

CHANCELLOR'S STRATEGIC PRIORITY AREAS

Working Paper Draft

UCR 2020

June 2010

One of the important goals of strategic planning is to define areas in which the university has a record of accomplishment and the potential to accomplish more in the future. Rather than pointing the campus in entirely new directions, the strategic priority areas described in this document embrace the work of the academic departments, as well as existing networks of collaborating faculty members. Academic departments form the disciplinary center of all major comprehensive research universities and the foundation for effective interdisciplinary work. UCR will, accordingly, continue to maintain and build strong core departments, recognizing that some already have achieved prominence and others will do so in the future. It will also continue to support outstanding individual faculty members.

Both the Academic Excellence Subcommittee and the Research and Creative Activity Subcommittee offered assessments of potential areas of strategic priority. In the case of the Academic Excellence Subcommittee these assessments were based primarily on quantitative criteria, including grant funding, publications, citations, and average h-indices for cooperating faculty members. In the case of the Research and Creative Activity Subcommittee, these assessments were based primarily on the expertise of subcommittee members, deans, and senior faculty members who are broadly knowledgeable about campus strengths.

Chancellor White chose the strategic priority areas described below by combining emphases in the lists provided by the two subcommittees and then revising the composites that emerged to reflect his own assessment of the areas in which UCR can have a continuing and significant impact. The Chancellor's Strategic Priorities are thus based on a combination of current knowledge about the campus and vision about what it can achieve in the future.

The choice of strategic priority areas is important to the campus community, because this choice will help to shape the profile of the university over the next decade. The choice is just as important for the broader community surrounding the university. Supporters and friends of UCR want to know how the university intends to use its resources, not only to advance disciplinary knowledge, but also to improve the quality of life in Inland Southern California and beyond.

Universities are places that create the future in many ways – by educating the next generation of citizens and highly-skilled workers, by conducting basic and applied research, and by translating the research results into forms that can be used by others. For this reason, the strategic priority areas described below are, by design, forward looking and progressive. They build on Chancellor White's vision of a 21st century land grant university, one that works hand-in-hand with business, government and community groups to revitalize community, and to discover and stimulate productive change.

The strategic priority areas are: (1) From Genomics to Harvest: The Basic Science, Cultivation, and Production of Plants and Food; (2) Next Generation Technologies: New Materials,

Phenomena, and Devices; (3) Mind and Body: Advances in the Study of Human Health and Well-Being; (4) Renewable Nature: Environment, Energy, and Sustainable Development; (5) Revitalizing Communities: Impact in Inland Southern California and Beyond; (6) New Voices and Visions: The Global Studio of the Creative and Performing Arts; and (7) Fundamental Research and Creative Activity. In addition to these strategic priority areas, the campus will encourage groups of faculty who have good ideas from outside of these seven areas to emerge and find investment support through “innovation incubators.”

UCR’s contributions to these strategic priority areas will depend on the deepening of collaborations among researchers from multiple disciplines, supported in their work by seed funds and new hires. The success of these efforts will be measured in the creation of new centers and, in some cases, new graduate programs supported by multi-investigator grants. They will also be measured by the effective engagement of UCR faculty members with the world beyond academia.

The campus will make financial investments in the strategic priority areas, as well as promising ideas that emerge from the innovation incubator program. Investments will be of two types: (1) seed funding for scholarly and organizational purposes and (2) new hires to solidify areas of excellence. By design, each of the strategic areas is broad enough to encompass multiple clusters of research and creative activity. Several new groups or clusters of faculty excellence may emerge from each of the seven priority areas, and each one will have the opportunity to seek seed funding and new hires. In some areas, the campus’s current strength owes much to the work of one or two people. One goal of seed funding is to provide incentives for faculty members with related interests to coalesce around these outstanding individuals to give UCR a critical mass of excellence in specific areas.

(1) *Seed funding.* Seed funding will be made available on a competitive basis for groups of faculty who propose to launch an initiative within one of the strategic priority areas or the innovation incubator. These funds may be used to hold brown bag meetings, workshops, and seminars aimed at encouraging interactions among faculty members working in cognate fields. The amount of funding will vary depending on the needs and opportunities of the groups. The immediate aims of the groups will be to share the results of research, stay abreast of the latest developments in their fields, establish collaborations, and to discuss opportunities for obtaining multi-investigator and program grants. Ultimately, seed funding is intended to encourage groups of faculty members to develop competitive proposals. Therefore, as a precondition for receiving continued seed funding, groups must commit to applying for multi-investigator project and/or training grants within three years after their initial award of seed funding. Funded proposals will deepen the capacity of the campus to continue to build on its strengths within the strategic priority areas.

Proposals for seed funding will be evaluated by the Strategic Planning Implementation Advisory Committee and approved by the Executive Vice Chancellor and Provost. The proposal process will require collaborating faculty to discuss how they will use seed funding. It will also require collaborating faculty to discuss specific criteria designed to show whether the group can be successful in grants competitions and, in some cases, graduate program development. These criteria will include: (a) the track record and organizational skills of the initiative’s leaders; (b)

histories of interaction among participants; (c) current research collaborations and funding; (d) evidence of national and international reputation of members of the collaborating group; (e) distinctiveness of the group's work in relation to competitors in Southern California; (f) potential for impact in UCR's service communities (whether regional, state, national, or international); (g) opportunities for funding of multi-investigator grants in the field; and (h) infrastructure requirements.

(2) *New Hires*. In some of the strategic priority areas, necessary contributors are currently missing from the roster of faculty. For example, although the campus has a set of highly productive faculty members who work on global climate and environmental change, its capacity to make a larger impact in the worlds of science and public policy is limited by not having a climate modeler on the faculty.

Accordingly, the campus will devote a significant number of future hires to filling personnel needs that will allow groups within the strategic priority areas to maximize their potential. Through such hires over the course of the next 10 years, UCR will build on its comparative advantages and create the critical mass necessary for national and international recognition in specific areas of research. Cluster hires -- i.e., multiple hires in collaborative areas -- can result in a cadre of faculty able to collaborate on their research and propel UCR forward. In some areas of particular strength, cluster hires will provide a valuable tool to enhance existing areas of prominence and to expand into important related fields.

Examples of some of our current strengths are in the Chancellor's following strategic priority areas, as described below:

- ***From Genomics to Harvest: The Basic Science, Cultivation, and Production of Food and Plants***

Thanks to the leaders of the Citrus Experiment Station, UCR's earliest research contributions came in the area of agricultural science. These contributions included studies that led to the prevention of diseases in citrus crops. They also included the underpinnings of biological control of pests and integrated pest management, both of which have been essential to the development of agriculture in California and throughout the world. The agricultural sciences remain central to the campus' reputation for academic excellence, and the Departments of Entomology and Botany and Plant Sciences remain among UCR's highest ranked departments nationally.

Today, UCR scientists are making fundamental contributions to the basic science of gene regulation, which will lead to tomorrow's improvements in foods and plants. UCR researchers, particularly those associated with its well-recognized groups in Plant Biology and Entomology, are among the most important contributors to the interdisciplinary field of genomics, as shown by their publication of a steady stream of high-impact papers and their support from NSF, NIH, USDA and numerous foundations. The Institute for Integrative Genome Biology (IIGB) engages more than 120 physical and life scientists, engineers, biologists, computer scientists, and statisticians from 20 academic departments. The emerging experimental paradigm uses computational biology

and engineering to advance knowledge gained at the gene level into an understanding of how organisms function as biological machines. The Center for Plant Cell Biology (CPCB), a unit in IIGB, is the nation's first research center devoted exclusively to integrating genomic, bioinformatic, cellular, molecular, biochemical, and genetic approaches. The work of the Institute has been greatly aided by its state-of-the-art high throughput sequencing services, proteomics, and microscopy facilities, as well as its bioinformatics group. The advances made at IIGB and CPCB will be central to future improvements in agricultural production.

On a more applied level, UCR's entomologists are continuing to advance methods of biological control of pests, the understanding of insect-plant interactions, and the investigation of insect resistance to pesticides. UCR nematologists have contributed to the reduction of crop damage due to parasites, preventing hundreds of millions of dollars in crop losses. UCR plant researchers have made significant contributions to the advancement of agricultural production in arid and semi-arid climates. They have developed heat-resistant seed strains, and one important recent line of research has specified how plants and crops survive drought by producing stress hormones that limit growth in times when water is unavailable.

In basic and applied work, UCR plant and cell biologists, as well as its agricultural scientists, will continue to lead the way toward safe and secure food supplies, with a specific focus on areas of the world in which water is in short supply. As stated by one UCR faculty member, "If we know how a live cell works, we can think of clever ways to strengthen its 'durability' and usefulness."

▪ ***Next Generation Technologies: New Materials, Phenomena, and Devices***

The unprecedented advance of information and electronic technology in the past four decades has been driven by the push toward miniaturization of silicon-based devices. Yet, as miniaturization proceeds, silicon-based technology is rapidly approaching its physical limits. The great challenge faced by the global electronic industry and scientific community is to define the next generation of devices. These devices will necessarily be based on new materials, as well as novel phenomena and properties that emerge on the nanometer scale.

Researchers at the Bourns College of Engineering and the physical sciences in the College of Natural and Agricultural Sciences are among those most centrally involved in creating the next generation of electronics and memory devices that will continue California's role as a leader in electronic and computer technologies. UCR researchers are already world leaders in the development of spintronics, 3-D electronics, and graphene and carbon-based electronics. Where conventional semiconductor devices make use of the charge of the electron, spintronics is based on the spin degree of freedom of the electron. Spintronic devices have the potential advantages of nonvolatility, increased data processing speed, decreased electric power consumption, and increased functionality compared with silicon-based semiconductor devices. The concept of 3-D electronics extends the electronic structures and functions into the third dimension.

Conventional electronics is based on two-dimensional planar processes, but this is becoming prohibitively expensive as well as a barrier to performance. By stacking devices and interconnecting in a 3D arrangement it will be possible to achieve a leap in functional density. 3D-electronics requires the parallel development of a number of enabling technologies to allow for its broad adoption. Critical enablers to fulfilling the vision for high density 3D technology are new materials for electrical interconnections, electromagnetic shielding and heat removal. UCR researchers have also made advances in the substitution of carbon-based materials – particularly carbon nanotubes and graphene – for silicon in electronic devices. The appealing properties of these materials include high strength and high electrical and thermal conductivity. These properties make carbon-based materials an outstanding candidate for use in spintronics devices, device interconnects, and thermal management of high density electronics.

At UCR, these areas of materials research have led to close collaborations among faculty members in physics, chemistry, materials sciences and engineering. The success of the Center for Nano-scale Science and Engineering (CNSE) has allowed for an enlarged UCR presence in the field. Recent hires include two new faculty members who have been honored with NSF Career Awards, one who has received the Presidential Early Career Award, two who have received Naval Research Young Investigator Awards, and one Sloan Research Fellow. Another UCR researcher has won the American Physical Society's McGroddy Prize. Based on these and earlier strategic hires, CNSE will be competing to become an NSF-supported Materials Research Science and Engineering Center next fall.

Post-silicon electronics will be a lynchpin of continued American leadership in micro-processing. The strong faculty members at UCR working on new materials, and the leadership provided by CSNE, will be at the forefront of developments in post-silicon electronics.

▪ ***Body and Mind: Advances in the Study of Human Health and Well-Being***

Body and Mind represents a comprehensive approach to health, not just health care. This comprehensive approach will involve the work of researchers from many parts of the university: scientists and social scientists working on the covariates of physical, mental and emotional well-being; those working on the reduction of health risk factors; those working on the scientific study of organs and disease: and, following the opening of the UCR School of Medicine (SOM), also those working on an integrated approach to disease care.

Science has identified quite clearly what the risk factors are for most diseases. People can live longer and with greater quality of life by controlling blood pressure, weight, diet, physical activity and stress levels. SOM will be a community-based medical school, with a strategic focus on population health, disease prevention and treatment, health care disparities, health policy, and the development of scientific knowledge to spur innovations in health care delivery. SOM, with its emphasis on prevention, can

contribute to the well-being of the community by focusing on risk factors, while its doctors treat those diseases that healthy lifestyles cannot prevent.

Even before the opening of SOM, the campus has a strong base on which to build studies of human health and well-being. UCR has more than 100 faculty members conducting research in health-related areas. This research includes (but is not limited to) work on cancer, Alzheimer's disease, cardio-vascular disease, and wound healing. The new Stem Cell Center focuses on the basic mechanisms that control stem cell function and on deciphering how the potential of stem cells can be used to improve human health.

UCR neuroscientists have built on the discovery that the brain is capable of changing the function and connections of neurons from childhood through adulthood. This finding, broadly defined as plasticity, suggests that rather than remain static the brain can improve function, change with learning, and recover from declines in function due to disease, injury, or normal aging. UCR currently has several labs conducting research on aspects of brain plasticity including neuronal-glia interactions, neuronal and glial responses to infection and inflammation, cortical plasticity due to injury, cortical plasticity in aging neural systems, and changes in cognitive systems due to learning.

Health psychology is an important related area of excellence on campus. Psychologists at UCR have published path-breaking work on doctor-patient communication, demonstrating that diagnosis is only one part of successful treatment. They have also studied the social and psychological foundations of the subjective sense of well-being (happiness). They have developed and tested theoretical models to account for the capacity of people to become sustainably happier through intentional and committed efforts, and they have shown the relationship between this sense of well being and enhanced social relationships, creativity, work productivity, and even longevity.

Understanding and activating knowledge about health and well-being will be the keys to the development of health science at UCR. Health scientists at SOM will promote a broader public understanding of the basis of healthy lifestyles and health risk reduction, while treating diseases that cannot be prevented through the adoption of healthy lifestyles. Biomedical and brain scientists will link to SOM through their work on risk prevention, disease treatment, and regenerative processes. Psychologists will develop the tools for doctors to improve their communication skills and their understanding of how to motivate healthy behavior and the positive attitudes that are so important in the maintenance of health and mental well-being. Through linkage and integration of the sciences of health and well-being, UCR will be at the forefront of a new conception of body and mind, which moves away from disease treatment and toward health creation.

- ***Renewable Nature: Environment, Energy, and Sustainable Development***

Sustainability is the integration of human beings, the built environment, organizational systems, and environmental sensibilities to create societies that replenish and renew their natural environments rather than deplete them. UCR has gained a strong national reputation for studies of global climate change and its impact on landscapes and

biodiversity. This work involves faculty members in Environmental Sciences and Earth Sciences, as well as the Center for Conservation Biology. The Earth Sciences Department focuses on the effects of climate change on the natural landscape, with a particular focus on the habitat of the Sierra Mountains. It houses state-of-the-art laboratory facilities including six new mass spectrometers, scanning and transmission electron microscopy, and x-ray diffraction. These facilities allow for the integration of field studies and laboratory studies. UCR's Center for Conservation Biology (CCB) is engaged in research on changes in biodiversity in a very different habitat, the desert ecologies of the Coachella Valley. CCB researchers are modeling population dynamics and the impacts and risks of environmental stressors, while also examining conservation objectives within a community rather than a single-species context. This approach serves as a model for future efforts to protect biodiversity. As it looks to the future, the campus will focus on broadening and integrating the efforts of scientists working on global climate change and its impacts.

UCR's commitment to environmental sustainability includes its ongoing commitment to clean air and renewable water resources. Quality of life in Inland Southern California has for decades been compromised by the reality of air pollution and the specter of water scarcity. Faculty associated with the Air Pollution Research Center have determined how smog-forming chemicals react with one another, how long pollutant compounds remain in the atmosphere, and their consequences for both humans and crops, and how long the compounds remain in the air. UCR water researchers have patented approaches that rely on microbial organisms to detoxify waste water. UCR water researchers are also known for their contributions to the study of drainage problems in California's Central Valley, the main source of California's agricultural production, and for modeling how climate change and pollution are affecting groundwater supplies.

Today, the United States and the rest of the world face special challenges in energy resources due to growing energy demands in the developing world, depletion of traditional energy resources such as oil and natural gas, and the need to curb carbon emissions. UCR is playing a role in the development of new materials and systems for providing clean, sustainable energy, a role that will expand in the future. UCR's most important contributions to energy supply have been in the areas of solar electricity and solar fuels. UCR engineers are currently working to produce materials that can be applied to walls and other surfaces on a massive scale, turning nearly any structure into a solar collector and allowing for the direct conversion of the sun's light and heat to electricity. UCR scientists and engineers have also developed innovative ways to convert biomass (waste materials) into fuels such as ethanol. In sun-drenched inland Southern California, it is particularly fitting that the University continues to harness the energy of the sun to human purposes.

The study of climate change, the conservation of clean air and water, and the further development in solar energy are central to the sustainability of the entire world. UCR scientists will help to lead the way in each of these areas, building on the expertise currently available on campus, while nurturing larger-scale research collaborations.

- ***Revitalizing Communities: Impact in Education and Social Policy***

Three institutions are central to the vitality of the places where we live and work: effective schools, well-run businesses, and capable, far-sighted governments (across the spectrum of e.g., state, county, city, and tribal governments). Through research and engagement, universities can contribute to the strengthening of these three essential community institutions.

Two keys to effective schools are, first, teaching strategies that improve learning for all students; and, second, practices and policies to reduce the educational achievement gaps between more and less advantaged students. Educational researchers in the Graduate School of Education (GSOE) have established strong relationships with local school districts to investigate reading and mathematics teaching strategies that produce strong results in student learning in elementary and middle schools. They have investigated the impacts of family structure, social network ties, and classroom environments on achievement gaps for children at risk. UCR also includes a strong program in higher education studies, whose faculty members' interests in student learning, as well as issues of access and affordability, are consistent with those of its K-12 researchers. Likewise, many faculty in CNAS and other colleges are highly committed to research and enrichment programs on campus designed to improve the pipeline of diverse students completing Ph.D. in STEM fields.

The current contributions of UCR faculty to social policy studies grow out of the work of two campus research centers: the Blakely Center on Sustainable Suburban Development and the Presley Center for Criminology and Socio-legal Studies. The Blakely Center has focused on studies of the relationship between demographic change and infrastructure requirements, surveys of regional social service uses, and studies of regional housing markets. The Presley Center is currently working to help local cities develop, implement, and evaluate policies designed to reduce youth violence. This research has led to the building of a neighborhood resource center as a hub and clearing house for activities designed to reduce youth violence. Other units are also increasingly involved in policy formation and analysis. Political scientists, for example, have organized annual conferences aimed at reforming immigration policy based on empirical research about immigrant communities. They have also developed experimental methods for examining public policy interventions and hold a regular "West Coast experiments" conference to assess the results of these efforts.

Unless the key problems of fiscal instability and social inequality are addressed, California's future will not be as bright as its past. The new School of Public Policy (SPP) consequently intends to build around the themes of financial and social sustainability. SPP researchers will investigate such topics as the redesign of local revenues and tax bases to avoid the specter of insolvency. They will also develop and test public policy tools to mitigate the consequences of de facto segregation by race, ethnicity, and socio-economic status.

California is the state with far and away the largest Native American population in the U.S., and UCR and our Palm Desert campus are in the heart of California Indian Country (on and near the homelands of the Cahuilla, Serrano, Chemehuevi, Luiseño, Kumeyaay, Cupeño, and Tongva Indians). Thus, an important dimension of revitalizing communities, including through the promotion of tribal sovereignty, can emerge from UCR's academic strength in the study of Native American social-cultural history and the policy scholarship of the California Center for Native Nations. By advancing a robust understanding of Native American history and issues, UCR can work to strengthen economic and political institutions in ways that are culturally appropriate for the needs of Native communities.

Improvements in public education, and the promotion of policy solutions for the tough problems of fiscal viability and social inequality are the building blocks of community revitalization in inland Southern California and beyond. These are challenges the university intends to take up even more vigorously with its community partners in the years ahead.

▪ ***New Voices and Visions: The Global Studio of the Creative Arts***

For the most part human beings experience the world in conventional and pre-structured ways. The arts probe and challenge these conventions. By their very nature, the creative and performing arts are oriented to developing new forms of expression and vision. They are, in this sense, one of the most important and natural centers of universities' efforts to "create the future."

UCR's creative and performing arts have a distinctive global orientation, which is fitting in the most diverse campus in the UC system and one of the most diverse campuses in the country. This global reach is evident when we look at the Department of Creative Writing, whose novelists, journalists, and poets set their work in such far-flung settings as Nigeria, Iran, and the borderlands between the United States and Mexico. It is evident in the Afro-Caribbean rhythms that influence the "hip hop" theater of the Department of Theater, as well as its provocative project on "staging the Middle East." And it is evident in the strong focus on ethnomusicology in the Department of Music.

Several of the arts departments have begun productive collaborations. The Departments of Theater and Creative Writing have developed a joint MFA in Creative Writing and Writing for the Performing Arts. The Department of Theater is transforming itself into a Department of Theater, Film and Television, with a research component in the Department of Media and Cultural Studies. Faculty members in Dance and Music work with humanities and anthropology faculty members on joint projects. UCR 2020 will encourage the deepening and extension of these collaborations.

The contributions of UCR creative and performing artists have brought individual artists acclaim, while bringing recognition to the campus. The John Simon Guggenheim fellowship is one of the highest recognitions available in the arts and humanities. Five members of the Department of Art alone have won Guggenheims. Faculty members in Creative Writing have won three Guggenheims, and faculty members in Dance two. Faculty members in the arts have also won two "Bessies" (the top New York Critics

dance prize), one Emmy, a National Book Circle award for fiction, an Edgar Allen Poe award from the mystery writers of America, and a PEN/O. Henry prize, as well as several other PEN USA prizes. The Ph.D. in Critical Dance Studies is the first of its kind in the U.S., providing an advanced interdisciplinary base for innovative research in the emerging field of cultural and historical studies of dance. It is a leading site in the U.S. for inquiry into the nature of corporeality and movement.

UCR has begun to build an important presence in the community through its arts programs. This presence includes, most notably, the downtown ARTSblock, which supports the revitalization of the City of Riverside, through the Sweeny Gallery and the California Museum of Photography. It also includes a long history of involvement in community performance through the Gluck Fellowships, which provide training and production opportunities to student performing artists. The campus itself thrives on activities such as Writers Week, the Spring Art show, Playworks, and campus symphony orchestra and choral performances.

Continued development of the arts is essential to the aspirations of the university to serve as a place of creative activity and inspiration for its students and for those living in its surrounding communities.

- ***Fundamental Research and Creative Activity***

Underpinning the six areas listed above are scholarly endeavors related to fundamental research and creative activity. These endeavors may range widely, depending on discipline, but they are essential to the advancement of knowledge. In the life and physical sciences, mathematics, and engineering, for example, fundamental research may engage the foundational questions that provide the building blocks of knowledge and further research. In the humanities and social sciences, such efforts may be directed toward deepening our understanding of the meaning, purpose, and context of the human experience – an interpretive exploration of historical and social phenomena. In the creative and performing arts, scholarly activities cultivate a sense of the aesthetic and enrich our lives.

To ensure that UCR faculty are supported in these efforts, a seventh area has been established to allow further engagement in this fundamental research and creative pursuits.

Innovation Incubator

Not all UCR faculty members work in one of the six strategic priority areas described above. These faculty members will not be excluded from opportunities to obtain seed funding for the development of new collaborations and centers of excellence, or to make hires in areas of campus strength. Instead, the campus will foster the contributions of these faculty members through the mechanism of “innovation incubator.”

Such proposals approved via the innovation incubator will provide support for up to one year of quarterly meetings. The only restriction on participation is that groups must number no fewer than four faculty members. In these meetings, collaborating faculty members will develop and discuss proposals for seed funding (or extramural funding). By the fourth meeting, cooperating faculty members will be expected to have produced a proposal addressing the eight criteria for

seed funding enumerated above, or to have developed a draft proposal for submission to a federal agency or foundation.

Through the mechanism of the innovation incubator, funding possibilities will be opened to faculty members whose work does not fall neatly into one of the six strategic priority areas. Faculty participating in such innovation incubator proposals will also gain the opportunity to enrich their ties to colleagues in other departments.