

UNIVERSITY OF CALIFORNIA, ACADEMIC SENATE

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

COORDINATING COMMITTEE ON GRADUATE AFFAIRS (CCGA)

Farid Chehab, Chair

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ACADEMIC SENATE

University of California

1111 Franklin Street, 12th Floor

Oakland, California 94607-5200

February 16, 2010

HENRY POWELL
ACADEMIC COUNCIL CHAIR

Re: CCGA White Paper on the Value of UC as a Graduate Research Institution

Dear Harry:

In recent months, the Coordinating Committee on Graduate Affairs (CCGA) has been discussing the value of UC as a graduate research institution and has drafted a white paper that I am pleased to present to Academic Council for their review and formal endorsement.

Please let me know if you have questions about the paper.

Sincerely,

A handwritten signature in black ink, appearing to read "Farid Chehab".

Farid Chehab, Ph.D.

Chair, CCGA

Enclosure

Copy: Academic Council Chair Harry Powell
Executive Director Martha Winnacker

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The University of California is the research arm of California's three-tier public education system. UC is recognized by California's Master Plan of Education to have the sole authority in public higher education to award the doctoral degree in all fields of learning, and to be the primary state-supported academic agency for research.

In its 2009 rankings of national universities, the Washington Monthly used classification criteria that target the ability of a university to graduate students, who significantly contribute to community service and cutting-edge research, while also recruiting and graduating low-income students. Unlike other popular university rankings, the Washington Monthly extracted the critical parameters that allow a university to advance knowledge and benefit society. The rankings revealed that among 258 university campuses surveyed, three UC campuses were at the top of the list. These rankings come as no surprise since the UC faculty has structured its teaching of the professions, science, humanities and the arts to encompass research methodology and critical thinking as invaluable tools to educate its students. In fact, the research excellence of UC is reflected by the Nobel Prizes that 56 of its faculty and researchers have been awarded to date in Medicine, Physics, Chemistry, Economics and Peace. The research breadth of UC faculty has resulted in the emergence and convergence of new fields of study such as in Global Warming, Electronics, Communications, Aging, Global Health, Stem Cell and Regenerative Medicine and the interaction of Neuroscience with Artistic performance, to name a few.

In addition to its striking contributions to scholarship and the economy of the State, over many years, UC has enriched the lives of Californians through contribution of its museums and cultural attractions. For example, The Lawrence Hall of Science, located on the Berkeley campus, provides opportunities for people of all ages to learn about the world of science through its interactive displays for children and adults, programs for schools, extensive classes and workshops at the museum and its online interactive website. Also, on the Berkeley campus are Cal Performances, an extensive series of music, dance and theatrical performances by artists from around the world that is available to the public.

We are reminded that one of the greatest environmental dangers to our planet was unveiled by UC Nobel laureate Sherwood Rowland, who showed that chlorofluorocarbons (CFCs) were significantly damaging the ozone layer and exposing people to cancer-causing radiation. At the Nobel Prize award ceremony, the committee noted that this discovery saved the world from catastrophe. This is the level of research excellence that UC is known for around the world. In fact, this Nobel Prize was also awarded to his postdoctoral fellow, Mario Molina, who was a Ph.D. student at UC.

UC graduates students represent the gem of the graduate programs and are the intellectual capital of the University. Unfortunately, decreased graduate students enrollments due to fiscal constraints are occurring throughout the University. This situation endangers the distinction and excellence of our graduate programs by decreasing faculty research productivity and deflecting the University's research mission from its intended charge assigned to it by the California's

Master Plan of Education. Graduate students are critical to the education mission of the University, especially when they serve as mentors for undergraduates and work as teaching assistants. UC is losing its most talented students to institutions that can offer only 10-20% more support than UC.

UC offers graduate degrees in over 600 different fields, all of which drive discovery, innovation and education. UC's research mission fosters graduate and undergraduate education by creating a resourceful environment for the interchange of information among students at all levels. In an information age where Arts, Humanities and Sciences are becoming increasingly complex, UC graduate degrees will provide the advanced knowledge that a highly educated workforce will need to help California retain its position as a global and worldwide economic force.

In post-graduate endeavors, statistics show that UC graduates are likely to settle in California and earn high salaries that in turn would increase revenues to the state. In addition, UC graduates with Master's and Doctoral degrees contribute to the prosperity of education in California and constitute about 25% of the faculty in the California State University system. Graduate academic students are the future life-blood of academia. They are trained to work relentlessly, to think critically and to play a dynamic role in society while they remain strong advocates to the University.

Furthermore, UC's research has resulted in the birth and growth of biotechnology industries throughout the state and particularly in the San Francisco and San Diego areas. Actually, UC scientists founded a third of California biotech firms, most of which employ UC alumni with graduate degrees. Prominent companies such as Intel and Broadcom that pioneered advances in Electronics and Communications also shaped Silicon Valley and the Internet. Both of these companies had UC doctoral graduates at their helm. Undoubtedly, these and other companies continue to positively impact the economy of California and will help the state to recover from its dire financial situation.

Overall, a matrix of creativity, intellectual flexibility and critical thinking have shaped the research mission of the University and allowed it to advance to new heights as reflected by the panoply of opportunities it has created through the diversity and richness of its graduate programs. It is well known that flourishing societies have great institutions of learning and the close association of UC with the unique California culture continues to impact on the progression and evolution of knowledge in society.

The graduate programs of the University face an unprecedented threat. Steep increases in costs and fees of graduate students paid largely by faculty and Departments, coupled with decreasing block grant allocations to campuses and dwindling of research grants are forcing a steady reduction in graduate students admissions throughout all disciplines, especially the Arts and Humanities. The impact of a decrease in graduate students will undoubtedly take its toll on many educational aspects of our research university including faculty research productivity, student morale, contributions to society and workforce. The Coordinating Committee for Graduate Affairs (CCGA), which includes Senate faculty experts in graduate education from all campuses calls for a greater support to the University's research mission, which is carried at its core by graduate students. We ask that the Regents, the President and Chancellors work together to halt the increases in fees to graduate students, because they negatively impact on the University's mission and our research faculty. In an effort to attract graduate student funds from outside the University, we encourage the Regents and the President to campaign for the extension of Cal Grants to graduate academic students involved in research activities.

Currently, Cal Grants, which are funded by the State of California, are intended only for undergraduate students and therefore broadening them to graduate students would empower graduate education in the State and encourage undergraduates to advance their knowledge and contributions to society.

Undoubtedly, past UC research contributions to society have enriched the world and made it a better place to live in. It would be a great loss if we imperil the critical component of the University's research. A modest listing of the most salient accomplishments that faculty, students and researchers have generated over the years is attached to this letter and highlights the type of work that UC has been known for since its founding. The continued success of the tight and productive relationship between faculty and graduate students is currently at risk and may lead to an interruption in the steady contributions that UC has provided to the state, the country and the world. A call to maintain the affordability of graduate education at all fronts is a necessity that cannot be jeopardized ignored or continuously deferred. We trust that our leaders will heed our concerns and act accordingly to protect and lead graduate education.

The Coordinating Committee for Graduate Affairs (CCGA)

Farid Chehab, Ph.D., Chair (UCSF)
James Carmody, Ph.D., Vice-Chair (UCSD)
Ira Tager, M.D., M.P.H. (UCB)
Rachael Goodhue, Ph.D. (UCD)
Fred Wan, Ph.D. (UCI)
Steven Nelson, Ph.D. (UCLA)
Chris Kello, Ph.D. (UCM)
Morris Maduro, Ph.D. (UCR)
John Sutton, Ph.D. (UCSB)
Sue Carter, Ph.D. (UCSC)
John Hildebrand, Ph.D. (UCSD)
Michael Beattie, Ph.D. (UCSF)

APPENDIX

A Selected List of UC Successes with Impact on our Society:

UCB

- First Linguistics Dept. in the Western World (1901).
- In 1950's, as part of a drive to conserve Native American languages conducted a survey of all such language in CA and to help reconstruct the pre-history of CA
- New Berkeley Diversity Research Initiative that focuses on social issues in multi-cultural societies;
- New public-private partnership to apply information technology to practical social challenges from energy conservation to education and health care
- UC Berkeley/Lawrence Berkeley Lab. \$625 million funding to develop carbon-neutral bioenergy, fuels to address nation's energy need and challenges of global warming.
- 1970—founded Physically Disabled Students Program to provide comprehensive services to provide people with disabilities services, which led to the founding of the Center for Independent Living, a first of its kind self-help program
- 1914-1920—Professors Joseph Grinnell and Tracy Story conduct landmark survey of Sierra Nevada wildlife
- 1922—Professors H.M. Evans and K.S. Bishop discover Vitamin E
- 1930's—Professor Wm Gruess invents the fruit cocktail
- 1930's —Professor J. Neyman becomes one of the founders of modern statistical theory
- 1931—E.O. Lawrence designs the first cyclotron—one practical consequence is production of isotopes for medical use
- 1937—J. Lawrence becomes father of modern nuclear medicine
- 1947-1955—Professor John Goffman and grad students discover and classify various lipoprotein classes now know to be important risk factors for cardiovascular diseases.
- 1952—Physicist Hugh Bradner invents the first wetsuit, now a staple for water sports, commercial and military activities.
- 1966-69—Herma Hill Kay of the Boalt Law School co-authors CA no-fault divorce law
- 1971—Donald Glaser establishes the first biotech company-Cetus. 1960 winner of the Nobel Prize for Physics
- 1971-1977—Berkeley electrical engineering creates UNIX; release to public and encourage hackers to improve it, which created the new paradigm we now call Open Source
- 1994—Spousal rape law is brainchild of Berkeley Lecturer Nancy Lemon
- 2003—Bancroft Library publishes online the body of letters of Mark Twain.
- 2000's UCB School of Public Health Infectious Disease Preparedness Center trains California and Nevada emergency, first-responders on how to handle epidemic and possible terrorist attacks with biological agents.
- UCB School of Public Health Faculty contributed to the discovery of the gene responsible for inherited breast cancer; screening is now performed for women at high risk of breast cancer.

UCD

- Kit Batten completed her M.S. in Ecology in 2001 and her Ph.D. in Ecology in 2004. Dr. Batten is the Science Advisor to the Deputy Secretary of the Interior in Washington, D.C. She has served in the office of Sen. Dianne Feinstein (D-CA) where she worked as a legislative assistant on climate change, energy, transportation, and agriculture policy. Dr. Batten also served as an American Association for the Advancement of Science Fellow in the office of Sen. Joseph Lieberman (I-CT) where she worked on a number of environmental and natural resource policy issues. In addition, Dr. Batten worked with Sen. Lieberman to investigate allegations of climate science censorship at several government agencies.
- Cherisse Boland completed her M.S. in Forensic Science in 2007. Ms Boland is a Supervising Criminalist in the San Francisco Police Department. She developed the DNA profile that led to the arrest of "Richard Ramirez, the Los Angeles Area Night Stalker". Based on her analysis, he is now a suspect in a 1984 San Francisco homicide of a nine-year old girl. Ramirez may have been involved in more than 17 murders.
- Tracy Ellen Caldwell completed her Ph.D. in Chemistry in 1997. Dr. Caldwell is an astronaut with the National Aeronautics and Space Administration, based in Houston. She has logged over 305 hours in space having completed her first space flight on STS-118 in 2007, the 119th space shuttle flight, the 22nd flight to the International Space Station (ISS), and the 20th flight for Endeavour. She is scheduled to launch again in April 2010.
- Karen Joy Fowler completed her M.S in Political Science in 1973. Ms Fowler is an award-winning author who has written science fiction, fantasy, and literary fiction. Her short story collection *Black Glass* won the World Fantasy Award. Her debut novel, *Sarah Canary*, won the Commonwealth medal for best first novel by a Californian. Her best-known book is *The Jane Austen Book Club*, which spent thirteen weeks on the New York Times bestsellers list.
- Martha Guzman-Aceves completed her M.S. in Agricultural and Resource Economics in 2002. Ms Aceves is a legislative advocate for the California Rural Legal Assistance Foundation. She advocates on a range of issues regarding the quality of rural life, including environmental justice, farm worker health and safety, and safe drinking water in rural areas. She is the Foundation's Director for its Sustainable Communities Project.
- Michael Hogan completed his M.S. in Soil Science in 2003. Mr. Hogan is the founder of Integrated Environmental Restoration Services. The company's objective is to integrate research and application techniques for disturbed site restorations in the Lake Tahoe region. Mr. Hogan's work has led to improved erosion control and habitat restoration. His company disseminates its knowledge to others interested in site restoration through publications, training sessions, and other means.
- Davor Hrovat completed his Ph.D. in Mechanical and Aeronautical Engineering in 1979. Dr. Hrovat works at Ford Motor Co. in the company's most prestigious technical expert position, Henry Ford Technical Fellow. He is a recognized world leader in the field of automotive system dynamics and is particularly strong in the fields of dynamical physical systems, automatic control and optimization. Dr. Hrovat developed some of the industry's first transmission shift control models and closed loop algorithms, which are still in use. He made key contributions to the design of advanced semi-active and active suspensions and vehicle stability control systems.
- Gurdev Khush completed his Ph.D. in Genetics in 1960. Dr. Khush is perhaps best known for his work at the International Rice Research Institute (IRRI) where he is

considered to be the father of the Green Revolution in South Asia through the development of more than 300 rice varieties. These rice varieties are collectively credited with keeping food production in Asia one step ahead of population growth. Today, high yielding rice varieties with disease and insect resistance and excellent grain quality developed by Khush and his team at IRRI are grown on over 50% of the world's rice acreage and the productivity increases attributed to these varieties are estimated to feed 1 billion people globally. Presently Dr. Khush is sharing his knowledge with current UC Davis graduate students as an adjunct professor.

- Nadine Naber completed her Ph.D. in Anthropology in 2002. Dr. Nadar is currently an assistant professor at the University of Michigan. A leading public intellectual on issues of Arab and Muslim Americans and race/religion, she is one of the most highly regarded young scholars of Arab American studies and the study of the intersections of race /ethnicity / gender / sexuality / religion in the US. Dr. Nadar is co-founder of the Arab Women's Solidarity Association, North America (cyber AWSA); Arab Movement of Women arising for Justice (AMWAJ) and Arab Women's Activist Network (AWAN).
- Peter Phillips completed his Ph.D. in Sociology in 1994. Dr. Phillips is Professor of Sociology at Sonoma State University, where he teaches courses on censorship, the sociology of the media, power, investigative sociology, and related topics. Over and above his accomplished career in teaching, Professor Phillips has brought focus and accountability to the mass media by spearheading the organization Media Freedom International, which on a yearly basis publishes *Project Censored*, a listing of the most significant underreported news stories of the previous year, such as whether or not elections in Afghanistan were rigged, and on sex trafficking in Paraguay.
- Pasquale Steduto completed his M.S. in Hydrologic Science in 1990 and his Ph.D. in Hydrologic Science in 1990. Dr. Steduto is the Chief of the Water Resources, Development and Management Service of the Land and Water Development Division of the Agricultural Department in the Food and Agricultural Organization in Rome. His research and policy program focuses on improving agricultural water management in order to increase efficiency and productivity through sustainable water use. During his recent years at FAO, Dr. Steduto has established a network of scientists and a working core group to develop a new crop model (named AquaCrop) that has been requested by thousands of users for use in the formation of national and regional water policies. He is heading the United Nations multi-organization water initiative, UN-Water.
- Jeffrey R. Unruh received his Ph.D. in Geology in 1990. Dr. Unruh is Vice President and Senior Principal Geologist, Fugro, William Lettis & Associates, Walnut Creek, CA. He has made significant contributions to the study of faults and seismic risk in Northern California, including the identification and characterization of blind (concealed) thrust fault between Mt. Diablo and its inclusion in the USGS seismic hazard model for the Bay Area and analysis of active faults and seismic risk in the Sacramento-San Joaquin Delta.

UCI

- Ian Lipkin identified the encephalitis sweeping the US in 2000 as West Nile Virus and found that the drug ribivirin can treat it.
- F. Sherwood Rowland's discovery that CFC's damage the ozone layer leading to the award of his 1995 Nobel Prize in Chemistry
- Frederick Reines' discovery of neutrinos leading to the award of his Nobel Prize in Physics in 1995
- Fan Gang Zeng invented the first frequency modulated Cochlear implant to improve hearing aids.

- Gary Lynch invented compounds called ampakines that reverse of age-associated memory problems seen in Alzheimer's disease.
- Hans Keirstead's stem cell therapy first to receive FDA approval for testing in humans
- Joyce Keyak invented first radioactive bone cement for cancer treatment.
- Roger Steinert invented the first laser corneal transplant procedure.
- Earth Systems Science faculty members shared in Nobel Peace Prize for IPCC climate conclusions
- George Baerveldt invented industry-standard eye implants – the Baerveldt shunts – that improve vision for glaucoma patients.
- Eva Lee finding that abortion pill compound prevents breast tumor growth
- Jay Famiglietti quantified groundwater loss in India, Central California

UCLA

- Judy Chicago (MFA, Art, 1964) became one of a handful of artists who created the Feminist Art Program at the California Institute of Art. This program, along with Chicago's famous 1974-79 work *The Dinner Party*, irrevocably changed the course of late 20th- and 21st century art in the US and beyond.
- Francis Ford Coppola (MFA, Directing, 1967) has directed, produced and/or written dozens of films, which include American classics *Patton*, *The Godfather Trilogy*, *Apocalypse Now* and *The Conversation*. These films have earned for Coppola fourteen Academy Award nominations and five Oscar awards, cementing his place as one of the most influential American directors of the past half-century.
- Julie Dash (MFA, Motion Picture and Television Production, 1985) is best known for her 1991 film *Daughters of the Dust*, which stands as the first feature-length film made by an African American woman, and it enjoyed both critical acclaim and box office success. Collectively, Dash's films explode stereotypes of black women. Most recently, *Daughters of the Dust* was placed by the Library of Congress with a select group of American films that are regarded as National Treasures.
- Mike Davis (MA, History), Distinguished Professor of Creative Writing at the University of California, Riverside, has written more than 20 books and 100 essays and book chapters in the academic and popular press. Exploring urbanism, the built environment, economic history and social movements, Davis's work is exemplary in its ability to expand and change historical writing, and, by extension, change the way readers understand the workings of the world. His best-known book, entitled *City of Quartz: Excavating the Future in Los Angeles*, published in 1990, won the Issac Deutscher Award from the London School of Economics and the award for Best Book in Urban Politics from the American Political Science Association. Davis is also the 1998 recipient of a MacArthur Fellowship (commonly known as the "Genius Grant").
- Brian Min, current graduate student, Political Science, is part of a team led by UCLA Professor of Sociology Andeas Wimmer that challenges the popular wisdom that ethnic diversity is the root cause of conflicts in various parts of the world.
- Elinor Ostrom (Ph.D., Economics, 1965), Arthur F. Bentley Professor of Political Science in the College of Arts and Sciences at Indiana University in Bloomington, received the 2009 Nobel Prize in Economics for her groundbreaking work that challenges traditional market-based views of Economics. She is the third UCLA Ph.D. to earn such a prestigious honor.
- Kay Ryan (MA, English, 1968), whose poems are renowned for their odd subjects and surprising humor, was named the 16th poet laureate of the US in 2008.

- Vinton G. Serf (Ph.D., Computer Science, 1972), Vice President of Google, is widely known as one of the fathers of the Internet. Together with Robert Kahn, Serf, while still a UCLA graduate student, co-designed the basic architecture of the Internet and the first TCP/IP Protocols. He has received both Turing Award and Presidential Medal of Freedom.
- Charles E. Young, (Ph.D., Political Science, 1960), currently Chief Financial Officer of the Los Angeles Museum of Contemporary Art (MoCA), was UCLA Chancellor from 1968 to 1997. During this time, UCLA became one of the nation's top-ranked universities. Under his leadership, UCLA created four Ethnic Studies Centers that 40 years later serve as cornerstones of their various disciplines in the academy. Other accomplishments include: pushing for reforms in intercollegiate athletics, establishing a partnership with the Los Angeles area that emphasizes the key role of the university in community development and service, and championing K-12 education in the city. At MoCA, Young has been responsible for bringing the institution back from the brink of financial disaster.

UCM

- Professor Roland Winston, Director of the California Advanced Solar Technologies Institute (an MRPI), has developed new solar energy technologies (e.g. patented solar concentrators), and is a recent recipient of the A.E. Conrady Award.
- Professor Roger Bales, Director of the Sierra Nevada Research Institute, has advanced methods for hydrologic forecasting based on measures of the Sierra snow pack.
- Professor Thomas Harmon has developed distributed sensor networks for gathering information about nitrates in water and soil, which is useful for environmental management.
- Professor Maurizio Forte has employed virtual environment technologies to recreate and thereby preserve past cultures and environments.

UCR

- September, 2009 – UCR PhD student Hongwei Yuan finds connection between second-hand cigarette smoke and liver disease.
- August, 2008 – UCR PhD student Allison Hansen discovers and names a bacterium linked to Psyllid Yellows, a tomato and potato plant disease.
- December, 2008 – UCR PhD student Sabrina Lin finds that harm-reduction cigarettes are more toxic than traditional cigarettes based on effects on mouse embryonic stem cells.
- August, 2005 – UCR PhD student Vincent Lavallo synthesizes molecules that can accelerate chemical reactions used to manufacture drugs. The new molecules could help make stable catalysts that work at room temperature.
- June, 2008 - UCR PhD student Yan Li discovers new technique for controlling electron spin and current flow, which could lead to development of faster computers.
- Baird King (Earth Sciences; works with Martin Kennedy) is studying an area of the Eastern Sierra Nevada mountains consisting of glacial landforms which may represent recent and poorly understood climate fluctuations. He started the "Climate Change Action Club" at UCR to educate the public about effects the human lifestyle has on Earth's climate system, as well as the inevitability and extent of natural changes for which the global community needs to prepare.

- Chongze Ma (Cell Biology and Neuroscience; works with Manuela Martins-Green) helped make a discovery about treating cornea healing. Ma found a combination of FDA-approved drugs that reverse the inhibition of healing that cigarette smoke induces. This kind of treatment can actually be immediately translatable to patients.
- Leslie Martin (Ph.D. 1996) and Kelly Haskard Zolnierok (M.A. 2004, Ph.D. 2007), health psychology and doctor-patient communication. Martin, Haskard Zolnierok and Distinguished Professor of Psychology Robin DiMatteo co-wrote a book just published by Oxford University Press, "Health Behavior Change and Treatment Adherence," which is a guide for health practitioners to develop strategies to help their patients put long-term, health-relevant behavioral changes into practice.
- Susan Hall, a current grad student in history, who worked for the National Park Service last summer under a Sally Kress Tompkins Fellowship, which is a joint program of the Society of Architectural Historians (SAH) and the Historic American Buildings Survey (HABS). She spent 12 weeks conducting research, documenting, and writing about War Department-era structures at Antietam National Battlefield in Sharpsburg, Maryland, where one of the most pivotal battles of the Civil War took place. Her work enters the permanent HABS collection, a federal repository managed by the NPS.
- Jeff McLaughlin, a Ph.D. candidate in political science, studies state mandate implementation at the local level with an emphasis on land use and housing policy. He also is a project director at UCR's Blakely Center for Sustainable Suburban Development. A paper the center published last year found that ecological attitudes may be more important than urban design with respect to modifying individuals' behavior to protect and/or preserve the natural environment.
- Neal Tognazzini, Ph.D. in philosophy in 2009, now an assistant professor of philosophy at the College of William and Mary, has published approximately 10 papers in leading academic journals, including *Philosophy and Public Affairs*, *Philosophical Quarterly*, *Journal of Ethics*, *Nous*, and *Philosophy and Phenomenological Research*. Also, he has won two fellowships from Mellon/ACLS, a dissertation year fellowship and now an additional fellowship to work on a book on the philosopher, Harry Frankfurt. He focuses on moral responsibility, certainly something the folks on Wall Street and in Sacramento should be thinking about.

UCSB

- UC Santa Barbara ranks among higher-education leaders in the United States and Canada as one of only 62 research-intensive institutions elected to membership in the prestigious Association of American Universities.
- UCSB's renowned faculty includes five winners of Nobel Prizes for landmark research in chemistry, physics, and economics, and scores of elected members of national and international academies and societies.
- In 2008, UC Santa Barbara Chemistry Professor Galen Stucky received the Department of Defense's Advanced Technology Applications for Combat Casualty Care Award for his role in the development of a blood-clotting gauze that is helping save soldiers who suffer severe, life-threatening injuries in Iraq and Afghanistan.
- UCSB is leading the MacArthur Foundation's \$10-million national program on the law and neuroscience, the first systematic effort to bridge the fields of law and neuroscience in considering how courts should deal with new brain-scanning techniques as they apply to matters of law.

- Scientists at UCSB have made a major discovery in how the brain encodes memories. The finding, published in the journal *Neuron*, could eventually lead to the development of new drugs to aid memory. The team of scientists is the first to uncover a central process in encoding memories that occurs at the level of the synapse, where neurons connect with each other.
- The invention and development of revolutionary new light sources by UC Santa Barbara Professor Shuji Nakamura. He invented the blue, green, and white light-emitting diodes and the blue laser diode. *Forbes* magazine described him as the successor to Thomas Edison. In recognition of his accomplishments, Nakamura was awarded the 2006 Millennium Technology Prize (worth one million euro, or about \$1.4 million US).
- A real-time sensor for detecting cocaine — made with inexpensive, off-the-shelf electronics — has been developed by a team of researchers at UC Santa Barbara. Two local high school students and a Nobel laureate, Alan Heeger, participated in the discovery. The potential applications of the sensor are far-reaching and include bioterrorism detection and important medical uses. Heeger and the students coauthored a paper on their research that appeared in the *Journal of the American Chemical Society*.
- UCSB marine scientists played a key role in developing Ocean in Google Earth, which enables users to dive beneath the sea in Marine Protected Areas worldwide: earth.google.com/ocean/.
- A new interdisciplinary Institute for Energy Efficiency established by the College of Engineering is bringing together 50 campus researchers with related expertise to develop new energy-saving technologies.
- UCSB has joined forces with research institutions across Southern California to advance stem cell research by establishing the Southern California Stem Cell Scientific Collaboration. Other members are the University of Southern California, Childrens Hospital Los Angeles, City of Hope, the California Institute of Technology, and the House Ear Institute.
- The campus is home to the California NanoSystems Institute, one of the first California Institutes for Science and Innovation. A research partnership with UCLA, the institute is on its way to creating revolutionary new materials, devices, and systems that will enhance virtually every aspect of our lives.
- The UCSB Libraries have opened up the world of historic sound recordings by mounting thousands of digitized cylinder recordings on an immensely popular new Web site: <http://cylinders.library.ucsb.edu>.

UCSC

- In a survey of U.S. engineering schools reported in *ASEE Prism*, UCSC ranked 3rd in the nation in the percentage of master's degrees awarded to women (44.2 percent).
- In 1994, UCSC became the first UC campus to offer a doctoral program in environmental studies, and in 2005, the first UC campus to offer a Ph.D. in music composition.
- New Ph.D. programs in film and digital media, in visual studies, and in technology and information management are admitting students for fall 2010.
- In 2008, four graduate students in engineering took first place in a national student robotics competition for their design of a solar-powered robot climber, demonstrating a concept essential to a "space elevator" that would transport material into space.
- In 2008, graduate student Tadashi Nakamura's documentary *Pilgrimage* was screened during the Sundance Film Festival, one of only 83 short films selected out of 5,107

submissions from around the world.

- A teacher and award-winning composer, Young-Shin Choi was attracted to the doctorate of musical arts program in music composition at UC Santa Cruz, where he studies computer-assisted composition, because of the collaborative nature of the program, generous financial package, and what he calls “perfect California weather.” Choi prepared extensively to enter the doctorate of musical arts program. Having earned a Master of Arts degree in music composition from Kyungpook National University in Korea, he then earned a second master of arts in the same field from San Diego State University in order to further develop his English skills before entering a U.S. doctoral program. In his compositions, Choi is working on developing an original musical sound combining traditional Korean music and Western idioms. He has received numerous awards for his music, including the Daejeon Contemporary Music Festival prize. Choi currently sits on the board of the New West Electro-Acoustic Music Organization, which organizes a prestigious international annual music festival.
- The 2008-09 Cowell College Puknat fellow, Michael Ursell (Literature), taught two independent courses for the college in addition to the fall core course. Michael's research investigates the relations between history of the book and the history of medicine. In 16th- and 17th-century Europe, printed books were beginning to circulate in unprecedented numbers, thanks to the spread of new printing technologies. The printed book as technological advancement coincided historically with new knowledge in a number of scientific fields, including human anatomy, physiology, cartography, and optics. Michael studies the ways in which new conceptions of the human body---of the workings of the heart, the lungs, the skeleton, and the skin---seeped into poetic thinking about love, inspiration, and the ‘life’ of books and led poets to write about books themselves as living bodies. Michael taught one of his Puknat seminars on the heart, from the perspectives of literary, artistic, medical, and popular culture from the ancients to today. For his other seminar, Michael turned to the consistent theme of friendship in lyric poetry across the ages to offer a seminar that picked up on the Cowell College motto (“The Pursuit of Truth in the Company of Friends”). That course was on friendship, from Plato, Aristotle, and Cicero to Facebook.
- In 1982, the total population of California condors was just 22 birds. Four years later, as the wild population continued to plummet, biologists decided to capture the remaining wild condors and breed them in captivity. Now, 140 captive-bred California condors are flying free in California, Arizona, and Baja California. Conservationists have long believed that the problem results from the use of lead ammunition by hunters. Condors feed on carrion and can ingest fragments of lead bullets from animal carcasses and gut piles left behind by hunters. Past efforts to ban lead ammunition in California have been stymied by opposition from hunting groups. But as a direct result of a scientific study led by UCSC graduate student Molly Church, the California Department of Fish and Game recommended a ban on the use of lead bullets throughout the range of the California condor. Church, who earned a master’s degree in environmental toxicology in 2004 and is now at the University of Pennsylvania’s School of Veterinary Medicine, was able to match the lead in blood samples from condors to the lead in ammunition obtained from a variety of sources throughout central California. She used a proven “fingerprinting” technique based on the unique isotope ratios found in different sources of lead. Donald Smith, professor and chair of environmental toxicology, was Church’s adviser and a coauthor of the scientific paper reporting her findings. “Had it not been for the outstanding science in Molly’s paper, the professional lobbyists for hunter- advocacy groups testifying in opposition to the bill would have gone unchallenged,” Smith says.

UCSD

- UCSD Libraries was the first academic library in Southern California to partner with Google on its global digitization project.
- UCSD Arts Library was the first academic library in the U.S. to digitize an entire slide collection for a now-global image collection known as ARTstor.
- UCSD's International Relations & Pacific Studies Library, which has the best collection of Chinese underground and independent films in the world, held the first international Asian film festival ever to include Chinese underground films and films from both North and South Korea.
- Scripps Institution of Oceanography Library is both the largest, and one of the first oceanography libraries in the world to be established.
- UCSD's Mandeville Special Collections Library's Archive for New Poetry is widely recognized as one of the first libraries in the nation to amass a premier collection of American poetry, documenting alternative and experimental approaches to writing in the post-WWII era.
- Scripps Institution of Oceanography developed the first American curriculum in oceanography (1938). Scripps Institution of Oceanography scientists Harald Sverdrup, Martin Johnson, and Richard Fleming wrote "The Oceans" (1942), which introduced Americans, who were ignorant of it, to the field of dynamic oceanography, invented in Europe, and help to jumpstart the growth of oceanography in America—a field that we would come to dominant after WW II.
- In 1952, Scripps Institution of Oceanography developed the California Cooperative Oceanic Fisheries Investigation (CalCOFI) program, the first long-term, complete data set of a marine ecosystem and the foremost observational oceanography program in the United States. A partnership of Scripps Oceanography, the California Department of Fish and Game, and the National Marine Fisheries Service, CalCOFI was originally formed in response to the 1949 collapse of the California sardine fishery, then the world's largest fishery. Today its focus has shifted to the study of the California coastal marine environment and management of its living resources.
- A Scripps Institution of Oceanography scientist was the first to confirm the buildup of carbon dioxide in the atmosphere. Charles David Keeling's precise measurements, started in 1958, produced a data set now known widely as the "Keeling Curve" that has become a benchmark of global warming studies. The Weather Channel recognized this "discovery of global warming" as history's Biggest Weather Moment.
- SIO's Climate Research Group, established the nation's first experimental climate forecast center. Among the first to recognize the influence of Pacific Ocean surface temperature on the atmosphere & weather over North America. Prediction of a warm winter at the time of the Arab oil embargo encouraged the government to forego gasoline rationing.
- The Deep Sea Drilling Project established that the oceanic crust is geologically younger than most continental rocks. Using the specially commissioned & outfitted *Glomar Challenger* research vessel, DSDP confirmed that the sea floor is moving and spreading. Information gained helps in finding oil, gas and other mineral deposits.
- SIO scientists made important contributions to the theory of plate tectonics. Measurements of high heat flow on the sea floor indicated areas of deep convection. Measurement of magnetic fields revealed the fracture zones & offsets in the NE Pacific. This information contributed to understanding the history of the sea floor.
- SIO scientists have shown that unique plants & animals in the ocean can therapeutically affect some cancers and viral and inflammatory diseases. Several drugs are in clinical trials. This is particularly important as other drug sources decline and diseases become resistant to known drugs.

- Scripps researchers have been studying the long-term effects of sewage outfalls on the southern California coastal environment. Studies of the San Diego sewage outfall show water quality has not been degraded despite a 70 percent increase in sewage discharge. As a result of this research, the Environmental Protection Agency has approved San Diego's use of advanced primary treatment, saving taxpayers billions of dollars. SIO scientists contributed to public awareness of the data and its implications for improvements to San Diego sewage treatment facilities.
- SIO researchers authored *The Health of the Oceans* (UNESCO, 1976), the definitive statement at that time on marine pollution, and implemented the Mussel Watch program, a non-invasive way to measure ocean pollution, in 1975. Under the sponsorship of the EPA, scientists from five universities periodically analyzed the quantity and concentration of pollutants accumulated by filter feeding mollusks from more than 100 stations along U.S. coasts. The program is now worldwide.
- 1999: The Preuss School -- admits first students. The Preuss School, whose mission is to take students from low-income families and prepare them for top-level universities, was the first public charter school in California to be established on a college campus.
- UCSD researchers initiated in 2001 the first human trial of gene therapy for Alzheimer's disease.
- Researchers at the UCSD School of Medicine and Children's Hospital and Health Center were the first to identify the neurobiological early-warning signs of autism during a child's first year of life, a finding that offers the potential for earlier diagnosis, intervention and improved clinical outcomes for autistic children.
- UC San Diego Medical Center pioneered a lifesaving procedure to remove blood clots from the pulmonary arteries, physicians around the country and worldwide refer patients to the medical center for the treatment.
- In 2005, the Jacobs School Department of Structural Engineering opened the world's first full-scale outdoor shake table, able to handle structures weighing 2,200 tons and as tall as 100 feet. The shake table, which is able to create realistic simulations of the most devastating earthquakes on record, is being used to verify advances in seismic safety designs for buildings and bridges.
- UC San Diego structural engineers have pioneered a wide range of retrofit and design strategies to improve earthquake safety of bridges. These innovations have been adopted as standards by the California Department of Transportation (Caltrans) and continue to influence bridge and structure design across the United States and around the world.
- UC San Diego electrical engineering professors played a crucial pioneering role in the development of direct sequence spread spectrum communications—the wireless communications technology which evolved into CDMA (Code Division Multiple Access), the current world standard for 3rd generation wireless communications.
- UC San Diego computer science faculty and students invented UCSD Pascal, a computer programming language and operating system developed in the 1970s and early 1980s. UCSD Pascal made microprocessors accessible to the masses and helped pave the way for the PC revolution.
- The Jacobs School Department of Structural Engineering's bomb blast simulator – the first of its kind in the world – is being used to better understand how bomb blasts impact critical infrastructure, and to test new technologies for protecting buildings and bridges against terrorist bomb attacks.
- UC San Diego computer science researchers developed the first automated method for automatically identifying worm and virus attacks across the Internet and other high-speed networks almost as soon as outbreaks occur. Cisco acquired the technology.

- UC San Diego mechanical engineering faculty developed the first therapeutic hypothermia treatment system, technology that is crucial in the treatment of people suffering from stroke or heart attack.
- UC San Diego mechanical engineers are the first in the U.S. to use lasers for ground measurements of water loss due to evaporation from the land and transpiration from plants. Such work could lead to water savings through better irrigation.
- UC San Diego electrical engineers were the first to create a silicon-on-sapphire semiconductor technology that has yielded cell phones with longer battery lives and smaller price tags.
- UC San Diego computer scientists developed the first “network telescope”— now a widely used technique that allows the measurement of large-scale network attacks such as Internet worms and distributed denial-of-service attacks.
- UC San Diego computer scientists invented the first asymmetric processors – a chip technology that can provide huge gains in energy efficiency and performance. Industry is in the process adopting the technology.
- Analyzing measurements from a space satellite, UC San Diego astrophysicists generated the first compelling evidence that black holes exist.
- The first clinical trials certification program was designed in 1998 in partnership with leaders in the pharmaceutical and biomedical research industry, the UC San Diego Extension clinical trials certificate programs continue to provide leading-edge practical education, preparing a highly trained and globally competitive workforce for the local, national, and international biotech communities.
- The National Science Foundation designated SDSC one of the first four national supercomputer centers in the United States along with centers at the University of Illinois, Cornell and Princeton.
- SDSC was the first academic supercomputer center in the United States to hit the once unimaginable computational speed of 1 trillion calculations per second, or 1 “teraflops.”
- SDSC was the first academic supercomputer center to build a digital data center 1,500 times the digital text equivalent of the Library of Congress, or 36 petabytes.
- Calit2 engineers in 2008 were the first to achieve more than 58 percent efficiency for the power amplifier of a 3G wireless base station, roughly five times the efficiency of cell-phone base station amplifiers just three years before.
- Calit2 launched the first annual conference series in the emerging field of metagenomics, and with the J. Craig Venter Institute has developed the largest public genomic data repository in the world to house DNA sequences and metadata related to ocean-dwelling microbial organisms and their ecosystems.
- In 2005 Calit2 rolled out the first free, public traffic-information phone service offering customized commuting tools for drivers on San Diego roadways. The California Wireless Traffic Report service has since expanded to Orange County, Los Angeles, and the Bay Area.
- Calit2 computer scientists were the first to develop a very fast and relatively low-cost computational tool to infer the variations between individuals' DNA at the level of each chromosome – so called haplotypes – to understand the structure of human genetic variation.
- Calit2 built the first display system to exceed 250 million pixels of screen resolution and the so-called HIPerSpace wall at UC San Diego was the highest resolution display system in the world.
- Calit2 built the first fully immersive, 3D and 360-degree virtual reality experience that allows groups of scientists to venture into worlds as small as nanoparticles and as big as the cosmos.

- Scientists at UCSD, partnering with the J. Craig Venter Institute, developed the first cyberinfrastructure customized to decipher the genetic code of marine microbes, thanks to a \$24.5 million grant from the Gordon and Betty Moore Foundation—previously, researchers had trouble finding computer servers that could handle all that data.

UCSF

- UCSF is one of the premier health centers in the world, and has developed health care technologies and innovations that have saved and improved countless. “Advancing health worldwide” is the UCSF mission.
- The birth of the biotechnology industry worldwide and in California can be traced to the discoveries and application of recombinant DNA by Hebert Boyer (UCSF) and Stanley Cohen (Stanford). Boyer founded in 1976, the pioneering biotech company, Genentech, which spawned a biotech industry that currently encompasses in California over 2,700 companies employing 258,000 Californians. In 2006, these companies generated \$72.8 billion in revenues.
- In 1975, UCSF geneticist and hematologist, Y.W. Kan discovered that alpha thalassemia, an inherited blood disease, was caused by the absence of the gene for alpha globin, a major component of hemoglobin. It was the first time the deletion of a gene was identified as causing human disease. Kan applied this discovery to the development of a DNA test that was used successfully in 1976 to diagnose alpha thalassemia in an unborn fetus. This innovation heralded the beginning of DNA testing for human diseases in adult and prenatal diagnosis. Later in 1979, Kan also discovered that DNA polymorphisms could be linked to human disease. This finding led to the mapping and eventually the sequencing of the Human Genome.
- UCSF physician/scientists spearheaded by Jay Levy, were the first to identify the AIDS virus in 1983 leading to rapid diagnosis and therapeutic strategies. As a result, AIDS patients now live long and productive lives, and UCSF physicians continue to provide new treatments and public health approaches.
- In 1982, UCSF pediatric immunologist Arthur Ammann warns the Centers for Disease Control that tainted blood can transmit AIDS. Nine months later, the blood bank at Stanford School of Medicine becomes the first to screen blood to prevent AIDS transmission.
- UCSF scientists Michael Bishop and Harold Varmus were the first to discover the role of retroviral ‘oncogenes’ that produce susceptibility to many types of cancer, leading to further discoveries that have led the way to novel cancer therapies. They received the Nobel Prize in Physiology or Medicine in 1989. Dr. Varmus now co-chairs President Obama’s Council of Advisors on Science and Technology.
- Dr. Stanley Prusiner (Nobel Prize, 1997) discovered a totally unknown form of disease transmission by ‘prions’ that accounts for the spread of devastating brain disorders including ‘mad cow’ disease. This work is leading to critical new understandings and treatments for neurological diseases.
- Continuing a tradition, basic scientist Elizabeth Blackburn was awarded the Nobel Prize in Physiology or Medicine in 2009 for her discovery of ‘telomerases’, enzymes that trim chromosomes as cells replicate, and which are a key to the aging process. Notably, the prize was given for work performed with her graduate student, Carol Greider, reminding

us that UC graduate education is key to discovery and economic and social development.

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