

September 6, 2006

Bears Breaking Boundaries 2006: the results

In the spring of 2006, the Big Ideas @ Berkeley initiative and the Berkeley student government (ASUC) teamed up with institutes and research centers across the campus to support competitions for 29 new student ideas, with total cash prizes of more than \$100,000.

The competitions covered a broad range of subjects, including curricular innovation, green cities, neglected diseases, clean energy, information technology for society, social entrepreneurship, science and technology policy, serious games, improving Lower Sproul, and designing the next “X Prize” – a \$10 million prize which launched the first private race to space.

The overall goals of the competition, called “Bears Breaking Boundaries,” were to:

- Provide concrete support (money, advice, other resources) for creative, high-quality student proposals.
- Encourage UC Berkeley students to set ambitious goals for their current and future endeavors.
- Increase the role that UC Berkeley students play in shaping the next generation of research, education, and service activities on the campus.
- Encourage the innovation and fresh thinking that often arises from multidisciplinary student teams.

Organizations that are involved in Bears Breaking Boundaries as either hosts or financial sponsors of one or more of the contests include the ASUC, Big Ideas@Berkeley, the Vice Chancellor for Research, the Center for Information Technology Research in the Interest of Society, the Berkeley Institute of the Environment, the Center for Neglected Diseases, the Center for New Media, the Center for Responsible Business, and the Lawrence Berkeley National Laboratory.

Below are short abstracts of the winning proposals.

Beautify Berkeley

Beautify Berkeley: Lower Sproul Plaza Proposal: This proposed design for improving UC Berkeley campus’s Lower Sproul Plaza includes the following elements: an arbor, green lawns, inclined grass lawn and stage, and shifts in programming. The design and program aim to build and support the local economy, nurture and define community identity, foster frequent and meaningful contact, promote sense of comfort, and draw a diverse population. This proposal received \$5,000.

Connecting the Lower Sproul: This design for improving the UC Berkeley campus's Lower Sproul Plaza would make it both more functional and attractive to the campus community, as well as more relevant to Berkeley's prestigious image. The design focuses primarily on the open space, taking into account the size, height, location, and general use of the surrounding buildings as existing site conditions. The proposal also includes some facility improvements to the Bear's Lair as well as simple additions to the Martin Luther King building that are designed to enhance the quality of natural light to the west side of the plaza during the late afternoon. This proposal received \$3,000.

Curricular Innovation

The Art of Mathematical Modeling in Science, Industry, and Society: Two incoming graduate students in IEOR and mathematics proposed an interdisciplinary course in which students would identify issues of interest in any discipline, and develop the methods and models to answer the questions they pose themselves. Examples of possible projects include counteracting the effects of political gerrymandering, determining the probability that a clump of cancerous cells will spread, and determining the best order for emergency rooms to treat patients with different symptoms. This project received \$4,000.

Center for Energy Innovation: Students in the Haas Business School and Energy and Resources Group proposed creating a "Center for Energy Innovation" that would help train the future leaders of the energy industry. Elements of the program would include joint degree programs designed to encourage multidisciplinary approaches to energy innovation, new courses, a speaker series, and a fellowship program for students interested in moving clean energy technologies developed at UC Berkeley and LBNL from the lab to the marketplace. This project received \$4,000.

Improved Cook Stoves for Darfur: There are over 2 million displaced persons in the Darfur region of Sudan. Because Darfur is an arid region with limited vegetation cover, women and children spend 7 hours a day gathering fuel wood. Venturing outside the refugee camps exposes women and children to abuse and rape from the Janjaweed. Working with scientists at LBNL, a team of UC Berkeley students with expertise in energy, physics, mechanical engineering, environmental science have designed a low-cost, energy-efficient and culturally appropriate cookstove. Compared to the conventional three-stone fireplace, the cookstove yields fuel wood savings of 54 to 87 percent. LBNL and UC Berkeley is now working with an NGO operating in Darfur to launch a pilot. This project was as part of a course developed by students called "Design for Sustainable Communities," and received \$4,000.

ICT for Development certificate: UC Berkeley is emerging as a center of excellence in both research and fieldwork on ICT for Development (ICT4D), as the result of projects such TIER (Technology Infrastructure for Emerging Regions, led by Professor Eric Brewer. This proposal would create a new certificate program to prepare students in the research, project management, and design of ICT4D. The program would include a core curriculum, a fieldwork requirement, and focus areas in ICT and business, public health, distance education, and design. Two new courses would be developed. This project received \$4,000.

Creating a New Engineering Major: Engineering in Society: These students propose to establish a multi-disciplinary engineering major with non-engineering concentrations to foster innovation and creativity in solving problems most relevant to central societal needs. They propose an introductory interdisciplinary course on how technology affects society, and a project-oriented capstone course. This project received \$2,000.

American Sign Language: One student proposes that UC Berkeley offer a course in American Sign Language, given UC Berkeley's leadership on empowering students with disabilities through programs such as the Disabled Students Program. He envisions students with hearing impairments being able to rely on their friends for translation in the classroom as opposed to professional interpreters. This project received \$2,000.

Green Cities

Urban Waste to Energy: This project has as its goal the design of a gasification co-generation plant that would re-route the city of Berkeley's solid sewage, waste, un-recyclables and plant debris from industrial, commercial and residential sources to produce electricity, ethanol and fertilizer. The team will coordinate with public works and government offices to provide a high-fidelity operation model, culminating in a detailed feasibility report that would lead to eventual implementation of a pilot gasification plant, as well as provide a blueprint for other cities seeking novel approaches to attaining energy self-sufficiency. This proposal received \$5,000.

Easy Carpooling: This project will develop a "dynamic carpooling demonstration program" to expand transportation choices for Berkeley residents and commuters to UC Berkeley. The premise of the project is that the most effective way to increase the throughput of existing transportation networks is to match willing passengers with willing drivers using technologies such as the Web, SMS, and cellphones. This would build on efforts such as RideNow (<http://www.ridenow.org>). This project received \$3,000.

Payment for Environmental Services: Solution to China's Water Problem?: Rising levels of industrial and household water pollution in China has degraded its rivers, threatening both environmental conditions and human health factors in China's cities. One student in the School of Public Policy proposes further research into meeting new Chinese national government standards for drinking water quality by considering alternative resource management models for building new infrastructure systems to treat water that might be more cost-effective, such as the payment for environmental services (PES) model. This project received \$2,000.

Information Technology for Society

AgLinx: The goal of the AgLinx project is to reduce water usage in agriculture by providing actionable advice to farmers. Wireless sensor networks will measure direct runoff, precipitation, infiltration, and irrigation. A farm-level server will aggregate and analyze data from field sensors, actions taken by farmers, weather service information feeds, and other

relevant information from the Internet. This project has also won an award from the National Collegiate Inventors and Innovators Alliance, and is receiving \$7,500.

Predicting Outbreaks of Vector-Borne Diseases: This team will explore the potential of geographical information systems to predict the outbreak of vector-borne diseases such as malaria. The initial pilot will take place in the State of Orissa in India, which accounts for 40 percent of India's fatalities from malaria. The team includes graduate students in public health, public policy, and computer science, and has developed a partnership with the Malaria Research Center in New Delhi. This project received a total of \$10,500 from the IT for Society and Neglected Disease competitions.

Concrete Garden: This UC Santa Cruz project is designed to reduce food insecurity in Mexico City by creating an inter-organizational portal for community-based organizations involved in urban agro-ecology and urban gardening. This project received \$7,500.

Simple Scalable Speech Technology: This project addresses the problem of universal IT access for illiterate end users in developing countries. The team will conduct three kiosk deployments of an inexpensive, community-based approach for gathering the linguistic resources needed to power a simple spoken dialog recognition system in rural Tamil Nadu. The deployments would each include onsite training, hardware and software localization, and baseline studies of the target population before and after deployment. This project received \$2,000.

Neglected Disease

Changing Contexts to Identify Pathways to Health: Students in the Epidemiology & Biostatistics program in the School of Public Health have developed an alternate approach to epidemiologic research which enlarges the current risk factor/disease paradigm by shifting perspective from disease to health and transcending traditional disciplinary boundaries. The initial project will collect self-identified pathways and barriers to health from the diverse population of UC Berkeley staff members (grounds keepers, program administrators, librarians, food service workers, etc.) for a multidisciplinary study of health and the development of comprehensive prevention programs that are meaningful to people in their communities. This project received \$7,500.

Predicting Outbreaks of Vector-Borne Diseases: This team will explore the potential of geographical information systems to predict the outbreak of vector-borne diseases such as malaria. The initial pilot will take place in the State of Orissa in India, which accounts for 40 percent of India's fatalities from malaria. The team includes graduate students in public health, public policy, and computer science, and has developed a partnership with the Malaria Research Center in New Delhi. This project received a total of \$10,500 from the IT for Society and Neglected Disease competitions.

Next X-Prize

Da Vinci Dexterity Prize: This proposal for a competition similar to the X PRIZE is to design and build, within the next five years, a remotely controlled set of robotic hands and arms that can perform any manual task that a capable six-year-old child can perform. The near term goals of the D-prize are to catalyze an industry that is languishing far behind its potential and to create a useful and economic robotic platform capable of performing simple tasks, which are either too dangerous or too strenuous for a human to perform. The prize's long term goal is more ambitious: to finally free humankind from menial labor. This proposal received \$5,000.

Science, Technology and Engineering Policy

Navigating to the Right Stem Cell Line: Human embryonic stem cell (hESC) lines are rapidly proliferating across labs around the US and the world. Scientists must acknowledge that their practices with these materials are under scrutiny by the public, advocacy groups, lawyers, and donors. The current process of choosing a hESC line is inefficient for scientists and incorporates only a select number of parties in a laborious, protracted manner. This paper proposes working with the stem cell research community to sponsor a central, open stem cell web-based database of hESC line history, encrypted donor information, terms of exchange, lay description for the public, and advocacy group endorsement to improve transparency, inclusion, and efficiency. This proposal received \$2,500.

A Return to Atoms for Peace: This paper proposes an experimental compact Liquid Metal Fast Reactor (LMFR) such as the ENHS (Encapsulated Nuclear Heat Source) as an attractive option should US negotiating strategy call for a new nuclear reactor deal in exchange for disarmament by North Korea (DPRK). This proposal received \$937.50.

Energy Independence: The Promise of Cellulosic Ethanol: Researchers at UC Berkeley are directly addressing the issues of environmentally friendly alternative energy production. Under the leadership of UCB faculty member Jay Keasling, a number of research projects will be launched that focus on the use of engineered microbes to provide new sources of alternative energy. The conversion of waste plant material into cellulosic ethanol by engineered microorganisms is one promising research project to be investigated. It is the development of this technology that has incited policy makers to predict that ethanol will be cost competitive with gasoline by 2012. This proposal received \$937.50.

Berkeley Award - Preparing for the Backlash: Pre-emptive Policy for the Nanomaterials Revolution: Nanomaterials research and production is progressing much more rapidly than relevant safety policy. There is a demonstrated need for preemptive policy, as a public backlash against the health and environmental risks of nanomaterials has begun. This paper proposes policies to safeguard society and secure the advancement of technology. This proposal received \$1,000.

Serious Games

Outbreak: Outbreak is a simulation that puts the player in the middle of a pandemic that is circling the globe. The vaccine supply is limited, and mutations of the virus could make the vaccine worthless. Players must manage game economy items such as hospital beds, vaccines, hygiene, and morale. This proposal received \$4,000, and is a collaboration between Stanford and Berkeley students. See <http://www.outbreakthegame.com> for more details.

Adventures of Arjun: This cellphone-based mobile game is designed to teach out-of-school children in the developing world to learn English as a Second Language. The student team has 2 graduates and 4 undergraduates, with backgrounds in computer science, psychology, cognitive science, education, and economics. This project received \$2,500.

Hot Books: As systems for keeping information safe and organized, libraries have their faults. Books suffer from neglect, sitting lifeless on shelves, lost in plain sight. Hot Books is a game that aims to change the way libraries function by bringing life and attention back to the massive amounts of books that are lost in the library. The game does this by making library patrons engage with and create relationships to books they might never imagined existed. This project received \$1,000.

Social Entrepreneurship

The UC Berkeley Resource Institute for Social Entrepreneurship: There exists a tremendous opportunity to leverage the resources, research, and reputation of the University of California, Berkeley to pioneer social innovation on a global scale. As a recognized leader in academic excellence, premier research, and distinguished public service across a diverse offering of disciplines, UC Berkeley is uniquely positioned to deliver dramatic solutions to pressing social and environmental issues. The UC Berkeley Resource Institute for Social Entrepreneurship (RISE) would serve to identify these cross-sector initiatives and bring to bear the entrepreneurial, operational, and management expertise of the Haas School of Business on the development and delivery of these innovative solutions. To bring these ideas to life, RISE would launch a set of key activities designed to engage students, faculty, staff, and alumni across professional, academic, and research disciplines with domain experts, practitioners, and other stakeholders. This project received \$5,000.

Solar Fuels

Novel Semiconductor Alloys for Photoelectrochemical Cells: This proposal outlines future research regarding the engineering of semiconductor alloys for the optimization of photoelectrochemical (PEC) electrodes. This work would be a valuable addition to the Lawrence Berkeley National Lab/ UC Berkeley Helios Project, a major new research initiative in sustainable carbon-neutral sources of energy, as it shows great promise for producing high efficiency PEC cells that can effectively transform solar energy into hydrogen. This project received \$5,000.

A Dual Approach for the Cost-Effective Production of Biofuels: This research proposal suggest a new approach for developing cellulose as an alternative feedstock for producing cost-competitive biofuels that could be incorporated into the Helios Project. The proposal suggests two model systems for engineering novel plant-microbe interactions: *Escherichia coli* (E. coli) and Arabidopsis which would produce enough cellulose to make it a feasible source of renewable energy. These solutions could be directly integrated into the existing agricultural infrastructure, while also providing cost savings for the agricultural industry. This project received \$3,000.

Aurora BioFuels: Aurora BioFuels is a newly formed venture created to commercialize a carbon-neutral source of energy created at the University of California at Berkeley by Professor Anastasios Melis. Aurora competed in the 2006 Berkeley Business Plan Competition, finishing in 1st place and winning the People's Choice Award (over 50 teams entered the event). The technology Aurora is commercializing will improve America's energy security, its economic competitiveness and will reduce global warming. Aurora's process for creating bio-oil input for bio-diesel production is more efficient and less costly than cultivating food crops for oil, allowing Aurora to achieve superior yields and margins compared to current bio-diesel producers. This project received \$2,000.