

POLITICAL SCIENCE

the policy plate.

step up to

Berkeley scientists

Most Berkeley students can tick off the major science policy issues in the news—the environment, stem cells, energy independence, nuclear technology, Mars exploration, and so on, but Congress has different priorities. Following recommendations from a recent National Academy of Sciences report, the 2007 Congressional budget focuses on improving and maintaining American competitiveness in innovation as well as supporting defense research. The new budget leaves funding for NASA and the National Institutes of Health at current levels (and thus falling behind inflation), preferring to promote basic science and defense applications through the National Science Foundation, National Institutes of Science and Technology, and the Department of Energy.

Unsatisfied by simply reading about such policy decisions in the news, a group of science and engineering students has embraced Berkeley's activist tradition and gotten involved in the debate over how government spends its money. The Science, Technology, and Engineering Policy group (STEP) formed to allow interested students to participate in the political process.

In its attempt to raise policy awareness on campus, STEP has two main goals: first, to encourage thinking about broader impacts of science, and second, to educate students about the impacts of scientific research at Berkeley and elsewhere. The group hosts a seminar series addressing a wide variety of

issues; past topics have included innovation in science and engineering, open source biology, energy policy, and American scientific competitiveness. Along these lines, STEP recently held a white paper competition as a concrete way to initiate thoughtful discussion in the community.

White paper competition

There was a strong response to the prompt for this year's competition: "Describe how a new technological innovation (or innovative use of an existing technology) could either help meet an important policy goal or raise the need for new policies." STEP received twenty submissions from undergraduate and

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graduate students from both engineering and policy departments. The papers also spanned the political landscape; the most popular topics included nuclear policy, genomics, stem cell research, health care, science education, and energy reform.

Perhaps most importantly, the students were encouraged to interact with STEP's advisers and other UC Berkeley professors.

Steve Maurer helped first place winner Krishanu Saha refine his paper, "Navigating to the Right Stem Cell Line." Saha's proposal—to form a comprehensive database to track human stem cell lines—was inspired by problems he noticed during his doctoral research on adult neural stem cells (from rats). His ideas were refined at a recent Boalt Hall conference on the ethical, legal, and societal implications of the California stem cell initiative, and in discussions with Maurer about current database policy.

Beyond the current debate about the ethical basis of human stem cell lines, there are practical issues associated with donor rights and ownership of biological material. For example, in order to obtain an appropriate stem cell line, scientists must communicate with other scientists or companies to determine if a stem cell line has been stored under the correct biological conditions, how the cells are best grown in culture, and what sort of proprietary rights the cell line owner has (publishing, patenting, sales, etc). Additionally, if a scientist chooses the wrong cell line, legal complications may arise due to donor concerns about what the cells are being used for or how they have been obtained. Collecting this information is time-consuming, difficult, and potentially expensive. Saha's database would centralize this critical knowledge. However, Saha notes, "the first step is to write a paper—there is still more research to be done on how society views biological donations and to look at what has

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Excerpts from *Navigating to the Right Stem Cell Line*

Krishanu Saha, Department of Chemical Engineering

When seeking information about human embryonic stem cell (hESC) lines for research, scientists do not simply peruse through a few catalogues or journal articles. Instead, scientists find themselves negotiating many familiar and new relationships—with other members of the scientific community, lawyers, advocacy groups, the lay public, and oocyte donors. Scientists communicate the merits of particular hESC lines. Lawyers negotiate intellectual property rights and materials transfer agreements, while advocacy groups aspire to guide scientists to hESC lines most pertinent to their own causes.

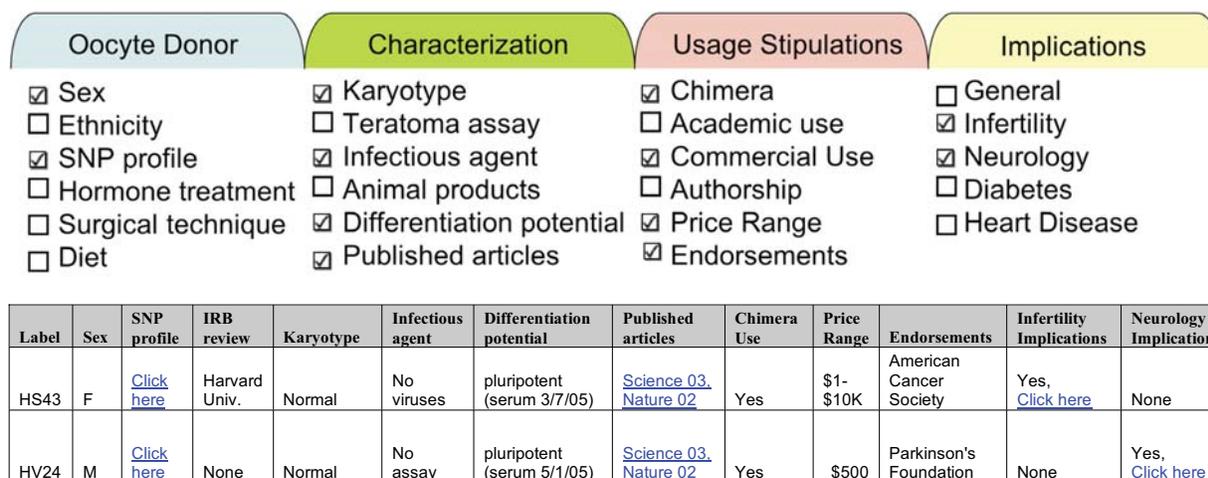
Simultaneously, the lay public seeks to track their investment in hESC science while protecting public health. Lastly, [donors] may seek to maximize usage of their hESC line in a particular field, or for therapies in general. Ultimately, the process by which scientists communicate their choice to all of these parties is notably variegated, laborious, and guarded. In such a politically and scientifically important arena as hESC research, every effort to make this process transparent, inclusive, and efficient should be immediately explored.

large connected scientific projects with property rights. In hESC research, databases have sprouted up isolated from one another, but are currently designed to incorporate information from and to communicate only to scientists...

Political Feasibility. Even minimal database incentives for input can create conflict in industry [by] pressuring trade secret disclosure and in academia by countering the lone discovery culture of science. ...Certain segments of industry will likely welcome the standardization and transparency from database adoption. As hESC companies become established, they will likely want stable markets and clearly-enforced property rights... Both donors and advocacy groups will likely welcome the database as it provides a new mechanism to influence research.

By providing a mechanism for donors to communicate to scientists, the database may introduce an additional encumbrance on scientists when choosing particular hESC lines as donor stipulations may greatly restrict hESC research on many lines... Legislation on donor rights likely will take years to settle, and will vary regionally. Scientists can proactively choose to manage such legal cases via relationships managed over the database.

Implications in ethical debates. By including other parties



Potential user interface of a proposed database to organize information on human embryonic stem cell lines for research purposes.

The wide accessibility of a web-based central database would be a responsive mechanism to shape hESC research for greater public benefit.

Suppliers of stem cell lines for research are increasing and diversifying. Suppliers currently range from purely nonprofit and public [e.g., National Institutes of Health (NIH)], a mixture of public/private [e.g., WiCell], and purely private [e.g., in vitro fertilization (IVF) clinics and biotech companies]. In 2001 in the US, NIH supplied a large majority of the hESC lines for research, while today there are over 200 known lines with suppliers from Korea, India, Australia, Sweden, Canada, and U.K. growing prominently in size. Each of these suppliers adheres to its own local regulations in deriving and trading hESC lines. Harmonization of such regulations has been proven difficult already among states in the US and is unlikely to occur soon in the international context...

Organizing, centralizing, and standardizing not only hESC scientific information, but also the legal and consent issues, could solve many of the concerns among all parties involved. Data is generally viewed as a public good that can not be patentable. But, the need for databases in organizing information has long been known in

in this information exchange, the database may also have unique outcomes in ethical debates. Donors are not forced to provide more information than they wish and have a mechanism to define their terms of donation. If donors collectivize into groups or charitable trusts, such institutions can oversee the selection process and even have a seat at the negotiation table when the supplier and scientist negotiate the terms of trade. The lay public and advocacy groups can scrutinize only the individuals who operate at ethical borders and not condemn the scientific enterprise as a whole.

While scientists seek information about and new sources of hESC lines, I have shown that a remarkably diverse assortment of groups has similar aspirations themselves. All of these parties, with differing interests and stakes, may gain much in the long run from effective implementation of a central database. Database management is relatively inexpensive compared to the funding of hESC research, and corporations are already willing to fund such an enterprise. hESC databases have little reason to restrict the database information and participation to only scientists, without paying attention to the democratizing forces on science.

been done in the past. Then, the next step is to get the National Academies to think about a good way of establishing it, if [the database concept] remains relevant.”

Fortunately, part of the white paper competition’s first place prize is a trip to Washington, D.C. for potential meetings with influential directors in the National Academy

school. “When people with a deep science background approached professors in policy, they got help shaping the proposal for a wider audience. The process was integral because the relationship to the advisers is key to the learning process.” Besides its monthly seminar series, STEP offers workshops on written and spoken communication. Ham-

mond hopes to see a wide turnout at the kickoff meeting in October, when plans for this year will be revealed.

In addition to the white paper competition and the seminar series, STEP plans to

expand student involvement in legislation. Last year, adviser Pat Windham of Stanford University took students to sit in on nuclear policy meetings in Sacramento. Thanks in part to his continuing support, STEP plans to turn toward California policy next year. Already, a few students have contributed advice to the California Council on Science and Technology (CCST) for California’s

response to the National Academies’ report “Rising Above the Gathering Storm,” which makes recommendations on issues of globalization and American competitiveness. Hammond hopes that STEP will be able to coordinate Berkeley involvement with CCST on other issues as well. “We would really like to ... provide a communal meeting point and contacts to state and federal policy makers,” she says.

Most importantly, STEP hopes to develop depth in specific areas of interest to students, and prepare task forces to advise the CCST and legislative groups. Tom Kalil, Special Assistant to the Chancellor for Science and Technology at Berkeley notes, “I hope that STEP will encourage science and engineering students to think about the broader economic, ethical, legal, and societal implications of their research.”

Adviser Steve Maurer goes a little further. “It’s really valuable to think about things engineering students can do that have real public policy implications. STEP could organize projects to get people involved in real world issues.”

Though STEP may not yet be ready to organize large-scale research projects, they are certainly amenable to involvement from the policy end. Current efforts aim to recruit more graduate students from the Goldman School of Public Policy. Hammond notes, “I think it’s one of the things that is very important about this group, that considering policy could affect the direction of a student’s research.” Scientists often think that science and technology drives policy, but STEP strives to highlight how policy can drive science, too. ■

KAYTE FISCHER is a graduate student in bioengineering and a member of STEP.

Want to know more? Check out STEP’s website at <http://step.berkeley.edu>



STEP student members pause for a photo opportunity with Governor Schwarzenegger’s portrait. UC Berkeley step members Erik Douglas (left) and Lance Kim (right) and UCLA member Jay Fahlen (center) represented STEP at the May 2006 meeting of the California Council on Science and Technology in Sacramento.

of Sciences, the American Association for the Advancement of Science (AAAS), the NIH, and Congress. Saha notes that the debate surrounding the recent stem cell bill has done a lot for visibility.

“One of the reasons I wrote the paper is that the prize is really good. You’re not wasting your time by writing the paper if you have a shot at getting it implemented,” says Saha. The feedback provided by the STEP contest judges helped Saha to polish his arguments for the next round of discussions.

Coming soon

According to STEP president Kate Hammond, Saha’s experience embodies exactly what STEP hopes to do for many Berkeley students. “Ultimately, we want to provide people with both [the] access and [the] abilities to pursue interests in science policy.”

As a start, STEP hopes to improve students’ ability to communicate complex scientific ideas to the public. Hammond notes that there was noticeable improvement in the white papers where the students had sought advice from professors in the policy

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