. However, in recent years, the term nanotechnology has been actively drawn towards the present in order to begin to deliver on the fantastic expectations. This debate is loaded with paradox. This work examines how future claims work to define what counts as nanotechnology and reveals the dilemmas that accompany temporal disjunctures. Science and politics converge in debates about the future of technology as expectations serve to create power and legitimacy in the emerging area.

Jennifer Kuzma, 'Tiny Things, Big Divides: Bridging Practice and Policy in the Study and Design of Oversight for Bio- and Nanotechnology.' January 24, 2006. In this presentation, she framed nanotechnology oversight issues by first reviewing the development and attributes of the existing oversight system for genetically engineered organisms. There are significant strengths and weaknesses, challenges and opportunities, and successes and failures associated with this system, and it illustrates several lessons for nanotechnology. With these lessons in mind, she then reviewed existing features of nanotechnology oversight. Finally, she presented her work on two projects which attempt to bridge the divide between the practical and theoretical worlds of science and technology policy within the context of nano-bio governance.

Michael Bennett, 'Techne De Jure: Technological Legislation in a Nanotechnological Age.' February 3, 2006. The technological and scientific advances germane to modern societies increasingly stress the capacity of legal theory and legal regimes to think through and act upon basic challenges. In an earlier phase of modernity, jurisprudence in the forms of judicial practices, policy-making legislative processes and theory was much more effective in shepherding a lay citizenry through varied adaptations to cultural change. In our era, characterized by rampant technocracy, narrow specialization, increasing complexity and diminishing understanding of our own creations, much jurisprudence is effectively captured in the wake of technoscientific change and hindered in attempts to enact and sustain basic social visions and cultural commitments. In this talk he briefly outlined several theoretical approaches to addressing the challenging questions facing jurisprudence in a modern technological society. He developed more fully a perspective based on the concept of technological legislation and described the advantages of this view over its competitors within the context of domestic nanotechnoscience research, development and dissemination.

Andrew Jamison, Professor of Technology and Society at Aalborg University in Sweden and Guest Professor, Environmental Science, Malmö University College, presented 'Hubris and Hybrids: On the Cultural Assessment of Nanotechnology,' April 26 at ASU. As with many new technologies before they find their appropriate -- and often inappropriate -- uses in society, the meanings of nanotechnology are still unclear. There is both a great deal of hype and a good deal of horror accompanying the emergence of this new field of research, and it can therefore be of some importance to attempt to provide a cultural assessment of nanotechnology. Drawing on a conceptual framework that he developed with Mikael HÖrd in their recent book, *Hubris and Hybrid: A Cultural History of Technology and Science* (Routledge 2005), Andrew Jamison will discuss both the hubris and the hybrids that are involved in the development of nanotechnology. He will also present some of the efforts that are being made in Europe to provide a cultural assessment of nanotechnology.

Jeffrey Schloss, co-Chair of the Nanomedicine Roadmap Initiative, NIH and a program director in the Division of Extramural Research at the National Human Genome Research Institute, spoke to ASU scientists and engineers on 'The Nanomedicine Roadmap Initiative: NIH's Interest in Nanotechnology and the National Nanotechnology Initiative,' on May 2. Nanomedicine Initiative is a ten-year program whose eventual goal is to manipulate precisely cellular processes by repairing or building new structures in cells to prevent and treat disease. A goal of the Nanomedicine Roadmap Initiative is to use quantitative approaches to understand, from an engineering perspective, the design of biomolecular structural and functional pathways, and to use that information to design and build functional biocompatible molecular tools to 'dial' the body's systems back into 'normal' operating ranges after function has been perturbed by disease.

Jeffrey Schloss spoke to ASU faculty and students on 'Nanomedicine in the NIH Roadmap: Priorities, Vision, & Implications' on May 3. In 2002, the NIH and its leadership engaged in a process dubbed the 'NIH Roadmap,' designed to ask the kind of probing questions that a complex research organization should periodically pose. The overall goal of the roadmap was to define a compelling, limited set of priorities that can be acted on and are essential to accelerate progress across the spectrum of the institute missions. For example, what if doctors could search out and destroy the very first cancer cells that would otherwise have caused a tumor to develop in the body? What if pumps the size of molecules could be implanted to deliver life-saving medicines precisely when and where they are needed? Such scenarios may sound unbelievable, but they are the long-term goals of the NIH Roadmap's Nanomedicine initiative that they anticipate

will yield medical benefits as early as 2012.

Below is a table describing the diversity of the speakers hosted by CNS-ASU at ASU only. Under 'Ethnicity,' 'W' refers to White/Caucasian, 'AF/A' refers to African-American. We also report 'Other' including disability and origin from a non-US institution.

SPEAKER SEX ETHNICITY OTHER

Wolbring M W disability/mob; non-US
 Berne F AF/A
 Selin F W non-US
 Kuzma F W
 Bennett M AF/A
 Jamison M W non-US
 Schloss M W

INFORMATION CHANNELS

CNS-ASU uses email and listservs as two important channels of communication. Below are details about the type of information distributed via three listservs developed by CNS-ASU between October 2005 and June 2006.

CNSASU (Interested individuals and organizations located anywhere with no formal affiliation to CNS-ASU; N=988). Designed to reach members of the general public, elected officials, government employees, regulatory bodies, etc., this distribution list receives our monthly newsletter and announcements about CNS activities and employment opportunities and conferences.

CNSINT (Colleagues at ASU interested in nano issues; N=113).

Designed to reach ASU personnel who have expressed an interest in CNS-ASU or nanotechnology, this distribution list carries information about local CNS-ASU activities and opportunities.

CNSLTD (CNS-ASU project colleagues; N=75)

Designed to reach CNS-ASU project collaborators, the list carries information of general interest and administrative importance.

Journal Publications

D. H. Guston., "A Still Small Voice", Journal of Nanoparticle Research, p. 149, vol. 8, (2006). Published

E. Fisher and R. Mahajan, "Nanotechnology Legislation: Contradictory intent? US federal legislation on integrating societal concerns into nanotechnology research and development", Science and Public Policy, p. 5, vol. 33(1), (2006). Published

D. A. Scheufele, "Five lessons in nano outreach", Materials Today, p. 64, vol. 9, (2006). Published

G. Wolbring, "Medicine, Disabled People, and the Concept of Health: A New Challenge for HTA, Health Research, and Health Policy.", Health Technology Assessment (HTA) Initiative #23, p. 1, vol. Dec, (2005). Published

T. Monahan and T. Wall, "Somatic Surveillance: Bodies, Networks, and Social Control", Surveillance and Society, p. , vol. , (). Submitted

E. Fisher, R. Mahajan, and C. Mitcham, "Midstream Modulation of Technology: Governance from Within", Bulletin of Science, Technology and Society, p. , vol. , (). Submitted

Books or Other One-time Publications

J. Tosi, J. Parsi, and D. H. Guston., "Anticipating the Political and Ethical Challenges of Human Nanotechnologies", (). book chapter, In preparation

Editor(s): P. Lin and F. Allhoff, eds.

Collection: Nanoethics

Bibliography: New York: Wiley.

J. Wetmore, E. Fisher, C. Selin, eds., "Studying the Future of Nanotechnology: Establishing Conceptual and Empirical Foundations.", (). Book, Accepted

Editor(s): D. H. Guston, series editor.

Collection: Yearbook of Nanotechnology in Society I

Bibliography: Dordrecht: Springer.

D. Sarewitz and D. Guston, "The Scientific Responsibility for Public Engagement", (). book chapter, In preparation.

Editor(s): T. Rogers-Hayden, A. Mohr, D. H. Guston, N. Pidgeon, and B. Wynne, eds.

Collection: Engaging with Nanotechnologies: Engaging Differently?

Bibliography: TBD

T. Rogers-Hayden, A. Mohr, D. H. Guston, N. Pidgeon, and B. Wynne, eds., "Engaging with Nanotechnologies: Engaging Differently", (). Book, In preparation.

Collection: Engaging with Nanotechnologies: Engaging Differently

Bibliography: TBD

Southern Growth Policies Board and the Georgia Tech Program in Science, Technology and Innovation Policy; co-authors: Philip Shapira, Jan Youtie, Ajay Bhaskarabhatla, Erin Lamos, Uttam Malani, John Slanina, Alexa Stephens and Li Tang, "Connecting the Dots: Creating a Southern Nanotechnology Network", (2006). Report, Published

Bibliography: Southern Growth Policies Board, Research Triangle Park, NC

G. Wolbring

, "The Unenhanced Underclass", (2006). book chapter, Published

Editor(s): Paul Miller, James Wilsdon

Collection: Building Everyday Democracy

Bibliography: London: Demos

Web/Internet Site

URL(s):

cns.asu.edu

Description:

Comprehensive site covering activities, papers, conferences, links to relevant sites, events, speakers, organizational partners, etc.

Other Specific Products

Product Type:

website

Product Description:

<http://www.cherry.gatech.edu/>

Sharing Information:

online

Product Type:

web site

Product Description:

<http://sciencepolicy.colorado.edu/nanotechnologyinsociety/>

Sharing Information:

web site

Contributions

Contributions within Discipline:

CNS-ASU is inherently and even aggressively trans-disciplinary, and there is no discipline as such that it primarily addresses by its work. Intellectual contributions will be reported in 'Contributions to other disciplines.'

Contributions to Other Disciplines:

Many social science disciplines — particularly political science, sociology, and anthropology — as well as professional fields such as public policy, journalism, and design, established subfields such as science communication, regional economics, and bioethics, and emergent fields including surveillance studies, will find contributions from the Center's activities. The Center's central contributions, however, will be in the closely related interdisciplinary fields of science and technology policy (STP) and science and technology studies (STS).

Indeed, an important intellectual motivation of the Center is to achieve something of a practical unity between these two fields which, while not alienated from each other, have not been as interactive as one might hope given their ostensibly common interests. The Center furthermore expects to contribute to potentially emerging fields of social studies of nanotechnology, e.g., nanoethics (as an analogue to bioethics). Indeed, the Center's imminent contract with Springer to publish a Yearbook of Nanotechnology in Society is an effort to channel just this emergence.

The Center's research programs may loosely be understood as a set of use-inspired Real-Time Technology Assessment (RTTA) activities cross-cut with a more fundamental set of thematic research clusters (TRCs). As described in 'Research Activities' above, there are four major RTTA activities and two TRCS:

ð RTTA 1 Research and Innovation Systems Analysis (RISA)

ð RTTA 2 Public Opinion and Values (POV)

ð RTTA 3 Deliberation and Participation (DP)

ð RTTA 4 Reflexivity Assessment and Evaluation (RAE)

ð TRC 1 Freedom, Privacy, and Security (FPS)

ð TRC 2 Human Identity, Enhancement, and Biology (HIEB)

Each of these RTTA and TRC areas has a lower-order set of activities whose contributions to a variety of fields, as well as to other aspects of the CNS-ASU program, will be discussed below. Especially since this discussion is prospective, it is intended to be illustrative and not comprehensive.

RTTA 1: RISA

Activity 1: Research Program Assessment (RPA). The key activity in RPA to date has been creating, through a broad process including consultation with NSE researchers and an international set of colleagues, an operational definition of nanotechnology with which to query bibliographic and patent databases. Analysis of the results will lead to maps of the research dynamics of nanotechnology, including distribution and pace of activity, emerging subfields, etc. RPA will thus contribute to STP and STS understandings of how new technical fields emerge and evolve. It will contribute to regional economics understandings of the geography of NSE activities. RPA will also contribute these understandings of the NSE dynamics to a variety of other CNS activities, including empirical understandings of the pace and direction of areas of NSE development to the scenario development workshops (RTTA 3/1 below), of the geography of NSE research to the workforce assessments (RTTA 1/3 below), and of the emerging sub-fields to the NSE researchers themselves.

Activity 2: Public Value Mapping (PVM). PVM engages initially in conceptual development to extend the evaluation of publicly funded research from traditional output measures of publications through the research ecology of an area to the societal outcomes that are promised in the original justification of the research. Developing PVM will add a more robust and comprehensive tool to the analytical kit for STP that will contribute to the ability to assess research for its broadest contributions to wide societal outcomes. This development is particularly important in the context of increasing interest from sponsors of research in a 'science of science policy' that accounts for the return on the public investment in research.

Activity 3: Workforce Assessment (WA). WA will contribute a concrete understanding of developing labor markets for NSE activities. A use-inspired application of a pre-existing methodology, this research will contribute to the understanding of how such novel, high-tech labor markets develop but, more importantly, to the understanding of policy makers in public, academic, and industrial sectors in the studied regions (Phoenix, Madison, Atlanta) of that NSE labor market, and to the understanding of the National Citizens' Technology Forum (RTTA 3/4 below) about what reasonable expectations for local job

growth might be from NSE R&D.

RTTA 2: POV

Activity 1: Public Opinion Polling (POP). The first public opinion survey, with more than 1100 of the planned 1200 respondents completed at the time of this writing, will make significant contributions to the academic understanding of the public's knowledge of and attitudes toward nanotechnology, in large part because this survey will be the first to take advantage of opportunities to compare changes over time (with questions from previous NSF-sponsored surveys) and differences across nations (with questions from Eurobarometer). It will contribute important information about public expectations — perhaps for both good and ill — regarding nanotechnology for use in discussions with NSE researchers (in RTTA 4/1 Reflexivity Assessment below) and in discussions with lay citizens who participate in the National Citizens' Technology Forum (RTTA 3/4 below) and other participatory activities.

Activity 2: The Why Files. Currently beginning the analysis of media coverage, The Why Files will contribute to our understanding in science communication of how journalism can shape public understanding of and attitudes toward new technical developments like NSE. When coupled with RTTA 2/1 POP, it will provide a powerful approach to detailing the dynamic relations of changing representations of NSE and changing public perspectives, and it will help us understand how to better tailor information to various sub-publics and improve public outreach.

Activity 3: Scientists' Values. A survey of scientists' values regarding NSE will complement the survey of the public's values and provide parallel measures of some attitudes and opinions. It will contribute to the understanding within STS of the relationship between scientists' values and their work, and when coupled with POP and Reflexivity Assessment (RTTA 4/1 below) it will provide a comprehensive and comparative assessment of how various publics anticipate nanotechnology.

RTTA 3 DP

Activity 1: Scenario Development. The primary contribution of scenario development will be to projects within CNS-ASU itself, including to the National Citizens' Technology Forum and to the InnovationSpace (RTTA 3/2 below). The method for developing the scenarios, through a wiki site, may contribute to a greater capacity to create such useful probes of plausible technological futures for NSE and other emergent, knowledge-based technologies.

Activity 2: InnovationSpace. The particular intellectual contribution of InnovationSpace is the engagement of the field of design -- which as a professional and academic activity is about the mediation of objects (technologies) and human and social needs -- with STS and STP. To date, the academic disciplines of design have not seriously addressed NSE. Designers have not contemplated new products and scenarios that NSE will make possible, nor have design studies scholars addressed how people's everyday lives and the discipline itself could change because of nano-scale technologies. The critical examination of these issues and the generation of new NSE based products and scenarios will be the major contributions of this project. As InnovationSpace is a multi-disciplinary program, this project will also help graphic design, industrial design, business and engineering students participate in the process of new product development centered around nanotechnology. They will have a better comprehension of the role their individual disciplines will play in bringing nanotechnology into everyday life.

Activity 3: CriticalCorps. By subjecting the scenarios and other products of the Center to critical scrutiny, CriticalCorps will open up a dialogue at a cultural level about nanotechnology and contribute to the cultural assessment of nanotechnological futures. Faculty and graduate students involved with CriticalCorps will publish this information in cultural studies and design studies journals and therefore contribute the awareness in these fields of the importance of NSE and its societal and cultural issues. This project also offers a new area of scholarly exploration for graduate students in design.

Activity 4: National Citizens' Technology Forum. The NCTF will be the first attempt at expanding the small-scale citizens' technology forum, or consensus conference, to a national-wide enterprise. This pilot will test whether such large-scale deliberative activities are feasible and whether they can contribute to public dialogue.

RTTA 4: RAE

Activity 1: Reflexivity Assessment. The interviews with NSE researchers that is the focus of RA will contribute to the general understanding of how researchers' identity, knowledge, and practice interact in a more or less self-conscious way, and to the practical understanding of how particular kinds of interventions may help may researchers more reflexive about their role in producing societal outcomes from their research. In particular, the study of Hispanic and Latino/a NSE researchers will contribute to our understanding not only of the narrow question of ethnic identity among scientists but also to more policy-relevant issues of recruitment and retention of under-represented researchers and how the values of such researchers influence their work and its outcomes.

Activity 2: Evaluation. In addition to providing an opportunity to evaluate the overall performance of the Center, evaluation activities will contribute to an understanding of boundary organizations and their ability to mediate between research and societal outcomes.

TRC 1: FPS

The study will contribute to understanding at the intersection between society and NSE research and application, especially concerning the potential applications of NSE for security-related purposes. Through an assessment of the assumptions and values underlying the designs of NSE research projects both currently underway and planned for the future, the research will contribute to our understanding of how NSE-based sensor technologies may be applied in ways that may exceed their intended uses and proliferate in daily life. This research will be one much needed step towards a better understanding of the potential benefits and ethical concerns of nanotechnology.

TRC 2: HIEB

Preliminary work makes clear the contribution that findings will have for bioethics and the ethics of emerging technologies like nanotechnology, but also for closely related fields, such as regenerative medicine. Particularly in the area of neurological innovations, concepts of human biology and human identity are being challenged in similar ways, no matter what the technological intervention. Activities in regulatory standards and ethical guidelines appear to moving in some parallel ways; this research will identify whether this is a general movement or specific to nanotechnology as compared to other emerging technologies. Organizational studies will also gain from this work, as the research is uncovering evidence of the way that accountability for ethical and social concerns shifts institutional structures and practices.

Contributions to Human Resource Development:

CNS-ASU is already well on its way to making significant contributions to education and human resource development in nanotechnology in society.

First, we are educating and training a relatively large number of diverse undergraduate and graduate students in the social studies of nanotechnology through both formal coursework and research experiences. In this area, we have designed courses that reach out to undergraduates and introduce them to NSE and its societal issues, and we have designed courses that allow graduate students to explore, in an interdisciplinary setting, more rigorous approaches to policy and social studies perspectives on NSE. The undergraduate courses were particularly fertile ground for attracting interns and honors thesis writers to CNS, and the graduate course was particularly useful in reinforcing social and intellectual connections among the students with diverse academic backgrounds.

Second, we are educating and training a smaller set of NSE graduate students in taking a more reflexive approach to their own research. The graduate course contributes to this goal, as do activities including regular student research meetings, the Science Fiction Workshop, and the provision of opportunities for NSE graduate students to take ownership of a societal implications activity, e.g., the way CNS-Biodesign fellow Spadola has taken ownership of the Science Cafes. Just this Su 06, CNS-Biodesign fellow Lappe has inquired about taking ownership of a project that would gather NSE researchers and CNS-ASU societal implications personnel, including from the law school, to discuss why researchers have such difficulty discussing the foreseeable but negative consequences of their work, as opposed to the foreseeable but positive consequences about which they talk quite willingly. We believe such activities bode well for the implementation of the planned PhD+, in which students like Lappe and Spadola would take on a social scientist to their thesis committee and write a chapter of their dissertation on a societal issue regarding their work.

The undergraduate Learning Community in 'Nanotechnology in Society' to be offered in Sp 07 at ASU will reinforce both these goals, as it will provide both an introduction to NSE and its societal issues to a broad set of undergraduates, but it will also satisfy the 'science and society' requirement that the College of Liberal Arts and Sciences has recently imposed on BS students.

Third, we have managed to reconstitute a significant post-doctoral training component by reprogramming funds from YR 1 residuals, re-establishing (at least for YR 2) a portion of a major activity we had to cancel due to the budget reduction in the award. ASU will host two full-time and two shared post-doctoral fellows in AY 06-07, and Wisconsin will host one full-time post-doc.

Fourth, we have made significant progress with CRESMET in developing the course on nanotechnology in society for high school teachers. With its planned implementation in Sp 07, the course will begin to train teachers who will reach thousands of high school students each year.

Based on the data presented in other sections of the report, we feel that CNS-ASU has already made a very good start in assuring the participation of individuals from under-represented groups in its activities, particularly in graduate education. In an important effort to expand our ability to recruit students from traditionally under-represented groups to these tasks, we are collaborating with the Hispanic Research Center on the planned 'Enhancing NBIC' undergraduate research conference anticipated for Sp 07. A draft call description of the conference is offered below.

Enhancing NBIC? Under-Represented Perspectives on Converging Technologies and their Societal Interactions

Science and engineering (S&E) have widespread and profound interactions with the broader society, and yet S&E activities draw from a relatively narrow slice of that society. Within the United States, neither practicing S&E professionals nor those making policies or setting agendas for S&E represent the broad diversity of American society. Likewise, S&E activities centered in the developed world do not represent the full diversity of the global community in their planning, practice, or outcomes.

As new S&E opportunities emerge, they bring with them an opportunity to shape their planning, practice, and outcomes in novel ways. This opportunity now exists with the convergent technologies of nanotechnology, biotechnology, information technology, and cognitive science (NBIC).

The research conference, 'Enhancing NBIC? Under-Represented Perspectives on Converging Technologies and their Societal Interactions,' is an attempt to engage in such shaping. By bringing together undergraduate researchers (and their mentors) from across the country who are contributing perspectives on NBIC that are not (yet) part of the dominant dialogue, the conference will begin to create a network whose purpose is steering NBIC toward more representative and more just outcomes.

'Enhancing NBIC?' is primarily for undergraduate students who are conducting research either: 1) in NBIC-related S&E fields and are strongly influenced by under-represented perspectives in their work; or 2) in the societal implications of NBIC with specific concerns about under-represented perspectives. The conference will bring such students together to share their research and to interact with faculty and graduate students at the sponsoring organizations doing cutting edge research in societal aspects of NBIC.

'Enhancing NBIC?' is sponsored by the NSEC/Center for Nanotechnology in Society at Arizona State University (CNS-ASU) and both the Western Alliance to Expand Student Opportunities (WAESO) and More Graduate Education at Mountain States Alliance (MGE@MSA) headquartered in the Hispanic Research Center at ASU, in collaboration with the NSEC/Center for Nanotechnology in Society at the University of California, Santa Barbara, the NanoSTS group at the University of South Carolina, and the nanotechnology-in-society group of Harvard University and the University of California, Los Angeles.

Contributions to Resources for Research and Education:

Through its RTTA 3/1 activity, CNS-ASU is in the process of developing a set of scenarios for the plausible future development of nanotechnologies. Draft scenarios are written and we are in the process of creating a wiki-like site to host the scenarios. On the site, we will conduct a quasi-experiment in which only invited, expert colleagues can develop the scenarios in one portion of the site and the wider public can develop them in the second portion of the site. After being validated in this way, the scenarios will be available for general use within and without the Center.

As we develop expertise and experience with the wiki-like, we envision creating additional public resources in a similar format. For example, graduate student Karinen and undergraduate Anderson are working on a structure and catalogue for domestic and international nano governing activities. Rather than using CSN personnel to conduct surveys, scan the literature and the web, etc., we will investigate creating a wiki-like site in which the participants in nano-governance themselves might contribute to updating the site. The site then might become a meetingplace for expanded interaction and governance activities.

We also imagine a similar site for cataloguing and tracking the nano initiatives underway in about 20 US states. Post-doctoral fellow Bennett and post-baccalaureate student Smith have been at work on just such a catalogue, and they have completed roughly 20 interviews with nano coordinators at the state level.

There has been continual discussion both between NSF and the NSEC/CNS's and among the NSEC/CNS's and its fellow nano-in-society network members about the nature of the 'clearinghouse' as required by the terms and conditions. At each stage of the CNS competition, it was our position that we would collaborate with NNIN/Cornell in developing such a clearinghouse, as we understood that providing such infrastructural support was part of the NNIN's mission, and that NNIN also had an important societal implications component. Our proposals had letters to the effect of the collaboration from Cornell. The ability of any of the nano-in-society grantees to support this collaboration, however, was degraded by the budget cuts we were submitted to when NSF decided to make the award to a 'network' rather than to a single center. Since that time, after discussions with NSF and on-going discussions among the PIs of the nano-in-society network, we agreed that we would pursue a similar arrangement with Cornell and believed that a potential collaborative framework had been tentatively agreed to. But there had been little response from the Cornell side, and recent personnel turnover at NNIN/Cornell may have set back the implementation of this collaboration further still.

Contributions Beyond Science and Engineering:

Special Requirements

Special reporting requirements: None

Change in Objectives or Scope: None

Unobligated funds: \$ 0.00

Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Contributions: To Any Beyond Science and Engineering