

A modern public university

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The increasing complexity of teaching and research poses significant challenges for public universities. The University of California, Berkeley, might provide a successful model for the 21st century.

As information technology fuels the expansion of knowledge at an ever-accelerating pace, universities everywhere are confronting the question of how a successful university should be structured in the 21st century. In the past decade, changes have swept European university systems from Britain through Switzerland to Germany. In the United States, publicly funded universities are facing a growing gap in trying to remain at the forefront of higher education and research while competing with private universities with wealthy endowments. My own institution, the University of California Berkeley (Fig. 1), widely regarded as one of the world's leading public universities, must consider how to maintain and enhance its success as a pre-eminent academic leader while still retaining its distinct public mission and character. This is our challenge for the 21st century.

American public universities have as their primary mission to provide excellent educational opportunities to the entire population and to serve the public good. Public universities are pivotal in realizing society's potential for opportunity, social justice and prosperity — extending the public good for the benefit of all people.

Berkeley is the oldest in a state-funded University of California (UC) system that is considered the best in the nation, consisting of ten campuses across the state. As the flagship of the UC system, in a state that is now the seventh-ranking economy in the world, Berkeley plays a special role in higher education within California and the US. For many decades, Berkeley has excelled at teaching and research. Students are taught by some of the world's finest faculty, including, at the present

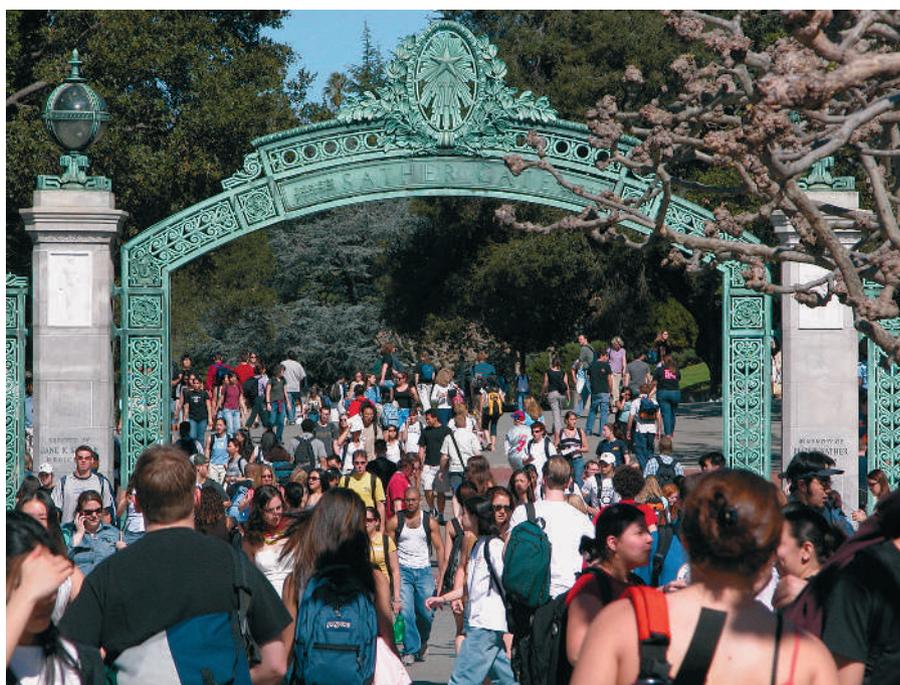


Figure 1 Students passing through Sather Gate, the south entrance to the Berkeley Campus.

time, seven Nobel laureates. Young faculty are chosen for their potential to make profound advances in their disciplines. There is nothing more exciting than studying with a faculty member who makes a discovery that changes the paradigm in his or her field and then brings it to the classroom the next day.

By agreement with the state, 90% of Berkeley's 24,000 undergraduates are residents of California, and they are typically among the top 4% of graduating high-school seniors. The profile of the Berkeley student body reflects an unusual

meritocracy, with admission granted on a comprehensive basis, not by test scores alone. One-third of Berkeley's undergraduates come from impoverished families, are the first in their families to attend college, and are funded generously by needs-based scholarships and government grants. This is a significantly larger number of such students than those in America's elite private universities. Berkeley undergraduates not only receive an excellent education, but more of them go on to receive PhDs than those of any other university in the US. In educating a

large number of people very well, Berkeley provides the same quality of education as the elite US private universities, at a fraction of the cost to the student, and thereby serves as an effective conduit for social mobility. One of the significant challenges facing Berkeley is that our student body is not appropriately representative of the people of California. African-Americans, Chicano-Latinos and Native American populations are particularly under-represented.

Berkeley is best known globally for its 105 graduate programs that span 130 departments and 14 schools and colleges. Of Berkeley's graduate programs, 97% are ranked among the top ten in the US in the most recent study by the National Research Council (*Research-Doctorate Programs in the United States. Continuity and Change*; National Academy Press, Washington, 1995). We compete with other leading universities for the best graduate students nationally and globally. About 20% of our approximately 10,000 graduate students are international (Fig. 2). Public universities generally charge higher fees to non-resident students, so the cost of supporting international students is a greater burden to departments. Our surveys have shown that a small difference in stipend can determine whether or not a student chooses Berkeley over another of our competitors. Accordingly, raising endowment for graduate student support is a top priority. The immigration debate is a major issue in the US. American universities are united in the view that foreign students enhance the research and education that we provide. Our country can only benefit by welcoming international talent.

There is a continuing need for any university to maintain a world-class faculty, staff and infrastructure in order to remain competitive. Berkeley's first priority is to hire, nurture and retain a diverse faculty that leads the world in research and education. Our emphasis is on hiring faculty in early stages of their careers and giving them as much independence as possible. From my perspective, the faculty who will have the greatest impact in the 21st century will be those who move across disciplinary boundaries effortlessly. Today's especially challenging problems — discovering new energy resources, abating global poverty, mitigating life-threatening diseases — require the attention of many academic disciplines coming together to seek solutions, and new models to support them.

Berkeley has excelled because of its very strong departmental structure, but has also been forward thinking about new, more fluid models that bring disciplines together. For example, Berkeley's current pre-eminence in the life sciences rests on a decision made 25 years ago, when the traditional disciplines took a collaborative approach to the new field of microbiology. As a result Berkeley is now among the world leaders in molecular biology. Today, life-science research is progressing towards problems of increasing scale and complexity with solutions rooted in the quantitative sciences: mathematics, physics, chemistry and engineering. The next revolution in scientific discovery will depend on scientific interdependence. How we catalyse interdependent and multidisciplinary research will be an important challenge that significantly shapes the profile of public universities.

This autumn we will be opening a new biosciences building that will house the Biomolecular-Nanotechnology Center, the largest MRI facility in Northern California and the Berkeley site of the California Institute for Quantitative Biomedical Research. The research that will be stimulated here, at the crossroads of multiple disciplines, holds the promise of transforming human health, energy, and the environment.

Similarly, as the world faces ominous predictions of disastrous climate change, alternative clean-energy is emerging as one of the most urgent and important themes for large-scale research. California is a national and global leader moving towards a sustainable energy future and it is in the public mission of universities to help find ways to meet this goal. For the past two and a half years, the Lawrence Berkeley National Laboratory (LBNL) and UC Berkeley have been developing a bold research agenda called 'Helios', exploring solar energy devices from photovoltaics to microorganisms.

UC Berkeley together with LBNL and the University of Illinois at Urbana-Champaign recently won a 10-year \$500 million grant from BP for research on developing biofuels; this will result in the establishment of the Energy Biosciences Institute (EBI). EBI will also explore the economic and social issues in finding better, cleaner transportation fuels. Over the next decade, it is anticipated that the campus and LBNL will generate approximately \$1 billion in funding for research in solar energy with the funds coming from federal agencies, foundations and donors, including a \$70 million state investment for the Helios/EBI building.

The EBI model is an unprecedented collaboration for public universities with industry, structured to bring advanced biofuels from the laboratory to the fuel pump as soon as possible and on a global scale. The commercial applications derived from university discoveries need partners in the private sector; indeed some federal funding agencies require this translational component in competitive grant applications. Iowa State University is partnering with ConocoPhillips and UC Davis with Chevron, although both at a much smaller scale than UC Berkeley and BP. Public-private partnerships hold much promise for connecting research with practical applications as long as the rights and freedoms of our faculty and students as well as our industrial partners are protected.

There are many more multidisciplinary research initiatives that play a central role at Berkeley, addressing other global challenges

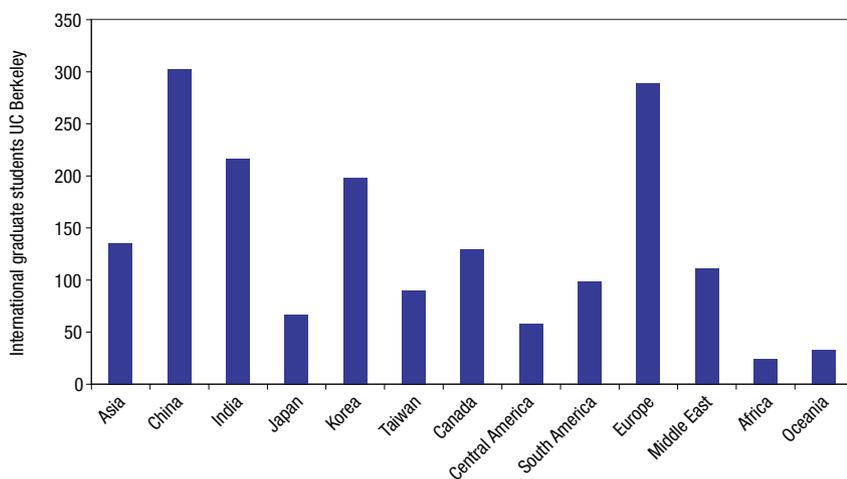


Figure 2 International graduate students at UC Berkeley. The data is from autumn 2006, and includes 1,751 students from 95 countries.

such as healthcare, global poverty and ethnic diversity. Such approaches are of course not unique to Berkeley, but the range of our academic programmes and their consistently rated excellence create a propitious environment to achieve enduring results.

Multidisciplinary centres pose a number of funding and logistical challenges. Who takes responsibility for the start-up costs for these centres? Typically, new initiatives are covered by the budgets of the home department. We have coped with part of this expense with capital works programs for new buildings that house a fluid model where office space is not permanently assigned.

How do universities best incorporate multidisciplinary initiatives into their existing academic structure? This is proving to be a challenge because teaching programs are primarily department based. Administratively, how does one give credit for teaching in a centre and also the home department? Hiring of additional staff helps to address these tensions, but there is still much more work to be done to facilitate new workable structures for multidisciplinary research.

The challenges posed by these centres indicate the broader funding difficulties of public universities. We are in the ironic position that to guarantee our public character, we need to increase substantially our private support. Most public universities have been raising fees — some like the University of Michigan are taking more high-fee-paying non-resident students — all are looking to increase private giving.

The funding model for private US universities has been phenomenally

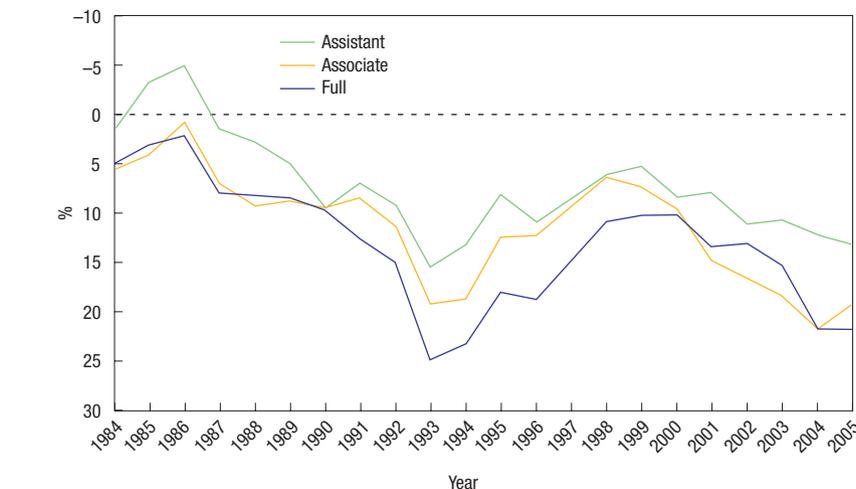


Figure 3 Mean faculty salary gap between Berkeley and peer private institutions. Comparison is made for assistant, associate and full professors. The private institutions include Harvard, Yale, Princeton, Stanford, MIT and Caltech. Source: AAUP Faculty Salary Survey, 1984–2005.

successful. Many of the elite US private universities now have endowments that are of the order of \$1 million per student. With the exception of the University of Texas system, public universities, including the Universities of California, Michigan, Minnesota, Virginia and Washington, have endowments that are modest by comparison. As of 2006, Berkeley's endowment totalled \$2.4 billion, which is distant from Stanford's \$14 billion, not to mention Harvard's \$30 billion. Adequate endowment could ensure for the indefinite future that every undergraduate student could attend Berkeley independent of family resources, and that our faculty and staff could be paid competitive salaries (Fig. 3).

The public structure of a university such as Berkeley is both the cause and the result of its ability to undertake complex initiatives and create real-world applications. Much of the educational territory ripe for opportunity in our time requires the attention of many disciplines, each pursuing undirected basic research that can result in revolutionary breakthroughs, while making critical connections to solve some of the world's great challenges. Berkeley is especially well situated to meet these difficult questions because of the phenomenal breadth and depth of our faculty's expertise and our students' talents. This, I believe, is a successful model for public teaching and research universities in the 21st century.