PROPOSAL FOR SCIENCE, TECHNOLOGY, AND SOCIETY PROGRAM

OCTOBER 2015

1. Program Description for Bulletin

Science, Technology, and Society (STS) brings methods from the social sciences and the humanities to engage with the STEM fields—the sciences, technology, engineering, and mathematics. Key questions in this interdisciplinary area include: *What is science, how did it develop, and why is it so good at explaining the world? How are science and technology affected by their social contexts? Does technology have its own culture and politics? What makes an "expert"? What concerns about citizenship, security, and human connection are raised by rapidly expanding technologies?*

The major and minor in STS bridge the separation between humanistic and scientific modes of inquiry, and the coursework will draw from departments across Arts, Sciences, & Engineering. Students will gain breadth as well as depth through the STS curriculum, which combines scientific and technical training with a range of analytical tools to study the human interfaces of scientific development.

A concentration in STS prepares students not just for academic careers but also for a broad spectrum of research, journalism, policy, and planning careers related to science and technology.

2. Overview and goals

This proposal describes a planned Program in Science, Technology, and Society (STS) at Tufts, designed to administer both a 10-course second major and a 6-course minor.

We envision STS at Tufts being an excellent co-major with either a scientific or a humanities field as a primary major. STS will build an intellectual community that exploits the liberal arts culture at Tufts to bring people into contact across the disciplinary boundaries that are conventionally strongest. Instead of attracting majors away from existing programs and departments, we hope STS offerings will broaden students in a meaningful way connected with their initial areas of interest, serving as a gateway into either humanities or science disciplines for students who came in with a stronger background from the other side of the divide. Thus we propose not to use number of majors as a benchmark for the success of the undergraduate program. Appropriate metrics for the success of the program include course enrollment, event attendance, strong preparation of students for graduate work in a range of fields, and placement in relevant careers. We anticipate significant benefits for faculty as well, both by bringing new and broader audiences to existing courses and by putting scholars in contact across specializations.

2.1. **Scope.** As a field, STS unites many scholarly methodological approaches in the study of a common body of questions about the social/cultural/political context, the historical development, and the production of knowledge in science and technology. This is a broad purview, which extends to policy, ethics, and planning when grounded in theory (as opposed to how those topics are raised in settings like advocacy, training, or public relations). STS is a mature enough discipline to have its own canon, which typically includes authors like Merton, Fleck, Popper, Lakatos, Kuhn, Bloor, Shapin, MacKenzie, Hacking, Haraway, Latour, and Daston, to name a sample.[1]

[1]Core texts for STS would include Fleck, *Genesis and Development of a Scientific Fact*; Kuhn, *Structure of Scientific Revolutions*; Latour & Woolgar, *Laboratory Life*; Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature*; Hacking, *The Taming of Chance*; Daston & Galison, *Objectivity*; Shapin & Schaffer, *Leviathan and the Air-Pump*; Traweek, *Beamtimes and Lifetimes: The World of High-Energy Physicists*; Jasanoff, *Designs on Nature: Science and Democracy in Europe and the United States*; Biagioli et al, *The Science Studies Reader*.

Furthermore, STS has a roster of professional associations,[2] journals,[3] and graduate programs, as well as its own Program within the National Science Foundation. There are already over 40 STS undergraduate programs around the country, and some of the most established and successful are at universities with an engineering school, such as Cornell, MIT, RPI, and Georgia Tech.[4] Graduates of STS degree programs have gone on to academic careers in a wide variety of fields, including political science, history, forestry, urban planning, English, journalism, pharmacy, engineering, gender studies, law, business, sociology, medicine, media studies, anthropology, and STS itself. In addition, it gives excellent training for a range of non-academic careers including in research, journalism, education, medicine, and policy and planning related to science and technology.

2.2. **Rationale.** Tufts, with its vibrant liberal arts atmosphere, strong basic science and engineering departments, and social justice orientation, is an ideal environment for an STS program to flourish. We have an impressive group of STS-related scholars among the faculty (see §4) and a substantial selection of appropriate course offerings already on the books (see §5). This means that we can be intensely intellectually productive with only a small investment of resources.

While fitting well in the landscape of existing STS programs, Tufts can also offer something distinctive. Its two departmental poles will be Anthropology and Philosophy, making the planned program immediately unique—we have an extraordinary concentration of scholars in those departments who take on science as a field of inquiry. From those two departments, the concentration will be able to draw a range of regularly offered courses, both at an advanced level for upper-year majors and as gateway courses; in particular, Anthropology already has an *Introduction to the Anthropology of Science and Technology* course planned for Spring 2016, while Philosophy is running *Philosophy of Science*. Another novel feature of STS at Tufts benefits from our large cluster of faculty across departments whose work directly engages with studies of mathematics, logic, algorithms, and formal modeling—the planned Mathematics and Modeling track described in §2.4 will be the first of its kind.

2.3. **Resources.** The program will need a modest budget for events and activities as well as part-time staff support. Many of the fundamental texts for STS (including all ten core texts listed in footnote 1 and all six leading journals listed in footnote 3) are already in the Tisch Library. We request a new STS course prefix, both for courses offered by the program itself and to cross-list courses in a single place where students can easily find them.

The requirements for the concentration are well covered by existing courses and the diverse roster of program affiliates among existing faculty provides strength and sustainability for the long-term success of STS.

STS is in an excellent position to seek outside funding to supplement or offset A&S support. Grant awards are available from both science agencies (NSF, NIH) and humanities funders (Mellon, ALCS) as well as from numerous private and corporate foundations with a history of supporting projects which analyze the human interfaces of science and technology. In particular, NSF has a dedicated Science, Technology, and Society Program (see Program Announcement 15506) which is dedicated to funding novel interdisciplinary projects in this area. The affiliated faculty members have an extremely strong record of grant support, including from NSF STS.

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[2]At least five of the affiliated faculty have presented work at the annual meeting of the major U.S. STS professional organization, the 4S (Society for Social Studies of Science). Other important STS organizations include EASST (European Association for the Study of Science and Technology), APSTSN (Asia-Pacific STS Network), HSS (History of Science Society), SHOT (Society for the History of Technology), PSA (Philosophy of Science Association), etc. See `http://www.4sonline.org/resources/professional_associations`

[3]Sheldon Krimsky is an editorial advisory board member for one of the leading and oldest STS journals, Science, Technology & Human Values. Other leading journals include Social Studies of Science, ISIS, Science As Culture, Journal of Responsible Innovation, Science and Engineering Ethics, etc. See `http://www.4sonline.org/resources/journals`

[4]Harvard's STS website identifies the following programs: Arizona State, Bard, Brown, CSU Pomona, Claremont Colleges, Colby, Cornell, Emory, Georgia Tech, Harvard, IIT, JHU, Lehigh, MIT, SUNY, NJIT, NC State, Northwestern, Penn State, NYU Poly, RPI, Rice, RIT, Santa Clara, Stevens Tech, Stanford, UC Berkeley, UC Davis, UCSD, U Chicago, U Maryland, UMass Amherst, UMass Boston, U Michigan, U Minnesota, U Notre Dame, UPenn, University of Puget Sound, UT Austin, UVA, U Washington, UW Madison, and Virginia Tech. See `http://stsnext20.org/stsworld/`

2.4. **Major/minor requirements and tracks of study.** Each semester, certain courses will be listed by the program as **General STS**, and a subset of those will be designated as **Core STS** courses. Regularly offered courses that will be listed among Core STS offerings will include ANTH 32 (Intro to the Anthro of Science and Technology), ANTH 147 (Medical Anthropology), BIO 196 (Microbiology of Food), ENVS 25 (Environment and Technology), HIST 12 (Science and Technology in World History), MATH 112 (Topics in the History of Mathematics), PHIL 116 (Philosophy of Science), and numerous others. Beyond that, the program will offer three **Tracks of Study**, described below; however, the courses listed for these tracks will not exhaust the STS course offerings, and students can design a personalized program of classes instead. The tracks are designed to illustrate coherent streams of study within STS. While they do not exhaust the major topics within STS, each is an important area of specialization in its own right, and these topic clusters are very well represented by our core faculty.

I: **Bodies, Health, and Medicine**
Medical anthropology, history of the body, sexuality, madness and psychiatry, public health and development, sociology of disease and epidemics, gesture, movement, and performance in science, animality and human-animal relations, ...

II: **Science and the State**
Scientific policy and planning, ethics in science (incl. bioethics), technological aspects of economic development and underdevelopment, scientific histories of institutional racism, media and physical infrastructure, democracy and science, ...

III: **Mathematics and Modeling**
Ancient and modern history of mathematics, social ramifications of quantification and measurement, computing, game theory and rational choice, ontology and epistemology of the exact sciences, human-algorithm interfaces, models-based reasoning, ...

The major requirements are:

- Five distinct courses that include two from General STS and one from each of the three tracks. Of the five, at least two must be designated Core STS.
- Two additional courses from within the student's chosen track. (If no track is elected, then these should be chosen from the STS listings in consultation with the advisor.)
- Any Three additional STS courses chosen in consultation with the advisor.

The minor requirements are:

- Four distinct courses that include two from General STS and two from different tracks. Of these, at least one must be designated Core STS.
- One additional course chosen in consultation with the advisor.
- A Capstone Project such as a research paper or oral presentation which integrates the topics and methodologies encountered in the coursework. Capstone projects will be run through the CIS 120 course (Interdisciplinary Minor Capstone).

STS will offer a senior thesis option and will offer a lab course called **STS Lab** which runs as an STS companion to traditional math or science classes drawn from a list maintained by the STS program.

2.5. **Other activities and synergy with other academic units.** Besides administering a major and minor, STS will sponsor a speaker series in cooperation with other departments and programs (see §7 for current plans). Many STS-related speaker events are already held across A&S: for instance, recent talks have been held on the history of American women in math, on the structure of experiments in particle physics, on the social contexts of Ebola, and on genetic engineering. This is part of a wide array of STS-related activity on campus: Jonathan Garlick (Dental Medicine, Medicine, Engineering) and Peter Levine (Tisch College, Philosophy) have convened a working group on Civil Science and have each expressed active interest in collaborating with an STS program; Tufts already has an Institute for Innovation (providing seed funding for ambitious interdisciplinary research projects in science and social sciences), an Institute of the Environment, and an Institute for Human-Animal Interaction; and we have Digital Humanities labs and clusters across AS&E. Jason Rife, the Associate Dean for Undergraduate Education in the Engineering School, is interested in partnering with STS to encourage development of coursework for engineering students on technology policy and ethics.

STS will build a community of Tufts faculty and students that provides a common audience and a coherent intellectual framework uniting such diverse activities and interests.

With adequate resources, we hope to offer a monthly event that pulls together affiliated faculty, majors, and other interested undergraduate and graduate students. Successful models include the Women's Center (monthly Dinner and a Movie), Environmental Studies (weekly Lunch and Learn), and Philosophy (monthly Undergraduate Philosophy Club). One proposal is to have a monthly lunch event in which a graduate student or faculty member workshops work in progress with a designated respondent and an open discussion.

3. Executive Committee

Director: **Moon Duchin**, Mathematics

Patrick Forber, Philosophy
Sheldon Krimsky, Urban and Environmental Policy and Planning
Anne Mahoney, Classics
Sarah Pinto, Anthropology

4. Outreach and faculty affiliates

Extensive outreach is underway to faculty, as well as to chairs and directors of relevant departments and programs (including Anthropology, Biology, Chemistry, Classics, Community Health, Computer Science, Earth and Ocean Sciences, Economics, Education, Environmental Studies, Mathematics, Music, Philosophy, Physics, Political Science, Psychology, Sociology, UEP, and Tisch College to date). More than 40 AS&E colleagues have already expressed interest in an STS program affiliation. (Though note that these affiliates include faculty whose research or teaching already reflects STS themes, which underrepresents the interest in STS within science departments.)

⋆ *denotes core faculty who will advise majors and participate significantly in the direction of the program*

Anthropology

Amahl Bishara – Media, journalism, knowledge production, politics of infrastructure
⋆ **Alex Blanchette** (Food cluster) – Industrial agriculture, animal studies, ethnography of labor
⋆ **Tatiana Chudakova** – Medical anthropology, technology, environment, ethnicity, nationalism
⋆ **Sarah Pinto** (Dir. of WGSS) – Medical anthropology, gender, mental health, reproduction
⋆ **Nick Seaver** – Technology of sound, critical algorithm studies

Biology / Environmental Studies

Colin Orians (Dir. of Env.Studies) – Herbivore-plant interactions, climate change, invasive species
Ninian Stein (Env. Studies) – Environmental policy, "landscape literacy," environmental justice
⋆ **Ben Wolfe** – Ecology and evolution of microbial communities, microbiology of food

Classics

Gregory Crane – Digital humanities
⋆ **Anne Mahoney** – Ancient science and mathematics
Joanne Phillips – Ancient Greek and Roman medicine
⋆ **Riccardo Strobino** – Ancient logical and scientific taxonomy, text transmission

Community Health

Jennifer Allen – Health disparities, community-based participatory approaches

Economics

Drusilla Brown (dir. Intl. Relations) – International trade policy, child labor, sweatshops
Ujjayant Chakravorty – Resource and environmental economics, energy and development, water
Anna Hardman – Urban economics, housing, international migration, development economics

Education

★ **Julia Gouvea** (joint with Biology) – Models-based reasoning, philosophy of biology
David Hammer – Learning and teaching of science, mainly physics; "intuitive epistemologies"

English

★ **Jess Keiser** – Literature of mind, history of science, madness

History

Virginia Drachman – Medicine and society in the United States
Kris Manjapra (Dir. of Colonialism Studies) – Intellectual history, urban history, digital humanities
Steven Marrone – Medieval spirituality, natural science, magic, and popular belief
Jeanne Penvenne – Sorcery and indigenous knowledge in African history
★ **Alisha Rankin** (Mem. WGSS) – History of science and medicine, history of the body and sexuality

Mathematics

★ **Moon Duchin** (Mem. WGSS) – History, philosophy, culture of math and quantification

Music

★ **Joseph Auner** – Sound studies, music and digital culture, sampling

Philosophy

Jody Azzouni – Ontology, epistemology of the exact sciences
★ **Patrick Forber** – Confirmation, explanation, and idealization in science, esp. evolutionary biology
★ **Brian Epstein** – Ontology of social kinds, philosophy of economics
★ **George Smith** – Philosophy of science, logic

Political Science

Kelly Greenhill – Measurement and quantification in conflict and crime
Nimah Mazaheri – Comparative political economy with a focus on developing countries, oil and mining sectors, and government-business relations

Physics

★ **Hugo Beauchemin** – Epistemology of physics, "autopsy of measurement"
Gary Goldstein – Ethics and politics of nuclear physics

Urban and Environmental Policy and Planning

Mary Davis – Environmental health, Haitian factories, New England fisheries
Justin Hollander – Land use, shrinking cities, intersection between technology and planning
★ **Sheldon Krimsky** – Science/technology, ethics/values and public policy
Barbara Parmenter – Evolution of cities, impacts of urbanization on regional climate change

Outside Arts and Sciences

School of Engineering

David Gute (Civil and Environmental Engineering, Public Health, Nutrition) – public health and engineering, occupational health risks for local immigrants, disease prevention in Ghana
Daniele Lantagne (Civil and Environmental Engineering) – Water and sanitation interventions in developing countries and emergency contexts
★ **Matthias Scheutz** (Computer Science) – Evolution of affect and communication, computation, mind, and language

Veterinary School

Allen Rutberg (Biomedical Sciences, Dir. Center for Animals and Public Policy) – Urban wildlife conflict, population and fertility control for wildlife

5. Courses

There is a long list of STS-related courses already on the books; these are a mix of regularly offered and one-time courses. (The inclusion of courses in this list does not indicate that any plans have been confirmed to offer them regularly.)

The executive committee will use bulletin descriptions and syllabi to designate some of these as General STS courses (and a subset of these as Core STS), and to assign some to each of the three Tracks of Study (see §2.4). If appropriate, a course can be in more than one of these categories.

ANTH 32 Introduction to the Anthropology of Science and Technology
ANTH 39 Introduction to Environmental Anthropology
ANTH 39 Unsustainable Agriculture
ANTH 049 Consuming Cultures: Tourism, Travel, and Display
ANTH 42 Extreme Environments: Human Adaptability to Novel Habitats
ANTH 147 Medical Anthropology
ANTH 149 Science, Magic, and Markets
ANTH 164 Media, the State, and the Senses
ANTH 178 Animals and Posthuman Thought
ANTH 185 Biopolitics: Life, Death, and Power
ANTH 182 Human Physique
ANTH 188 Culture, Psychiatry and the Politics of Madness
BIOL 2 Biology and the American Social Contract
BIOL 7 Environmental Biology
BIOL 10 Plants and Humanity
BIOL 131 Principles of Medical Imaging
BIOL 183 Seminar in Darwinian Medicine
BIOL 185 Food for All: Ecology, Biotechnology and Sustainability
BIOL 196 Microbiology of Food
CHEM 94 Science and the Human Experience
CIV 06 Time and Modernity
CLAS 48 Time and Festivals in the Ancient World
CLAS 83 Transmission of Ideas: Greek to Arabic to Latin
CLAS 146 Ancient Greek and Roman Medicine
CH 02 Health Care in America
CH 55 Race, Ethnicity, and Health
CH 106 Health, Ethics, and Policy
CH 107 Science and Practice of Medicine
CH 109 Social Movements for Health
CH 184 Globalization and Health
ECON 35 Economic Development
ECON 48 Health Economics
ECON 86 Amer. Economic Development in Historical Perspectives, 1630–1930
ECON 87 Economics of the British Industrial Revolution, 1750–1850
ECON 127 Urban Economics
ECON 130 Topics in Environmental Economics
ECON 176 Multinational Enterprises
ECON 183 Topics in International Political Economy
ECON 184 Number & Size of Nations
ECON 192 Resource and Environmental Economics and Policy
EDUC 111 Dev. of Knowledge and Reasoning in the Science Curriculum
EDUC 112 Mathematics Learning Environment
EDUC 291 Epistemological Foundations of Educational Research
ENGSCI 11 Technology as Culture
ENGSCI 27 Public Health Engineering
ENV 10 Plants & Humanity
ENV 15 Native Peoples and Indigenous Rights in South America

ENV 25 Environment and Technology
ENV 82 Imagining the Environment: Cross-Cultural Perspectives
ENV 150 Environment, Communication and Culture
ENV 160 Environmental Justice and World Literature
ENV 278 Environmental Justice, Security and Sustainability
HIST 02 Globalization
HIST 05 History of Consumption
HIST 07 History of Public Health
HIST 12 Science and Technology in World History
HIST 27 Modern American Society (Objectivity, empiricism, relativism)
HIST 41 Modern China, 1500–2010 (Development of science and technology)
HIST 80 Enlightenment and Imperialism (Intellectual history in global context)
HIST 96 Nature & Knowledge
HIST 154 Health and Healing in Medieval and Early Modern Europe
HIST 156 Science, Magic, and Society 1100–1700
MATH 15 Mathematics in Antiquity
MATH 112 Topics in the History of Mathematics
MUSIC 33 Music, Technology, and Digital Culture
MUSIC 55 Technology and the Jewish Oral Tradition
MUSIC 59 Psychology of Music
PH 247 Global Health Priorities and Approaches
PH 248 Introduction to Global Health and Development
PHIL 11 Biology and Humanity
PHIL 37 Evidence
PHIL 113 Cognition of Society and Culture
PHIL 116 Philosophy of Science
PHIL 118 Philosophy of Biology
PHIL 124 Bioethics
PHIL 134 Philosophy of Social Science
PHIL 141 Global Justice
PHIL 163 Rationalism
PHIL 167 Science Before Newton's Principia
PHIL 168 Newton's Principia
PHIL 170 Computation Theory
PHIL 191 Foundations of Cognitive Science
PHY 6 Physics for Humanists
SOC 40 Media and Society
SOC 94 Health, Policy, and Inequality
SOC 94 People, Places, and the Environment
SOC 108 Epidemics: Plagues, Peoples, and Politics
SOC 141 Medical Sociology
SOC 149 Sociology of the Body
SOC 180 Cities of the Global South
SOC 184 Nonprofits, States, and Markets
SOC 186 International Health Policy
SOC 188 AIDS: Social Origins and Global Consequences
SOC 188 Social Networks
UEP 94 Environmental Policy, Planning & Politics
UEP 173 Transportation Planning
UEP 174 Air & Water Policy
UEP 222 Biotechnology: Social and Environmental Issues
UEP 252 Cities in Space, Place, and Time
UEP 281 Toxic Justice & Human Ecology
UEP 286 Environmental Ethics

6. Possible/planned courses

Among faculty contacted to discuss the possibility of an STS program, many expressed excitement about designing and teaching courses that would list with STS offerings. This is a short list of possible or already planned future courses with STS content, by affiliates and others.

Amahl Bishara: Politics and practices of knowledge in the Middle East
Alex Blanchette: The global factory: Labor and industrial capitalism
Tatiana Chudakova: Materialities of everyday technology
Moon Duchin: Measurement and the history of intelligence
Brian Epstein: Foundations of the metaphysics of the social world
Patrick Forber & Moon Duchin: Explanation in biology and mathematics
Patrick Forber & Michael Reed: Decision theory and conservation biology
Julia Gouvea: Model-based learning in biology
David Hammer: Intuitive epistemologies in physics
Sheldon Krimsky: Toxic justice
Anne Mahoney: Ancient mathematics; Indian mathematics
Nick Seaver: Digital ethnography; Cultures of computing; Critical algorithm studies
Riccardo Strobino: History of logic
Sigrún Svavarsdóttir: Food ethics

7. Speakers for co-sponsorship

Speakers already scheduled.

October 9, 2015: *Alex Broadbent* (Johannesburg)
Causation in science.
[sponsors: philosophy / med school / STS]

February 4, 2016: *Funke Sangodeyi* (ReD Associates)
Big Pharma looks at HIV/AIDS among black gay men in Mississippi and Baltimore.
[sponsor: STS; co-sponsors: community health, WGSS; possible: Africana / anthro]

March 3, 2016: *Nancy Nersessian* (Georgia Tech)
Modeling practices in bioengineering.
[sponsors: physics / philosophy / STS]

April 2016: *Natasha Myers* (York)
Plant-human interactions, gesture and dance.
[sponsors: anthropology / STS]

Ideas for future co-sponsored speakers.

Sunita Vatuk (CCNY), mathematical thinking in South Indian women's folk art
Kate Crawford, *Tarleton Gillespie* (Microsoft), *Christian Sandvig* (Michigan), algorithms
Jonathan Sterne (McGill), *Trevor Pinch* (Cornell), sound technology
Lilly Irani (UCSD), cultural politics of "high-tech" industries
Sherine Hamdy (Brown), Egyptian ideas about organ transplantation
Eleana Kim (UC Irvine), infrastructure & technology and the Korean DMZ
Loren Graham (MIT), Soviet science and the Cold War
Sienna Craig (Dartmouth), science and indigeneity
Frederique Apffel-Marglin (Smith), biocultural diversity, local ecology, dance
Jim Griesemer (UC Davis), philosophy of biology
Steve Shapin (Harvard), scientific expertise and social status
Valerie Olson (UC Irvine), anthropology of ecosystems; NASA
Megan Bang (UW Madison), native sciences; cultural differences in sense-making
Richard McElreath (UC Davis), human evolutionary ecology, social behavior