Recommendations of the Research Strategies Working Group
to the UC Commission on the Future

June 11, 2010

Following are the second round of recommendations from the Research Strategies Working Group. Some of these recommendations represent expansions of concepts presented in the first round of recommendations, while others are new recommendations. After we receive comments on the first round of recommendations submitted in March, we plan to combine related recommendations from our March and June submissions into a final report noting our priority ranking of recommendations in four areas: Revenue Enhancement; Advocacy; Administrative Efficiencies and Cost Savings; and Research Quality Enhancement.

RECOMMENDATIONS RELATED TO REVENUE ENHANCEMENT

Sponsored Internships, Fellowships, and Teaching Engagements

Recommendation 1: Collaborate with foundations, businesses, industries and the National labs to provide internships and fellowships for undergraduate and graduate students, and opportunities for industry leaders to work with UC students, providing new sources of student support and reducing the overall cost of education.

Rationale:

- Most UC students find careers in the private or non-profit sector using their training in engineering, science, the professions, the arts and humanities. There is an enormous potential to find support for our students through enhanced use of internships, fellowships, and exposure to their future mentors outside the university through cooperation with the private sector.

- Internships that provide students with work for outside organizations during their undergraduate or graduate careers could reimburse a large fraction of their educational costs. Additional benefits to students include exposure to career options outside of academe, experiences that clarify career goals, and additional career development opportunities. The University would benefit through receipt of funds from these outside organizations to fund and facilitate the internship program, while the outside organizations would benefit through recruitment and training opportunities for potential future employees.

- Similarly, researchers at the national laboratories and other organizations would welcome the opportunity to become regular members of the UC community as visiting professors. Those whose jobs at their parent organizations would benefit from the UC connection can establish regular contact with students through teaching, reducing the overall student/faculty ratio without increasing the university’s costs.
**Challenges:**

- Many companies and foundations are experiencing significant fiscal constraints. The challenge will be to identify strong partners with a committed interest in University engagement and resources for supporting internships.

**Impact on Access / Fiscal Implications:**

- If 20% of UC students receive internships at 50% time for one year, it would generate at least another billion dollars of student support, equal to the benefit of UC’s scholarship drive.

- The engagement of researchers from the national laboratories and other organizations through visiting professorships would reduce the overall student/faculty ratio without increasing the University’s costs.

**Impact on Quality:**

- The quality of a UC education is greatly enhanced by research internships and fellowships that can provide valuable work experience, professional mentorship, and exposure to potential career paths and opportunities outside academic environments.

- Through visiting professorships, researchers from the national laboratories and other organizations can help reduce student/faculty ratios, bring “real-world” experience and professional mentorship to our students and greatly enhance our relationships with these laboratories and organizations, benefiting students and faculty alike.

**Next Steps for Implementation:**

- Examine existing internship programs within UC, including the “Graduate Student Internships for Career Exploration” (GSICE) program at UCSF, established internship programs in engineering, and those established with government, foundations, community service organizations, and policy-making agencies.

- The University of California should reach out to foundations, businesses, industries and the national laboratories to develop systemwide opportunities for internships and fellowships, and visiting professorship engagements.
RECOMMENDATIONS RELATED TO ADVOCACY

UC Research Mission Statement

Recommendation 2: UC should adopt the following as a systemwide research mission statement:

Research is central in the University of California's mission to benefit California and society globally as we discover, interpret, apply and communicate new knowledge and innovations that ensure the quality education we provide our students, inspiring them to be leaders and contributors to the public good.

- **Research**: The California Master Plan for Higher Education designates UC as "the state's primary academic research institution," charged with providing the highest quality both in research and in undergraduate, graduate and professional education.

- **Discover**: UC researchers discover new basic and applied science, technological, social, and cultural knowledge that benefits California and the world.

- **Interpret**: UC researchers make new discoveries while also preserving and re-exploring historical and cultural knowledge.

- **Apply**: The work of UC researchers inspires new ways of thinking, solutions and innovations that catalyze the industries, economy, society, and culture of California.

- **Communicate**: As both researchers and educators, UC faculty are committed to conveying new knowledge, discoveries and innovations to our students, stakeholders, policy makers and the public.

- **Educate**: UC researchers give students unique access to the newest and best research that prepares them to be life-long learners, leaders and contributors to society. At UC, research and teaching are part of a single act of exploring and communicating knowledge.

Short version:

*University of California*

*We discover, interpret, apply, communicate and educate*

**Rationale:**

- *Need for consolidated UC research mission statement*. This recommendation was produced by the Research Strategies Working Group in response to frequent requests for an effective, consolidated UC research mission statement. Existing UCOP, UC campus, and other UC communications and Web pages often contain language about the purpose of UC research, but such language exists in a bewildering variety of formats, at different levels of detail, and in only partial agreement on how to emphasize or contextualize the research mission.

- *Public and internal goals of UC research mission statement*. This recommendation complements the Research Strategies Working Group’s recommendations on
“Advocating for UC Research at a National Level” and “Public Engagement” by strengthening the engagement between the University and its public. Internal to UC, a consolidated research mission statement helps remind us during a difficult season of budgetary retrenchment that it is the high-quality research of our faculty and students that distinguishes the University of California from all other public institutions of higher learning in California.

- Criteria guiding the creation of an effective UC research mission statement:
  - It must be clear and concise so that it can be used broadly and often.
  - It must represent research in the context of the tripartite mission of UC (research, teaching, service).
  - It must emphasize that research is central to the overall mission of the University of California, as well as integral to both educating students and serving society.

**Next Steps for Implementation:**

- Adopt mission statement in current and future UC communications at the systemwide and campus levels.
- Use mission statement in future UC public advocacy and engagement campaigns.
- Illustrate with examples of UC research and its impact from a wide variety of disciplines (our final report will provide a large list of examples that the Research Strategies Working Group has collected by polling UC faculty, administrators, and campus media offices).
Public Engagement

Recommendation 3: Create innovative practices to engage the public with the goals and results of research to strengthen links between the historical service mission of the university and its 21st-century research mission.

Because the contemporary dilemma of research is less what C.P. Snow called the “two cultures” division between the sciences and the humanities than the even wider division between university research and the public, UC should make it a high priority to devise new ways not just to communicate its research to the public, but also to learn from and respond meaningfully to the public throughout the research process. We note that the Office of the President has recently enhanced its public communication strategies, as well as communications with the State. We applaud these efforts and provide the following recommendation to enhance these efforts with regard to research.

Rationale:

- As a public university system, UC has a social-contract obligation to bring the full diversity of science, technology, social, and cultural resources to bear on global problems that also affect California, and for which California is often a pioneer in entrepreneurship, public policy, social experimentation, and cultural innovation.

- Part of the social-contract obligation of UC, descended from its heritage as a public land grant institution, is our dedication to the principle of "linking knowledge with action." This principle values responsiveness to a wide variety of stakeholders, respect for partners, academic neutrality, scientific credibility, usefulness, accessibility, integration, coordination, and resource partnerships (National Research Council, 1996; Kellogg Commission on the Future of State and Land-Grant Universities, 1999; Cash et al 2003).

- Opportunities to link knowledge with action through engagement with the people of California span the full range of UC research activities. An advocacy campaign could draw on extensive examples of UC research with a powerful public impact. Such examples, gathered by the UC Commission on the Future’s Research Strategies Working Group, encompass disciplinary fields across the sciences, humanities, arts, social sciences, and behavioral sciences, as well as every UC campus and UC’s national labs.

- Positioning UC as a 21st-century research institution means reaping the benefit of new media and communication technologies, as well as new methods of participatory and field research, to reinvent the paradigm of “publicity.” Effective public engagement today is a process of give and take, exploiting agile combinations of old and new tools of communication. Exploiting new channels and networks, UC researchers should be able to draw effectively on the knowledge, beliefs, and needs of the public to inform their work; and, reciprocally, the public should be able to learn from UC researchers by engaging directly (e.g., through a distinguished or up-and-coming UC “researcher in the spotlight” appointed on a rotating basis to interact with the public) or indirectly (e.g., by watching the excitement of UC researchers in the field, at the telescope, at sea, in the lab, in the rare book room, working with children, etc.). UC should place itself at the forefront of inventing the new technologies, practices, and institutional arrangements
needed to negotiate between academic “expert knowledge” and the new “networked public knowledge” catalyzed by the Internet.

- Creative implementation of public engagement/advocacy will be especially important if UC follows our recommendation for starting “Grand Challenge” initiatives to bring integrated UC research talent to bear on large-scale, publicly funded projects.

**Challenges:**

- **Maintaining balance.** Research that responds to public priorities is but one element of an appropriate UC research portfolio. Research that directly engages the public must be balanced with other forms of foundational academic inquiry; especially basic research, without which meaningful applied research could not be sustained.

- **Managing boundaries.** Effective institutional safeguards are needed to guide how UC handles conflicting interests and power imbalances among different groups of the “public” with different priorities. The University must enhance existing methods for consulting other institutions, the private sector, and the public at large, protecting academic freedom, preventing conflicts of interest for researchers, ensuring the priority of public interest in any public-private partnership, and drawing a line between policy-relevant research and inappropriate policy advocacy or lobbying.

- **Securing sufficient funding in time to meet heightened public expectations.** Effective public engagement requires real resources (time, attention, and funding) for consultation, interaction, communication, and translation of research results for specific audiences. Even the simple collection and presentation of research examples for public advocacy, for instance, requires the dedication of skilled communication officers working in consultation with researchers. Engagement and advocacy making use of the new media technologies will require even more thoughtful use of resources and talent. Declining funding levels and lack of stable funding for engagement are critical problems. Enhancing engagement efforts raises public expectations; failure to follow through on commitments can do lasting harm to the reputation of UC. In short, UC must commit to some initial, one-time expenses to enhance the new public engagement/advocacy paradigm. Strong public buy-in for the university research mission is the return on that investment. In addition to securing system-wide benefits, UC must also foster efforts by the various campuses to improve their communication with the public through sharing ideas, information, practices, and technologies across campuses.

**Impact on Access:**

- **Increased awareness by underserved groups of UC opportunities.** Engagement with the full range and diversity of people in California will build links to underserved communities and should increase awareness, aspirations, and access by young people from those communities. There are many examples of the power of these interactions between UC researchers and K-12 students in California’s public schools.

**Impact on Quality:**

- **Research.** Research initiatives that are responsive to the public and informed by global trends, incorporating insights from experience in the private sector, policy arenas, and communities in California will enable UC to develop its forward-looking research agenda and tackle complex, contentious issues that are significant both for advancing knowledge and for addressing society’s emerging needs.
• **Education.** Experience, training and capacity building to “bake in” public-engagement awareness and skills in research programs will spill over into UC education programs (much in the manner, for instance, that many UC programs include professionalization courses and workshops, or that UC engineering departments provide entrepreneurship training). Graduate-student training, for instance, can introduce future researchers to the concept that public engagement and advocacy for research must be part of the research mission.

• **Direct and tangible value to society.** Use-inspired basic research undertaken at UC has historic, current, and future roles in shaping prosperity and quality of life in California. Systematic engagement with the public will enhance the salience of UC research for people in California (and elsewhere).

**Fiscal Implications:**

• **Higher visibility of tangible research impacts provides compelling evidence for UC advocacy.** Advocacy for UC as a research university should proceed at multiple levels simultaneously—including top-level advocacy (e.g., UCOP and the Regents to the Legislature), middle-level advocacy (e.g., communications from departments or programs to their alumni and parents of students), and “in the trenches” advocacy or advocacy by example (e.g., opportunities for the public to see or interact with UC researchers as they go about the task of making discoveries about our universe, planet, nation, state, society, populations, species, etc). Greater public engagement will assist across all of these advocacy activities.

• **Increased research funding.** Public engagement is one important means of identifying and fostering opportunities for innovative public-private research partnerships. A growing track record of public responsiveness and the legacy of results and impacts of UC research can create a virtuous circle of opportunities for new funding, including partnerships with California industry and government.

**Next Steps for Implementation:**

• Inventory ongoing UC engagement activities and collect documentation of their impacts. Such an inventory will establish a comprehensive repertory of best practices for use in UC advocacy and also set a basis for assessing opportunities.

• Consider establishing a rotating award for a distinguished or up-and-coming researcher “in the spotlight”; and creating a media campaign on “A Day in the Life Without UC” that would highlight the benefits of UC research on the daily lives of Californians. Today, large audiences watch crab fishermen on the Discovery Channel, or follow particular blogs. What kinds of technologies, communication practices, and institutional support arrangements would need to be put in place to give a UC researcher a chance at that kind of audience? (For example, UC researchers behind the discovery of green technology, extrasolar planets, nanotech, medical procedures, nearly 50 previously unknown letters of Benjamin Franklin, effective new ways of educating K-12, startling new forms of art or entertainment performance, ancient archaeological or archival finds that refashion our understanding of history, etc.—all of these have the potential to put the value of UC research before the public in dramatic ways.)

• Initiate a process for consulting with internal and external audiences to identify and prioritize new engagement opportunities in concert with the “Grand Challenges” recommendation.
It is worth emphasizing that each of these recommended implementation steps embodies researchable topics that could (indeed should) be developed as ongoing, prospective, system-wide activities led by UC faculty, staff and students, possibly through competitive research grants. Developing UC capacity for monitoring, evaluation, and impact assessment of our own programs would also enhance UC capabilities to undertake these activities on behalf of other agencies and institutions, thereby providing yet another link between the generation of knowledge and more effective action (particularly in the public sector).

**Other Options Considered:**

*Business as usual / Status quo.* UC clearly is engaged significantly with the public over a wide range of areas, but these activities seem underfunded and under-recognized by UC, by the people of California, and by our legislators.

**References:**


RECOMMENDATIONS RELATED TO RESEARCH QUALITY ENHANCEMENT

UC Libraries

Recommendation 4: Maximize the UC library system’s capacity to support the University’s research mission by: enhancing and developing data curation techniques; extending systemwide acquisition and sharing of resources; expanding accessibility of physical and virtual library space; and promoting systemwide scholarly publishing initiatives.

Rationale:

UC libraries power research, teaching, learning, patient care, and community service. The intellectual capital of UC libraries—their acclaimed research collections, innovative services, user-friendly facilities, and highly trained staff—constitute an unparalleled resource that must be thoughtfully cultivated in order to ensure its continued support for students, scholars, and the people of California.

- Data curation must keep pace with new forms of knowledge. Not only must libraries preserve and manage the "collection of record" in which large investments have already been made, but librarians must continue to comb through the explosion of new knowledge to keep up with the research demands of UC faculty and students.

- Systemwide acquisition and sharing of resources can lower costs and prevent unproductive duplication. The UC libraries have established a strong track record in securing collaborative purchases and conducting tough negotiations with commercial publishers to reduce the ever-increasing licensing costs of electronic resources. The University must continue to support and expand this capacity.

- The library as a physical and virtual space is central to the university’s mission. Library buildings and the resources they hold represent the heart of the academy, and continued physical presence of such buildings, supported by steady funding sufficient to ensure their availability to students and faculty, must be a high priority. The changing role of libraries in creating and supporting virtual spaces must be supported and enhanced, just as the physical facilities are.

- Library-sponsored scholarly publishing initiatives benefit the entire UC system by rapidly making cutting-edge and in-process research available. The libraries have developed and promoted alternative means of publishing, including infrastructure that supports open access more cost-effectively than options made available by publishers.

- The role of the librarian in building and curating collections, providing consultation and instruction, exploring new educational technology, and contributing to the success of UC is more vital and necessary than ever. Thomas Benton has called librarians “activists defending democracy and the First Amendment, as well as visionaries opening the door to the digital future, while protecting our printed legacy.”
Challenges:

- The UC libraries must calibrate their operations to serve faculty and students across all disciplines. Complex and varied fields of study require different types of services from the libraries, including, for example, the maintenance of print collections to meet the needs of the humanities and social sciences.

- Limited acquisitions resources must be wisely managed and shared. Resource-sharing programs such as interlibrary loan and systemwide access to online resources must be supported so that all UC faculty and students have ready access to all materials held by libraries within UC as well as worldwide.

- Data curation is a moving target. UC’s libraries must work with other campus and system-level partners to ensure that research data archiving and preservation meet the requirements of funding agencies.

Impact on Access:

For the humanities and social sciences, libraries offer primary source materials for research as well as individual study space, group study rooms, or collaborative research commons. Libraries also meet the needs of students in sciences and engineering for collaborative study and workspace, and they increasingly provide access to large datasets for analyses. Technological change in the way that information is organized and archived will make it possible for the broader California community to have improved access to UC’s library resources.

Impact on Quality:

Libraries can best support the research, teaching, and service missions of the library by remaining open and adequately staffed with research librarians. Working with faculty, librarians engage directly with students at all levels to teach them new information skills, how to access information, introduce them to multifaceted collections useful in specific disciplines, and expand their understanding of how information resources can help them succeed.

Fiscal Implications:

Libraries cost money to maintain; we must be forthright about this. Because libraries are at the heart of UC’s research mission, they are among the University’s most essential expenses. Use of systemwide collaboration, tightening of collection linkages among campuses, and judicious use of UC’s combined negotiating power with content vendors and publishers all give UC an advantage in controlling costs, as well as national influence in setting cost trends.

Next Steps for Implementation:

- UC should continue to use the size and power of its linked libraries, in coalition with other major institutions, to press for access to scholarly databases on financially viable
terms. Faculty and librarians are now doing this with the journal *Nature*, which proposes to raise its prices 400%.

- Develop plans for further linkage of UC collections through shared licenses, distributed data curation, and other cooperative projects.
- Interlibrary Loan services should be adequately staffed, funded, and reinforced.
- Library hours and reference staffing should be protected from further cuts and restored.
- Further develop online publishing capability for individual and collaborative projects, in conjunction with proposed recommendations about Grand Challenge research initiatives and recognition of online and collaborative work for faculty and graduate student advancement.
- Enhance public access to UC collections; digitize special collections.

**Other Options Considered:**

Concentration on electronic resources only or new collections in support of a restricted range of research interests was considered but rejected since this would result in a reduction of library capabilities to support the UC research mission.

**References:**


Enhanced Research Paradigms and Training

Enhanced research paradigms are needed within UC:

**Recommendation 5a:** UC should build on its strength as a multi-campus system by improving the ability to create and support multi-campus and system-wide research programs and research training.

**Rationale (5a):**

One of UC’s greatest strengths--that which makes it one of the most successful research institutions in the world and allows it to attract top students and faculty in a wide variety of disciplines--is its multi-campus structure. This provides a collective expertise and strength in research that is unparalleled in the world. When its multi-campus strength is effectively harnessed, the whole of the UC research enterprise is much greater than the sum of its parts, allowing much grander projects than a single unconnected university could support, while attracting and retaining faculty and students even in the face of lower total remuneration.

Coordinated research programs offer opportunities to share large-scale resources beyond the reach of an individual campus. Examples of such large-scale shared resources that have allowed UC researchers to excel are the national labs, Sierra Foothill Research and Extension Center, libraries, Multicampus Research Projects and Initiatives (e.g., California Institutes for Science and Innovation), supercomputers, and large ground-based telescopes. When these resources are shared system-wide, they bridge gaps between campuses and increase the stature of all campuses. Coordinated research programs also enable individual campuses to hire critical concentrations of faculty in specialized areas without a loss in breadth in the larger scale program. Coordinated research programs can operate both within a discipline, where individual campuses contribute different sets of expertise to support a large-scale facility, and across disciplines, where campuses may integrate different programs to create a successful combined interdisciplinary program. While UC runs very successful multi-campus research programs, procedural barriers hinder achievement of the maximum advantage of quality combined with cost efficiency. Therefore, UC research could be greatly enhanced by improving the ability to create and support multi-campus and system-wide research programs.

Coordination of multi-campus research would also enhance the training of graduate and professional students inside and outside of the classroom environment. Classroom training currently happens almost exclusively on a graduate student’s home campus. However, graduate training requires much more specialized learning than that available at the undergraduate level. Multi-location teaching at the graduate and professional levels would allow students to take specialty courses from experts across the UC system. This would not only improve the quality of education but also reduce the number of specialty classes that need to be taught at individual campuses. In addition, assistantships--an important aspect of graduate training--currently cannot be filled on one campus by graduate students from another UC campus. Allowing such flexibility would permit graduate students to benefit fully from and participate in multi-campus research efforts.
Challenges for Research Programs:

- Improvements in University policies should be undertaken to overcome significant barriers and disincentives that currently exist for multi-campus research:
  - Reciprocity should be established across UC campuses for approvals to conduct human or animal subjects research.
  - Collaborative studies should be rewarded or recognized in a faculty member’s academic personnel review for advancement. Change is especially needed in the humanities, where only single-authored work is valued.
  - The approval process for access to shared resources and facilities should be streamlined.

- Adjust the incentive structure for fundraising from both private and public sources for multi-campus collaborations by providing proportional development taxes to the campuses. For private funds, development offices are located at the campus level without coordination between campuses. Consequently, development officers from different campuses can approach foundations for the same large-scale UC projects. This sends an unclear message to the foundations and decreases the chance of success.

- Remove impediments to multi-campus research that result from the convention of campus-level competitions for permission to submit a grant pre-proposal or proposal to extramural funding agencies (i.e., making the campus the gatekeeper that limits “slots” for submission to the NSF, foundations, and other funding opportunities). This convention is ill-adapted to UC’s strength as a multi-campus system. Proposals for projects that share extramural funding among campuses are disadvantaged in campus-level pre-competitions, even if they are likely to be highly competitive upon final submission to the extramural agency.

Challenges for Research Training:

- Course-credit systems are not designed to recognize courses or accommodate students from other campuses. The mixture of semesters and quarters further complicates this issue. All UC campuses should be able to accept grades and credits from other UC campuses and from cross-campus courses.

- There is a shortage of classrooms and meeting rooms with the appropriate equipment and technology to work collaboratively from distributed locations. Faculty may have to be trained in the use of this technology to be effective.

- It is difficult to pay research assistants from other campuses (a process that sometimes requires negotiating incommensurable pay scales, navigating complex financial systems, protocols, and graduate-division regulations). Such barriers to multi-campus collaborations need to be removed.
**Impact on Access (5a):**
- Improved access to high caliber facilities
- Improved access to research facilities across the UC system
- Improved graduate and professional student access to specialized training and multi-location courses
- Improved graduate and professional student access to research opportunities across the UC system

**Impact on Quality (5a):**
- The quality and quantity of graduate and professional education would be improved by having specialized courses taught on a multi-location basis by uniquely qualified experts.

**Fiscal Implications (5a):**
- Increase philanthropic giving, in particular from foundations, by creating a coordinated voice for multi-campus research.
- Additional facilities are required to increase the availability and ease of multi-location teaching/learning.

**Next Steps for Implementation (5a):**
- Develop a reward system for collaborations between development offices for multi-campus research (e.g., shared gift taxes across participating campuses). This would improve UC’s chances of success in raising funds from foundations and possibly even individual donors.
- Set up a system that would encourage campuses to approve large-scale, multi-campus proposals in limited submission competitions without endangering the total number of slots for the entire UC system.
- Establish additional facilities and training for multi-location teaching and research seminars. Encourage faculty to offer courses and seminars across the UC system.

**Recommendation 5b: Each campus should ensure that its academic structures will maintain the quality of research within UC.**

**Rationale (5b):**
To enhance research excellence within and across disciplines, UC campuses should:
- engage faculty in creating strategies for successfully organizing and supporting research, and
- share information about strategies that have worked well.
For example, some campuses have had success with faculty searches carried out by several departments, with cluster hiring, and with the creation of faculty positions linked to the development of new initiatives.

Additional areas in which strategic planning may be beneficial include graduate student support packages, seed funding for research projects that show special promise, organization of computer support for research, and the clustering of staff support for grant-writing.

**Challenges (5b):**

- Institutional strategies that have worked well in the past may not be easy to change in response to current budget realities.
- We must ensure that change flows from the bottom-up rather than from top-down decisions. In collaboration, the Academic Senate and campus administrators should set up the facilitating framework for the exploration of new strategies for research organization and support. Administrators should then step out of the way to let the process of inventing those new arrangements evolve organically from existing or emerging concentrations of strength at the individual faculty or department level.
- Where new strategies entail cross-disciplinary work or split faculty FTE, special care must be taken to regulate service obligations, to make research expectations clear, and to reward excellence.

**Impact on Access (5b):**

- By helping maintain the viability of both small and large departments on UC campuses, and thus mitigating the need to merge or eliminate programs, supplementary research strategies can help to preserve undergraduate and graduate student access to a full range of programs at UC. Graduate students involved in multi-program projects may also have access to a larger pool of faculty mentors.

**Impact on Quality (5b):**

Careful strategic planning will help campuses maintain the quality of disciplinary research while supporting effective collaborations.

**Fiscal Implications (5b):**

- *Cost efficiency.* Thoughtful strategies in such areas as faculty hiring, graduate student support, and IT resources may enable campuses to enhance quality without increasing costs.
- *Revenue generation.* Some strategic research plans may enable campuses to leverage new sources of external support.

**Next Steps for Implementation (5b):**

- Campuses should share best practices regarding strategies for: (a) hiring faculty, (b) using project funds to help departments recruit and support graduate students, and (c) implementing shared facilities.
• Policy discussions and revisions should be undertaken through the appropriate Academic Senate and administrative committees.

**Other Options Considered (5b):**

Eliminate or merge some departments/programs on some UC campuses; reduce the quality of UC research or concentrate quality in selected areas.

**References (5b):**

Mentoring and Professional Development

**Recommendation 6:** Implement mentoring, career, and professional development opportunities for graduate students, professional students, and postdoctoral researchers.

**Rationale:**

UC’s postdoctoral scholars and graduate students are critical to the advancement of the research mission and represent the capacity of UC to provide training at the highest levels to maintain research excellence. Effective mentoring and career development above and beyond the generation of research are an important component of graduate student and post-doctoral training.

Graduate students stand at the nexus of faculty research and undergraduate education, while postdoctoral researchers stand at the nexus of faculty research and graduate education. Supporting these students and fellows also bolsters the recruitment of top faculty, and ensures high quality instruction of undergraduate students and graduate students. This interrelation between students and faculty sustains the University of California’s academic excellence.

While all of the UC campuses have graduate students, there is considerable variability in the number and proportion of postdoctoral researchers at each campus. Postdoctoral researchers bring new expertise and training to their host institutions, departments and mentors, often assisting in the transition to new lines of research. They engage in mentoring activities for undergraduates and graduate students, assist in the grant writing process, and optimize research and scholarly output. The postdoctoral experience represents a period of intense and directed professional development by providing opportunities for recent Ph.D.s to deepen their research in their area of expertise or, as is increasingly common, to acquire expertise in new areas of research prior to starting careers in industry, government or academic institutions. In many fields, particularly Science, Technology, Engineering, and Mathematics (STEM), postdoctoral training is critical to professional advancement after the doctoral degree, especially for those pursuing tenure-track faculty positions. Postdoctoral positions are also becoming more common in the Humanities, Arts, Behavioral Sciences, and Social Sciences (HABSS).

Professional and career development programs for graduate students, professional students, and postdoctoral researchers are a significant and important aspect of training; one important component of these programs is mentoring. Mentoring has been demonstrated to have positive effects on career satisfaction, likelihood of entering academe, and recruitment of underrepresented minority junior faculty. Mentors also have cited significant benefits in their own career satisfaction. Excellent mentors are committed to furthering the careers of their students and fellows, as well as providing a supportive professional environment. In addition, excellent mentors provide exposure and networking opportunities within professional circles. Development of strong mentoring programs on UC campuses will likely improve degree completion rates among graduate students, as well as enhance the image of UC as a supportive educational and research environment.
**Impact on Access:**

If UC is seen as a supportive institution in which to receive training, our efforts to recruit the most qualified graduate students, professional students, and post-doctoral researchers will be enhanced. We also will enhance our efforts to recruit the top candidates from groups that are under-represented at the University, thereby increasing the diversity of UC.

**Impact on Quality:**

- Research indicates that effective mentoring increases the productivity of students and trainees, thereby enhancing research. Effective mentoring also creates synergy between faculty and students, enhancing the integration of teaching and research. Creating a more engaged experience will allow graduate students and postdoctoral researchers to become more effective TAs, effective researchers, and mentors for undergraduate students that they teach and interact with in the classroom and laboratory.

- A strong mentoring program will provide a legacy and skill-set for students to possess when they graduate from UC. Graduate education and increasingly postdoctoral fellowships are necessary to prepare future professors, research scientists, academic physicians and veterinarians, teachers, social workers, psychologists, policy experts, and lawyers. Therefore, mentoring should be a major aspect of enhancing research experience and training.

- A system-wide effort to enhance mentoring and professional development will increase research productivity and produce a professional workforce whose training reflects the quality of their host institution. It will also enable all campuses to comply with the training guidelines mandated by major federal granting agencies such as NSF and NIH.

**Challenges:**

- Per Academic Personnel Manual (APM) 210.1, the evaluation of teaching for appointment and promotion of faculty should also consider mentoring; however, it appears that some campuses have not encouraged faculty to document their mentoring activities, nor do all campuses consider mentoring in their evaluation for advancement. Mentoring on all campuses should be encouraged, valued, and rewarded.

- Excellent mentoring requires training of both mentors and mentees. Such training programs exist at only a few UC campuses. Resources will be needed to establish mentoring programs at all UC campuses.

- For some of the smaller campuses where postdoctoral scholar populations are small and the provision of similar support and training for graduate students (who are a larger segment of the population) is also limited, these recommendations may be difficult to implement. Consequently, a critical component of enacting this recommendation is the implementation of multi-campus training programs and events, as well as the creation of joint services that benefit both graduate students and postdoctoral researchers. There are cases wherein resources already available to the graduate division can be collaboratively utilized by graduate students and postdoctoral researchers in a manner that improves their effectiveness for both groups. Because many of the UC campuses
already provide excellent graduate and postdoctoral resources, their programs can be used as models for success and they can be shared with other campuses via multi-location seminars, videoconferencing and joint workshops.

**Fiscal Implications:**

- **Mentoring programs and training require resources.** While funds will be required to establish and maintain excellent mentoring programs, strong mentoring programs are likely to increase retention and degree completion rates for graduate students, thereby increasing the “return on investment” for graduate student support.

- **Increased research productivity.** Graduate students who maintain regular contact with their mentors can receive valuable help on troubleshooting experiments and guidance on writing grant proposals as well as manuscripts for publication. This enhances the overall UC enterprise as effective mentorship will save the faculty member and graduate student time in completing their training.

- **Increased federal research funding and recruitment of faculty and students.** Federal agencies such as the National Institutes of Health (NIH) and National Science Foundation (NSF) are supportive of, and in many cases require, specific mentorship and training activities as a part of their grants. Strong mentoring programs at UC increase our faculty members’ competitiveness in applying for federal grants. Furthermore, rewarding those faculty members who do a good job in mentoring helps them to serve as role models for their peers and to recruit future graduate students and faculty members.

**Next Steps for Implementation:**

- Establish mentoring programs for graduate students, postdoctoral researchers, and professional students on all UC campuses. Existing mentoring programs with documented success can be used as models for other UC programs (e.g., the UCSF Faculty and Postdoctoral Mentoring Programs).

- Graduate students should be trained and rewarded for being effective mentors to undergraduate students, especially in guiding undergraduate student research. Examples already exist within the UC system where graduate students are rewarded for their excellence in guiding undergraduate research. It would be beneficial to have these types of incentives available for graduate students at all UC campuses that engage in the teaching and training of undergraduates.

- Establish mentoring awards for faculty, postdoctoral researchers, and graduate students (all of whom mentor trainees).

- Encourage documentation of mentoring and consideration in academic advancement reviews. Such documentation could include an assessment of the accomplishments of mentored trainees, including: publications during training, abstracts and presentations at professional meetings, teaching evaluations, grants/fellowships awarded and current position. Letters should be requested from graduate students, professional students, and/or postdoctoral researchers whom the faculty member has mentored.
• Ensure that graduate and postdoctoral programs include a career and professional development component. One implementation approach would be to create seminar courses that provide career and professional development training such as development of a curriculum vitae, job search strategies, and professional networking. Seminar speakers could include alumni who now work in a variety of settings, including industry, government, foundations, and universities. These courses could be done in a multi-location teaching format, making use of specialized expertise and addressing needs on campuses with limited resources.

• Provide enhanced administrative and financial support for campus career centers so that they can mount valuable workshops, assessments, career fairs, visits by speakers and recruiters from various employers.

• Create partnerships with industry and others to augment graduate and postdoctoral programs and career development opportunities. Under this model, companies would contribute modest amounts of funding each year that could be rewarded competitively, with oversight and governance residing within UC.

• Establish an office or administrative position dedicated to postdoctoral support, training and tracking of postdoctoral researchers on each campus. This entity would oversee professional development workshops and courses that include basic skills and career counseling, collaborating with the graduate division whenever possible. The entity would also support and assist a postdoctoral scholar association, a critical component of postdoctoral support. Because postdoctoral scholars are primarily research staff, administrative responsibility for them should be housed under the Offices of the Vice Chancellors for Research in collaboration with the graduate division for each campus.

• The appointment of an administrative liaison of postdoctoral affairs at UCOP would greatly assist in enhancing coordination of programs across campuses. The purpose of this position would be to facilitate the management and coordination of postdoctoral support efforts across all of the campuses, including compiling data on postdoctoral scholars generated by each campus; coordinating yearly meetings between offices and administrators across the system; and organizing shared events such as training workshops and retreats between campuses, as well as between UC and non UC institutions.

References / Examples:
• http://www.springerlink.com/content/1383072723614542/
• http://www.springerlink.com/content/c5j1777230g35076/
• www.rackham.umich.edu/downloads/publications/Fmentoring.pdf
• statusofwomen.ucsf.edu/pdf/GS_mentoring.pdf
• http://academic-senate.berkeley.edu/committees/pdf_docs Consolidate/mentoring%20gdelines-FINAL.pdf
• http://grad.berkeley.edu/sarlo/ (This one from UCB focuses on rewarding faculty members for excellence in graduate student mentorship)
http://www.gdnet.ucla.edu/asis/sfap/srmintro.htm (This one from UCLA is geared for supporting graduate students in the Humanities and to encourage faculty-student collaboration)

http://www.sciencemag.org/cgi/content/summary/324/5923/13

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http://www.the-scientist.com/article/display/18834/

Institutional Best Practices for Postdocs
http://www.nationalpostdoc.org/policy/institutional-policies/recommended-practices-for-institutions

Improving the Postdoctoral Experience: An Empirical Approach:

UCSF Gladstone- New Scientist Best Places to Work Postdocs 2005-2010
http://www.gladstone.ucsf.edu/gladstone/site/postdoc/

Joint workshops for postdocs and graduate research assistants at Berkeley Lab
(Lawrence Berkeley National Laboratory
http://www.lbl.gov/Ops/survey/postdoc/#wkshp
The following are samples from a collection of UC research examples gathered from existing UC documents (e.g., from Los Alamos National Labs) and a survey of UC humanities, arts, behavioral science, and social-science faculty conducted by the “Research Mission & Principles” subgroup of the UCOF Research Strategies Working Group in spring 2010. Additional samples from this collection will be written up and added in summer 2010 to serve as material for a possible future UC research advocacy and public engagement effort.

[Note: These descriptions have not yet been fact-checked. Image permissions will have to be cleared for any future publication. (Most, but not all, of the images are taken from the relevant research sites. Some are generic placeholders.)

UC Research Contributions to the Public

STEM Disciplines (Science, Technology, Engineering, Mathematics)

**Oil Spills and Wildlife**
When an oil spill spreads over the surface of the ocean endangering birds and other small mammals, rescuers spring into action, thanks to a formidable network led by UC Davis wildlife veterinarians in conjunction with the California Department of Fish and Game. Injured animals are cleaned and rehabilitated at a dozen facilities stretching along the entire 1,100 miles of California’s coast.

**Cyclotron**
Ernest O. Lawrence, namesake of the Lawrence Berkeley National Laboratory, designed the first cyclotron, launching the scientific use of particle physics to discover the fundamental structure of matter. The cyclotron has had a major impact on the treatment of diseases, making it possible to create in large quantities the radioactive isotopes used in medical treatments.

**Insect control**
UC Berkeley Professor Edward Steinhaus, a pioneer in the field of insect pathology, used bacteria to attack a caterpillar that infests alfalfa. This was the first successful use of an insect pathogen to control insects in the field. Today these bacteria, Bacillus thuringiensis, are used worldwide to fight crop disease.

**Laser Diode**
UCSB researchers, from the Solid State Lighting and Display Center in UCSB’s College of Engineering, achieved lasing operation in nonpolar gallium nitride (GaN) semiconductors and demonstrated the world’s first nonpolar blue/violet laser diodes. These new orientations of GaN will result in laser diodes with lower operating power and longer lifetimes, which are necessary for high-performance operation.
**Dairy**
Better sanitation procedures, improvements in raw milk handling and quality, and innovations that have reduced the environmental impact of livestock waste have contributed to making California the nation’s largest dairy state. The J15 vaccine alone, developed in 1988 by veterinary medicine faculty to prevent mastitis in dairy cattle, saves producers $11 million every year.

**Baby Sign Language**
UC Davis research gave birth in the 1980s to “baby sign language,” a then-revolutionary way to communicate with infants. Ongoing studies by UC Davis psychology professor Linda Acredolo have demonstrated that children who sign as babies have higher IQs at age 7 and 8 than those who don’t.

**Diabetes**
UCSF scientists isolated the gene for insulin, leading to the mass production of genetically engineered insulin to treat diabetes.

**Cleaner Smokestacks**
Frederick G. Cottrell, UC Berkeley professor of chemistry, developed an electrical precipitation device to clean smokestack emissions; it is still in use today.

**State Water Project**
Engineering work at UC Davis played a big part in the design of the 444-mile-long California Aqueduct and other elements of the State Water Project that today serves 23 million Californians and 755,000 acres of farmland. Jaime Amorocho and others built water project models in a laboratory that now bears his name and that is used today by scientists designing river pumps and other diversion works that are safer for fish like the endangered delta smelt.

**Renewable and Appropriate Energy Laboratory**
The PACE -- property assessed clean energy -- program was developed in a collaboration between the City of Berkeley, CA, and a research team at the UC Berkeley Renewable and Appropriate Energy Lab led by Professor Daniel Kammen. The program flips the conventional financing model around, building equity in clean energy investments. PACE has rapidly been adopted by 10 states, the White House, and is part of the Waxman-Markey Climate bill.
**Discovery of Earliest Known Life on Earth**

In 1993, UCLA paleobiologist J. William Schopf found the earliest evidence of life on Earth, dating back 3.5 billion years, and in 2002, he substantiated the biological origin of the earliest known cellular fossils. In 2006, Schopf and colleagues produced 3-D images of ancient fossils - 650 million to 850 million years old - preserved in rocks, an achievement that had never been done before. The technique could be used to look for life on Mars.

**Most Powerful Magnet Helps Create Futuristic Materials**

A world-record-breaking magnet is helping scientists create next-generation materials that will help make our buildings greener, our gadgets smaller, and our power and light systems more efficient.

**Nanotechnology for Tech, Environment, and Medical Benefits**

Los Alamos scientists are creating miniature machines that have cellular characteristics. Capabilities are endless: self-repairing computer chips, removing greenhouse gases, making human organs self-healing.

**UC Planetarium Brings Research to the Public**

UCLA faculty and graduate students run the UCLA planetarium and offer weekly, free shows for the public and schoolchildren to give a sense of the excitement of hands-on research into the universe. Visitors at the shows view planets, nebulae, star clusters, and other celestial objects through the facility’s telescopes.
HABSS Disciplines (Humanities, Arts, Behavioral Science, and Social Science)

Treasure of Previously Unknown Letters by Benjamin Franklin
In the Spring of 2007, in the British Library, UC San Diego Political Science professor Alan Houston discovered nearly 50 previously unknown letters by Benjamin Franklin. "I couldn't sit still; I couldn't work," Houston remembers. "On the last day, on the last document [of my research trip], and I had this incredible discovery. I ran out of the library and called my wife in San Diego." When the letters were published in 2009, they created a stir in national and international media. The letters, Houston says, show "an example of Franklin's skill of working with people of different agendas and different concerns, appealing to their interests, appealing to their passions, appealing to their political beliefs."

Research into Human Cognition Leads to Credit Card Fraud Prevention
With collaborators of the Cognitive Science Program at UC San Diego, Professor David Rumelhart played a leading role in the development of the "backpropagation algorithm" as a theory of human learning and cognition. Developed in the late 1970s and early 1980s, the theory became a major machine-learning algorithm now used in countless engineering applications. It is also used today in familiar applications such as credit card fraud detection.

DigitalOcean
Researchers at the UC Santa Barbara Carsey-Wolf Center for Film, Television, and New Media working on "environmental media" have created the DigitalOcean online network to encourage communities of scientists, educators, students, policy makers, media specialists, ocean enthusiasts, and others to share in producing and learning knowledge about the seas. Their "Sampling the Sea" Learning Space engages middle and high school students in 200 classrooms around the world in monitoring, analyzing, and sharing information about the declining global fish population.

World History For Us All
Led by researchers Ross Dunn at San Diego State University and Edmund Burke at UC Santa Cruz (in cooperation with the UCLA National Center for History in the Schools), the "World History For Us All" project makes available a free, publicly available model curriculum adaptable for K-14 world history courses.
Culture and Human Moral Life
Jason Throop at UCLA, Stephen Parish at UC San Diego, Joel Robbins at UC San Diego, and other professors work in the anthropology of morality, exploring the cultural aspects of ethical subjectivity that deepen our understanding of human ethical subjectivity and may lead to new perspectives on ethics.

California Newspaper Project
A project of the Center for Bibliographical Studies and Research at UC Riverside, the California Newspaper Project identifies, describes and preserves California newspapers. Close to 9,000 California newspapers were inventoried in over 14,000 repositories throughout the state, 1.5 million pages of California newspapers were preserved and made available on microfilm, and 100,000 rolls of negative microfilm rolls are being processed for permanent storage at the UC Regional Library Storage Facilities.

Students Learn from California Holocaust Survivors
Professor Deborah Hertz founded and directs the Holocaust Living History Workshop at UC San Diego. Its aim is to use the Visual History Archive, a database at USC of 52,000 Holocaust survivor testimonies, to connect undergraduate students and local survivors. The Workshop brings local speakers to the library to speak to students, and the students in Professor Hertz’s “Holocaust as Public History” class make their own video interviews.

Helping Drivers Avoid Collisions
Professor John Andersen of the Psychology Department at UC Riverside studies how the brain processes information in performing complex tasks. His research focus on improving driving performance and safety, including among aging people. One facet of his studies has been to identify the perceptual mechanisms drivers employ to detect and avoid collisions. His findings have important implications for how to design effective in-vehicle warning systems and semi-autonomous driving systems that can take control of a vehicle when a driver fails to detect an impending collision.

The Prehistory of Multitasking
Professor Monica Smith at UCLA conducts research on the long-term development of human behavior as exhibited in archaeological remains. Her book A Prehistory of the Ordinary Person examines the long history of multitasking as a human adaptive strategy.

“Multitasking is not just a modern notion,” she says, “it has characterized human activities for more than a million years. The ability to undertake many tasks simultaneously through complex processes of language, cognition, and social interaction enabled our species to go from being merely one type of clever but
vulnerable primate to being the only species whose conscious actions with material objects continually shape the landscape.”

**AlloSphere for 3-D Science and Art Visualization**

A collaboration of artists, musicians, and engineers at UC Santa Barbara led by Professor JoAnn Kuchera-Morin of the Music Department and Media Arts & Technology program are work in the one-of-a-kind AlloSphere. The AlloSphere is a globe-like, immersive 3-D visualization facility used to explore the kind of complex multi-dimensional data essential in such sciences as nanotechnology, neuroscience, and chemistry. It is also a stage for experimentation in combining art with science—as when visitors fly through a brain-scan map of artist-architect Marcos Novak’s mind, which Novak compares to a bodily “architectural space.”

**Preuss School Prepares K-12 Students from Minority and Low-Income Backgrounds for College**

A college preparatory public charter school on the campus of UC San Diego, the Preuss School has been named Best High School in California Serving Low Income Youth, the 8th Best High School in the U.S., and one of the Top Ten High Schools in the U.S. For example, 82% of Preuss graduates in the 2004 and 2005 classes enrolled in college compared to 36.5% of students in comparison groups for those years. The school achieved the highest API score among San Diego County high schools in 2009.

**Big Humanities**

Digital media and arts researchers in the UC San Diego Software Studies Program are at work on a federally-funded “Cultural Analytics” project that uses new digital technologies to explore and present large datasets of humanities, art, and cultural material. For example, the project allows researchers and students to move seamlessly between seeing any individual painting by artist Mark Rothko and seeing it on the developmental plot of thousands of his paintings.

**UC and Human Rights Around the World**

In fall 2008, Professor Perry Link of the Comparative Literature and Religion and Foreign Languages Department at UC Riverside worked with the drafters of China’s “Charter ’08” to produce an English version of the Charter. The Charter, which was signed by over 300 Chinese intellectuals and human rights activists, argues for democratization in China. It has had a public impact around the world and in the U.S. Congress. Liu Xiaobo, arrested in 2008 as a drafter of the Charter, was nominated for the Nobel Peace Prize.
**Berkeley Center for Independent Living**
The Berkeley Center for Independent Living was the first of its kind in the U.S. It brought together students and the community to find ways for disabled people to live independently from parents and from institutions. Stressing peer counseling and support, the Center provided a wide array of services, and it undertook a major role in advocacy for reform legislation in California and the nation. The Berkeley model, used in the 1973 Rehabilitation Act as a demonstration of best practice, spread rapidly around the country and eventually the world. It provided a basis for national and international legislative and other social changes that transformed disabled people’s lives.

**Literature and Neuro-cognitive Science**
Some scholars are turning to magnetic resonance imaging of the brain and cognitive theory to explore how and why people read fiction. As the New York Times reported in a story titled “Next Big Thing in English,” a prominent leader in the field is the scholar Lisa Zunshine, who trained in neuro-cognitive and evolutionary-psychology approaches to literary studies as a graduate student at UC Santa Barbara.

**An Ancient South American Empire**
UC San Diego archaeologists working in the southern Peruvian desert discovered a previously unknown system of agricultural colonies of the Tiwanaku culture, dating to the 7th century AD. Ongoing excavations are discovering how this early state society watered the desert and organized its vast provincial network through work at the region’s only Tiwanaku temple, as well as towns and cemeteries. Research on ancient societies’ relationship to land and resources has great relevance to modern problems. Ongoing work on the Tiwanaku includes studies of desert ecology, climate change and irrigation, analyses of ancient ceramics, metals and textiles, and mortuary and isotopic studies of excavated Tiwanaku mummies’ to understand diet and migration patterns over the long term.

**Helping Dual-Career Working Middle Class Families**
Researchers in Anthropology, Applied Linguistics, Education, and Psychology at the UCLA Sloan Center on Working Families have started a Center on Everyday Lives of Families to study how working parents and their children approach the challenges of balancing the demands of work, school, and family life using detailed, ethnographic research of everyday life.
What is the Community Reading?
UC Santa Barbara Media Arts & Technology Professor George Legrady's "Making the Invisible Visible“ media installation was chosen as permanent art installation at the Seattle Public Library. The installation, which consists of a series of high-definition screens behind the main library circulation desk tied into the library’s computer system, visualizes the books being checked out, providing a visualization of what the whole community is reading.

Sources:
- UC Research Contributions 032510-1.pdf
- Survey of UC HABSS faculty conducted in April 2010 by Alan Liu, member of UC Commission on the Future, Research Strategies Working Group (RSWG)
- Suggestions from various UC media office, RSWG members and UC faculty