Research

Background

From its founding in 1965, UC Santa Cruz has progressively emerged as a research university of distinction, both among the other campuses of the UC system and among institutions of higher education nationally and internationally. Research has always been a fundamental part of our mission, integral to our mission of teaching and granting degrees to undergraduate and graduate students, and to our mission of providing service to the state of California. At UC Santa Cruz, research is expected of faculty and doctoral students in all disciplines; many of our masters students and undergraduates also participate in research. UC Santa Cruz's research takes place in a wide variety of formats, including laboratory and field work, interviews and ethnographic observation, design and testing of instrumentation, computational analyses, statistical analyses, archival- and textual-based scholarship, performances, and the exhibition of artistic works. Similarly, faculty and mentored student research, from doctoral to undergraduate, takes place in a wide range of sites and settings, including labs, libraries, document collections, studios and field sites on and off the UC Santa Cruz campus.

Key programs and individual faculty members have contributed to a reputation for research excellence, as our consistent top scores in international rankings for research impact and the high National Research Council ranking of some of our doctoral programs demonstrate. At the same time, it must be admitted, these indices of excellence and impact are unevenly distributed across the campus and disciplines. Significant strides in research productivity, among other things, would be a likely precondition of UC Santa Cruz's joining UC Berkeley, UCLA, UC Davis, UC Santa Barbara, and UC San Diego in the national consortium of research universities, the American Association of Universities (AAU), which recognizes a shared profile of research, graduate, and undergraduate excellence.

At present, research contracts and grants constitute a crucial part of the revenue of the campus, providing additional support for faculty and staff salaries, offering research funding for graduate students, maintaining and enriching campus infrastructure, and contributing to core campus funds. On the expenditure side, engagement in research entails extensive commitment of campus resources to laboratory spaces and equipment, personnel involved in research and grant support, compliance with federal and state regulation, support for government and industry partnerships, employment of post-doctoral and adjunct researchers, and release time of faculty from teaching. Total external funding for research, research expenditures,

and per-faculty funding and publication measures are key standards for understanding the overall strength of the research enterprise on our campus.

Research and teaching are two complementary ways that we translate our many-sided academic expertise into public good. Research affects the public through our discovery and translation of new knowledge into social and commercial impact, while teaching disseminates knowledge and trains students to learn throughout their life, in their further education, in their professional life, and in the full range of their civic and cultural activities. While public discourse about the university sometimes pits research and teaching against each other and question the effort and expenditures going to research, UC Santa Cruz strives to maintain a mutually beneficial relationship between the research and instructional aspects of our campus mission. Our students gain from working with faculty who are engaged in innovative research and participate actively in the research debates in their respective fields. Many undergraduates have the opportunity to take part directly in faculty-led research, which enriches their educational experience and prepares them for better placement in professional employment or graduate-level education. Training graduate students, especially doctoral students, is a key component of the UC mission, and graduate excellence without active faculty research is unthinkable. Many doctoral students are supported directly from faculty research grants, and all doctoral students, in their dissertation work, are required to conduct research that contributes to new knowledge in their fields.

Lastly, the impact and high reputation of our faculty research and the strength of our graduate programs are crucial attractions for star faculty to come to Santa Cruz and stay, despite competitive opportunities at other institutions. Similarly, our research excellence is an important attraction to industry and government partners, where our students may find valuable mentorship, internship, and placement opportunities.

Lessons Learned

UC Santa Cruz's ability to combine dedication to excellence in teaching with research has been a hallmark of the campus. Teaching both graduates and undergraduates has been a productive incubator for research, enhancing not impeding research excellence. We need to find new, more flexible ways to integrate research and teaching, understanding that one size does not fit all. We want to attract top senior researchers to campus; sometimes we have lost these candidates due to the course load associated with the job. Nonetheless, we do not want a two-tier system of research and teaching faculty. Our challenge is to develop a broader understanding of how faculty can contribute to our pedagogical mission, one attuned to the constraints and opportunities faced by particular researchers and the way their research activities ebb and flow in the changing research environment. We also need to encourage a more flexible conception of the student role in research, given that

the opportunity to mentor, teach, interact with, and learn from our diverse students, ranging from the doctoral to undergraduate levels, is one of the attractions of university partnerships. Finally, graduate growth creates new sets of demands when it comes to teaching. To the greatest extent possible, we need to integrate graduate training into our research and increase the degree to which research provides financial support and training opportunities for graduate students.

If we are to make the strides in research that we seek in the next five years and beyond, UC Santa Cruz must act upon the view that supporting research and fostering research impact are essential aspects of our campus's overall strategic planning, rather than just the individual responsibility of research faculty members or a specialized activity overseen and supported by the Office of Research. Various other offices and individuals must be involved in coordinated, strategic "impact management" for our campus's research. We need to work together to realize a campus-wide strategy in which public information, advocacy and government relations, nominations and prizes, commercialization and research transfer, and other drivers of research impact are optimally aligned. Our planning processes, hiring, and advancement procedures must be made to better reflect our strategic research and research-impact goals.

National/State Trends

The research funding landscape is changing, and becoming both more dynamic and less certain and reliable. Faculty members may find it increasingly difficult to rely on a steady stream of grants from federal agencies in order to conduct ongoing research and build research careers. Federal grant support for research has been flat overall, or even downward trending in some areas. It has also become less predictable, as the suspension of long-standing programs and even more spectacularly, the "sequester" of federal funding and the recent government shut-down demonstrate. A greater burden of supporting research has been transferred onto the sponsoring campuses, while some fund sources have dried up or shifted radically, interrupting on-going research and long-term career expectations of faculty. These pressures on federal funding have come at a time when tough budget conditions also brought cuts in state allocations, further restricting the ability of the campus to increase research support and development.

Research in the sciences and engineering funded by single investigator federal grants and research in the cultural disciplines conducted during campus-supported leaves and sabbaticals have both been critical to UC Santa Cruz's past research achievements, and no doubt they will continue to play an important role for many researchers. But they must also be increasingly complemented by new models of conducting and funding research, including more multi-investigator and interdisciplinary collaborations, a greater role for research centers and institutes in

supporting and disseminating research, and novel sources of research support beyond our past mainstays of federal grants and campus funds.

Our ability to sustain and expand our research enterprise must take into account these external trends, which set constraints on traditional ways of supporting research and create variable opportunities for different disciplines and research foci. Such uncertainty makes it imperative that UC Santa Cruz work to diversify our research funding sources, to seek funding from new sources (eg. foundations, industry, crowdsourcing, etc.), and to foster interdisciplinary and international collaborations to give faculty access to previously unavailable funding opportunities, and to be creative in the use of incentives and initiatives to jumpstart research projects that have high impact potential.

Strategic Themes

Research is integral to a wide range of UC Santa Cruz's current activities and future aspirations. Four themes emerge, however, as especially critical as we seek to frame and develop concrete plans and improved policies designed to grow the research enterprise:

- Expanding and improving research development services, shifting to a more proactive support and encouragement of investigators in pursuit of research opportunities;
- Expanding the integration of teaching and research across the disciplines and at our different levels of teaching, to the mutual benefit of both missions;
- Developing an integrated campus-level strategy for institutional support of research, which will leverage new external resources and catalyze advancement of research across the disciplines through critical infrastructure;
- Expanding analytical capabilities for managing opportunities and validating strategies, and for tracking and evaluating progress toward goals in order to provide feedback and accountability for performance.

Opportunities

To maximize UC Santa Cruz's research potential and reputation in the nearer term, the following actions to manage opportunities generally are recommended:

- Identify, cultivate, and optimize under-utilized sources of research support, and address gaps in faculty and graduate student participation in research;
- Publicize more effectively, to the benefit of our research reputation and impact, the research accomplishments of our faculty;

- Increase support for our graduate growth goals through the growth of research funding to incentivize closer ties between research activity and doctoral training;
- Leverage experience gained from larger-scale projects (e.g., NASA NAMS re-compete; Cancer Genomics Hub) to facilitate and support other complex, multiple-PI research centers and projects;
- Strengthen the existing network of research development staff and institutional infrastructure, to achieve coordinated progress on campus research goals and to more effectively connect with external collaborators.

As we proceed, we need to define carefully the application and appropriate metrics across the disciplines: for example, the different status and character of larger, collaborative projects in the STEM (Science, Technology, Engineering, & Mathematics) and non-STEM disciplines. We should plan and prioritize campus research investments in seed-funding, infrastructure and staffing, and other institutional support, utilizing the campus data and faculty-informed benchmarks / goals.

The use of better data and relevant comparisons / benchmarks will be of benefit to faculty across the campus. It allows a clear picture of the differential levels and sources of extramural funding available to faculty in various disciplines and sub-disciplines, and it measures UC Santa Cruz's situation against relevant norms and establishes reasonable, evidence-based aspirations for improvement. We will be able to encourage improvement from all programs and disciplines without viewing this improvement in a one-size-fits-all frame. Increased capacity to use metrics to inform research-related decisions will also allow a clearer picture of the potential tradeoffs between sustaining and strengthening existing research areas, fostering new areas of promise, and taking relatively under-performing areas to greater strength. The campus should develop a culture of making nuanced, impactful decisions whose grounds can be clearly communicated to the campus and external stakeholders.

Short and Long- Term Plans

We should plan to build up the Office of Research capability to develop and coordinate strategy for campus research development that will sustain our high research impact while growing and generalizing research across the campus. UC Santa Cruz's research development effort should define a clear progressive path from removing bureaucratic or policy obstacles to investigator initiatives, to actively encouraging and facilitating investigator initiative, to proactively seeking out and catalyzing research opportunities. These do not represent successive stages, but shifting emphases within the overall, on-going improvement of our research development efforts as we gain experience, knowledge of opportunities, and the practical confidence of our faculty.

This new Office of Research effort should embrace a wide range of potential dimensions: sponsored projects, industry and foundation opportunities, partnership arrangements, entrepreneurial opportunities and research transfer. Furthermore, we need to coordinate more effectively between the Office of Research and University Relations for a mutually beneficial relationship between research and philanthropic goals. To the greatest extent possible, our research should serve to leverage institutional giving, while in turn, philanthropic giving can provide crucial support for research growth and enrichment.

Our understanding of faculty's required participation in undergraduate and graduate teaching must become enlarged and flexible. Instead of returning to campus to teach large lectures, for example, faculty working in Silicon Valley might be expected to act as advisors for undergraduates doing internship or working on independent studies. The same might go for some campus-based lab scientists working on large projects. We also need to recognize the seasonal nature of academic careers. Faculty working on large, ambitious projects need time to devote to them. Instead of imposing a one size fits all requirements, we need to take the longer view. By shifting emphasis back and forth between teaching and research over time, a faculty member often can achieve greater excellence in both. We also need to recognize that the relationship between research and teaching varies enormously depending on the academic field, with faculty in different disciplines experiencing a broad range of productive integration and tension between research and instructional activity. Through integrated campus initiatives and challenges, we should encourage innovative research, new programmatic contents, and novel pedagogical methods in integrated research-curricular "centers of excellence."

Research support will need to become more diversified and may require new thinking, new collaborative connections, and new approaches. At the same time, outside funding will be increasingly critical to provide resources for graduate training if we are to grow our graduate programs to reflect our already strong research profile. Outside agencies often approach faculty with requests for projects focusing on problems of commercial, governmental, or public interest. These offer a perfect opportunity for graduate training and professionalization. Involving graduate students is a way of developing relationships with partners beyond the university. We must focus effort and resources on cultivating such partnerships, developing both their depth and breadth across the disciplines and extending them to a greater variety of companies and agencies. Access to opportunities to teach and advise students can, reciprocally, serve as a point of attraction for independent researchers from industry, government, and other external agencies. Our faculty and students benefit from these relationships, and programs leverage additional curriculum, research opportunities, and in some cases extramural support associated with these researchers. We must find creative ways to take advantage of their eagerness for

contact with students, removing obstacles to collaboration and augmenting our faculty time and resources with their contributions.