ACADEMIC SENATE
of
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
San Luis Obispo, CA

AS-712-10

RESOLUTION ON EMERGING TECHNOLOGIES,
POLICY & ETHICS CENTER (ETPEC)

1 RESOLVED: That the Academic Senate of Cal Poly endorse the attached proposal for establishment
2 of the Emerging Technologies, Policy & Ethics Center (ETPEC).

Proposed by: Colleges of Liberal Arts and Engineering
Date: April 14 2010
Proposal Summary:
Emerging Technologies, Policy & Ethics Center

Prepared on: April 13, 2010

Submitted by:
Patrick Lin, Ph.D. – College of Liberal Arts, Philosophy Department
George Bekey, Ph.D. – College of Engineering, Dean’s Office
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Submitted to:
Rachel Fernflores, Ph.D – Chair, Academic Senate

Overview

"Will we develop monster technologies before cage technologies, or after? Some monsters, once loosed, cannot be caged."

— Dr. Eric Drexler, Engines of Creation: The Coming Era of Nanotechnology (1986)

We propose to create a Emerging Technologies, Policy & Ethics Center (ETPEC), a non-partisan and highly interdisciplinary research and education center, based on the momentum and success of our Ethics + Emerging Sciences Group (EESG): http://ethics.calpoly.edu.

Researchers are rapidly developing new technologies—from nanotechnology to neuroscience—under significant pressure to commercialize or militarize such innovations. Yet, by definition, we do not have a firm grasp of how these emerging capabilities might benefit society as well as cause

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1 The name of our center may change prior to its formal establishment, in which case the Dean of Research and Graduate Programs will approve of any changes.
unintended, and potentially harmful or disruptive, effects. Our center would raise and engage key societal, ethical, and policy questions related to emerging technologies, helping to guide their responsible use.

Purpose

The mission of our proposed center is to leverage Cal Poly’s unique strengths—e.g., science and technology leadership, growing humanities programs, central location in California—to promote academic and public discourse on the ethical, policy, and security implications of emerging areas of science and technology.

We envision a world in which new, world-changing technologies are not created in a vacuum—as they largely are now—but instead are developed proactively in partnership with stakeholders throughout society to minimize disruption and harm, as well as to maximize benefits.

Rationale

Our Ethics + Emerging Sciences Group (EESG) continues to expand its activities, outgrowing the scope and organizational support of any single department. As we explain in this proposal, we believe that establishing a formal center will benefit Cal Poly and the broader community in several critical ways, which include:

- Building bridges among traditionally and self-isolated colleges and departments
- Enhancing professional development opportunities for faculty
- Forging links with industry, non-profits, and the surrounding community
- Providing an identifiable campus entity for practitioners
- Fostering interdisciplinary work
- Aiding in obtaining external support
- Enriching the undergraduate and graduate instructional programs.

 Appropriately for a polytechnic university, we are focusing on new or emerging technologies—as distinct from established ones, such as Internet technologies or cloning—because there is a greater ethics and policy gap with emerging technologies, which urgently needs to be filled. This focus also serves to differentiate us from other ethics and policy centers, some of which may dabble in emerging technologies, but very few are focused on them. Further, this focus aligns with funding opportunities and captures public imagination and interest.

To the extent that the EESG already contributes towards enlivening many, if not all, elements of Cal Poly’s mission, we expect that ETPEC will enhance the broader institutional mission.
Momentum

As the basis for ETPEC, the Ethics + Emerging Sciences Group (EESG) has its roots outside of Cal Poly, organically growing from The Nanoethics Group—a non-partisan research group that Dr. Patrick Lin co-founded in 2003 (www.nanoethics.org). The latter is now one of several research clusters of the EESG, which is also a parent to: Robot Ethics Group (www.robotethics.com), Human Enhancement Ethics Group (www.humanenhance.com), and others in the process of formation.

Cal Poly is credited for its support of our projects, which include: a nanoethics anthology (Springer, 2008), a nanoethics monograph (Wiley-Blackwell, 2010), an ethics and policy report on autonomous military robotics (funded by US DoD/Office of Naval Research, 2008), an ethics and policy report on human enhancement technologies (funded by US National Science Foundation, 2009), and several other publications. We are in the process of developing a robot-ethics anthology (MIT Press, under contract), the first of its kind.

In the last few years, our core faculty members have won several external grants and supporting fellowships, ranging from $10,000 to $300,000, some of which resulted in the above-mentioned publications. Pending projects include two NSF grants currently under review (for $300,000 in robot ethics and $400,000 in geoengineering policy) and other funding proposals in progress.

Our broader, public outreach activities include articles and interviews in popular media (Popular Mechanics, Forbes, Wired, BBC Focus, London Times, The Christian Science Monitor, etc.), as well as development of the above-listed websites. In March 2009, we co-organized a successful conference on human enhancement ethics in Michigan, with invited speakers from Oxford, Yale, Indiana Univ., Carnegie Mellon, IBM, General Dynamics, and other organizations. In early 2009, we launched the Technology & Ethics Lecture Series, which has been well attended—standing room only for the last two events, with the most recent event drawing over 200 attendees. This lecture series tackles such topics as research ethics, cyberweapons, Facebook, and neuroscience.

People

The EESG has already been operating as a highly interdisciplinary team, giving rise to unique synergies. We expect to continue this teamwork with ETPEC and propose the following leadership roles:

- **Director:** Patrick Lin, Ph.D. (CLA/Philosophy)
- **Associate Director:** George Bekey, Ph.D. (CENG/Dean’s Office)
Currently the director of EESG and the proposed director for ETPEC, Dr. Patrick Lin is an assistant professor in the philosophy department. We also propose to have two associate directors, representing both the College of Engineering and the College of Liberal Arts: Prof. George Bekey (CENG Dean’s Office; professor emeritus at USC), and Dr. Shelley L. Hurt (political science). In the following, we provide brief biosketches for these personnel:

Patrick Lin is the director of the Ethics + Emerging Sciences Group. At Cal Poly, he has led research efforts that culminated in two major reports: *Autonomous Military Robotics: Risk, Ethics, and Design* (funded by the US Dept. of Defense/Navy, 2008) and *Ethics of Human Enhancement: 25 Questions & Answers* (funded by the US National Science Foundation, 2009). He has published several books and papers in the field of technology ethics, including a new monograph *What Is Nanotechnology and Why Does It Matter?: From Science to Ethics* (Wiley-Blackwell, 2010) and a forthcoming anthology *Robot Ethics: The Social and Ethical Implication of Robotics* (MIT Press, in preparation). Dr. Lin earned his BA from University of California at Berkeley, MA and PhD from University of California at Santa Barbara, and completed a three-year post-doctoral appointment at Dartmouth College. He is currently an assistant professor in Cal Poly’s philosophy department and an ethics fellow at the US Naval Academy.

George Bekey is a research scholar-in-residence at Cal Poly, distinguished adjunct professor of engineering, and special consultant to the CENG Dean, Mohammad Noori. As professor emeritus at University of Southern California (Department of Computer Science, Electrical Engineering, and Biomedical Engineering), he founded the school’s robotics lab. Over the last two decades, he has won more than $7.5M in grants to fund his leading-edge research. Prof. Bekey has authored scores of papers on robotics, including *Autonomous Robots: From Biological Inspiration to Implementation and Control* (MIT Press, 2005). He is a member of the National Academy of Engineering and the recipient of a number of other honors and awards. He earned his BS from UC Berkeley and MS and PhD from UCLA.

Shelley L. Hurt is assistant professor of political science at Cal Poly. Her dissertation, “Science, Power, and the State: US Foreign Policy, Intellectual Property Law, and the Origins of Agricultural Biotechnology, 1969-1994” has recently been nominated for the Virginia M. Walsh Award for Best Dissertation at the American Political Science Association. She has received numerous awards and fellowships for and in support of her doctoral research from respected institutions such as University of Virginia, Dartmouth College, and the New School for Social Research. Dr. Hurt is currently a co-PI on a project about the emergence of public-private partnerships at home and abroad, which is expected to culminate in an edited volume in early 2011. Among other works in technology policy, she is currently co-authoring a book on the American military’s role on technological innovation and economic growth. Dr. Hurt earned her BA in political science from UC Berkeley and her MA and PhD in political science from the New School for Social Research.
Our work has involved faculty from many other Cal Poly departments, including: military science, computer science, ethnic studies, agribusiness, and others. We have over 50 faculty on our news-distribution list, as a sign of wide interest in our work. We have employed two student assistants to help with our projects and have included budgets for more student researchers in our funding proposals under review.

Outside of Cal Poly, we continue to collaborate with experts from other universities and organizations, including: Arizona State Univ., The Australian National Univ. (Australia), Carnegie Mellon Univ., Case Western Reserve Univ., Centre d'Etudes et de Recherches Internationales (France), Copenhagen Business School (Denmark), Dartmouth College, Delft Univ. of Technology (The Netherlands), Georgia Institute of Technology, Indiana Univ. at Bloomington, Oxford Univ. (UK), Nagoya Univ. (Japan), Stanford Univ., UC Santa Cruz, University of Delaware, University of Southern California, Univ. of Sheffield (UK), University of Sydney (Australia), University of Virginia, US Naval Academy, Western Michigan Univ., Yale, York Univ. (Canada), and many others in the US and internationally. These academic ties also will be valuable to other Cal Poly faculty and students, as ETPEC begins its work.

Projects

In addition to project already underway as mentioned above, ETPEC will continue and extend the work of EESG, which includes the myriad activities expected from a research and education center:

- Academic publications, incl. journal papers, reports, books
- Seeking external funding for research and other deliverables
- Organizing conferences on leading-edge issues
- Hosting a lecture series for students, faculty, staff, and the local community
- Developing university-level courses
- Writing also for public audiences, incl. blogs, op-eds, etc.
- Engaging K-12 and other audiences
- Creating websites that serve as public information portals
- Advising organizations on policy and related issues
- And more.

While we will remain a non-partisan group, we may participate in public policy as appropriate, as we have done in the past. For instance, Dr. Shelley L. Hurt has presented research findings at a conference on détente, sponsored by the Office of the Historian at the US Department of State.

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2 With the retention, promotion, and tenure (RPT) process in mind for faculty, especially junior faculty, the priority of these activities will be aligned with RPT requirements—generally falling into the category of professional development, service, or teaching.
Dr. Patrick Lin has advised high-profile organizations, such as the President’s Council for Bioethics, American Bar Association, and California’s Environmental Protection Agency, on nanotechnology ethics and regulations, and he has recently been asked to testify before Congress on policy and ethics related to military robotics (details to be determined). By virtue of his fellowship at the US Naval Academy, Dr. Lin is part of a consortium on military technologies and policy (CETMONS: Consortium for Emerging Technologies, Military Operations, and National Security), composed of ethics and engineering centers at the Naval Academy, Arizona State Univ., Case Western Reserve Univ., and Georgia Tech. The consortium intends to engage policymakers and seek funding for related projects. (Note: If we were a center now, Cal Poly could formally be a part of this consortium and play a more visible role, including directly receiving funding from secured sources.)

Currently, Dr. Patrick Lin and colleagues are developing a course on robot ethics and discussing an interdisciplinary course on nanoethics; and Dr. Shelley L. Hurt has taught the “International Organizations and Law” course in the Winter 2010 quarter and is teaching “Technology and Policy” in the Spring 2010 quarter—both involving arms control, human rights, and intellectual property rights, all through the lens of emerging sciences and technologies.

With respect to the research areas we are engaging, they are currently:
- Nanotechnology
- Biotechnology
- Human enhancement technologies
- Robotics
- Geoengineering
- Military technologies, including cyberwarfare.

We also have interests in many other fields and expect to engage those fields, which include:
- Virtual reality
- Artificial intelligence
- Space development
- Neuroscience
- Synthetic biology
- And others.

**Sustainability**

We expect the majority of our operating budget to come from external grants, which will fund specific projects. Previously, we were successful on a pair of DoD/Office of Naval Research (C3RP) grants totaling over $90,000 to study issues in military robotics. Currently, we have two (2) NSF grants under review: a $300,000 proposal for work in robot ethics, and a $400,000 collaborative
proposal (with Western Michigan Univ.) for a study in geoengineering policy. In the last review cycle for the NSF's Science, Technology, and Society funding program, our $400,000 collaborative proposal (with USC) qualified for funding—with two “Excellent” ratings, two “Very Good”, and one “Good” — but was ultimately not funded given program budget limitations; so we are encouraged that our future proposals will be highly competitive.

Separately, Dr. Patrick Lin led efforts on a successful NSF award of approximately $250,000 (collaborative project between Dartmouth College and Western Michigan Univ.) for a study in nanotechnology and human enhancement ethics—one of the first awards, if not the first, of its size for a specific ethics project; and his US Naval Academy fellowship includes a $10,000+ budget for research and travel.

Dr. Shelley L. Hurt’s grants include a Venture Capital Fund grant from the International Studies Association of $25,000 and a France-Berkeley Fund grant of $10,000 from the University of California, both in collaboration with Dr. Ronnie Lipschutz of UC Santa Cruz.

Prof. George Bekey has been involved with project awards totaling over $7.5M in the last 20 years alone, including an NSF award at Cal Poly for nearly $300,000, under the Research Experiences for Undergraduates (REU) program.

The ETPEC leadership team plans to submit a steady flow of proposals to other grant programs in order to help fund the center’s intellectual and programmatic goals. For instance, we already have inquiries into or conversations started with Google Foundation, Hewlett Foundation, Kavli Foundation, and others to support both specific projects as well as the center at large.

Without physical facilities to rent or equipment to pay for, our fiscal needs are modest and can be met with project-specific grant funding, as has been the case in previous years. However, with formal center status, we would be able to recover a sizable percentage of indirect costs from our grant-funded projects, giving us a cushion for administrative expenses and smaller, unfunded initiatives.

**Organization**

The center director will report to the Dean of Research and Graduate Programs and will be advised by an Executive Committee—which includes the Deans of the College of Liberal Arts as well as the College of Engineering—and an External Advisory Board.

With ETPEC as the parent organization, we plan to develop research clusters around our various interests, as well as the technical and policy expertise we have available in and outside of Cal Poly. Indeed, several of these clusters already exist in various stages of development, such as The
Nanoethics Group, Robot Ethics Group, and Human Enhancement Ethics Group. Thus, we plan to build out these and other groups to form research clusters in:

- Nanotechnology
- Human enhancement
- Geoengineering
- Cybersecurity
- Artificial intelligence
- Neuroscience
- Robotics
- Biotechnology
- Military technologies
- Virtual reality
- Space development
- Synthetic biology
- Others

Note: Our budget, bylaws, organizational chart, and other details are available upon request. These items are omitted here for length considerations.

**Conclusion**

From conversations with senior administrators, deans, faculty, students, and other stakeholders, we believe there is strong interest for our center. Our Emerging Technologies, Policy, and Ethics Center (ETPEC) would be positioned to make dynamic contributions to the university, San Luis Obispo county, as well as national and international security. Science and technology are developing today at an ever-rapid pace, while the capacity of societies and governments to assess risk and opportunities is increasingly difficult. In light of these challenges at home and abroad, ETPEC can help Cal Poly's students, faculty, and international community to confront some of the most important and cutting-edge issues of our time. As a center at a premier and comprehensive polytechnic university, ETPEC will serve as a critical hub in bridging disciplinary divides—integrating ethics, policy, and national security dimensions of emerging sciences and technologies.