

THE FUTURE OF THE UNIVERSITY OF CALIFORNIA

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September 1998

The role of knowledge in transforming virtually every aspect of our world has moved research universities like the University of California to center stage of American life. More than any other institution in our society, research universities are on the cutting edge in producing the well-educated people who drive our economy and the new research ideas that keep it growing.

The tradition of research universities has been to value knowledge for its own sake. However, society's increasing need for applications of knowledge has placed new demands on these institutions, including the University of California, as we move into in the twenty-first century. I want to discuss the organizational changes, goals, and initiatives UC needs to pursue to meet these demands and to sustain itself as a great university. These reflections do not cover all the issues of importance to the University. Instead I am concentrating on a few of the trends that, in my judgment, will shape our future as a particular kind of university during a particular period in its history. I should emphasize that these are personal views. They have not been fully discussed with Regents, Chancellors, faculty, or other members of the University community.

Assumptions

I begin with some assumptions. The first assumption is that California will continue its 38-year commitment to the Master Plan for Higher Education. The combination of record numbers of students and constrained funding for higher education over the next two decades will test California's will to keep the Master Plan's promise of access, quality, and affordability. But although some details of the Master Plan may need to be altered to address new circumstances, its central idea--the concept of three public segments (the University of California, the California State University, and the Community Colleges) with different missions, admission standards, and responsibilities--should endure because it serves this state so well.

My second assumption is that the University of California's future is committed to the notion that we will remain a research university. And by the term "research university" I mean an institution in which the search for knowledge is at the center of everything we do. This does not mean a university in which research is carried out at the expense of undergraduate education. Rather, a university in which, in the words of a 1974 University of California mission statement, every responsibility is "shaped and bounded by the central and pervasive mission of discovering and advancing knowledge."

Research universities in a knowledge-based society

For 50 years we have had a good understanding of the role of education as a driver of the economy, but it is only in the past 10 to 15 years that we have begun to fully understand the impact of research and development (R&D) on economic growth. A substantial literature on this

subject has evolved, which has led to a development in economics called "new growth theory." This work is nicely summarized in a report by the Council of Economic Advisers: 50 percent of American economic growth since World War II has been the result of investments in research and development.⁽¹⁾ Obviously, the private sector is a major driver of R&D, but federally funded research in universities like UC also plays a key role. The literature also supports the conclusion that when investments in university research increase, there is (with an appropriate lag) a corresponding increase in private-sector investments.

No state in the country illustrates the connection between knowledge and wealth more vividly than California. Almost all of the industries in which California leads the world--biotechnology, software and computers, telecommunications, multimedia, semiconductors, environmental technologies--were born of university-based research. Hewlett-Packard, one of the top ten exporter companies in the United States, estimates that over half of its revenue comes from products that were developed within the past two years. More and more of these products are emerging from work done at universities.

Ensuring strong economic growth has implications beyond simple dollars and cents. The state and the nation face tremendous problems--deteriorating inner cities, homelessness, degradation of the environment, the prospect of a huge number of baby-boomers retiring with a far smaller workforce to support them in their retirement. How are we going to deal with these problems? There is only one way--we must have substantial economic growth. This requires investments in university-based research and a highly educated workforce. The link between California's success and the success of its universities is clear and direct.

Even as research universities are being called on to contribute more to economic vitality, they are being transformed by a revolution they themselves helped create. The way learning takes place--the interaction between teacher and student--has not varied much since the time of Plato's Academy over 2,000 years ago. But today, computer and communication technologies are creating a dramatically different environment.

Videoconferencing, interactive instruction via the Internet, and various forms of computer-assisted learning are transforming the educational process throughout the University of California. There are many examples, but one of the most exciting is the recently established California Digital Library (CDL).⁽²⁾ This is a virtual library that will make UC's digital collections--not just books but works of art as well--available via computer to UC faculty and students. Ultimately, the CDL is intended to be California's library, open to all the citizens of this state. We will accomplish this goal through a partnership with the California State Library and California library leaders to employ the CDL as the primary means of making digital library services available throughout California.

The California Digital Library illustrates how learning is beginning to transcend the conventional limits of time and space that have bound universities to a particular place and a particular schedule. The term "lifelong learning" takes on new meaning in light of the capacity of these technologies to reach people beyond the doors of our campuses, in their homes, offices, and community centers.

What these two phenomena--society's growing dependence on knowledge and the technological revolution in education--will ultimately mean for the organization and role of universities is a topic we have barely begun to understand. But it is clear that we need to look at the University anew in light of both the demands and the possibilities of a knowledge-based society.

UC as a collection of ten research universities

Such a knowledge-based society requires a university sufficiently large in scope to span the map of knowledge but flexible enough to respond to the economy's shifting demands for educated people and the research necessary to keep productivity growing. What does this suggest for our vision of the University?

We envision UC as a collection of ten research universities--as a single but not a monolithic institution of ten campuses--not all identical and not all moving toward the same template. Just as Princeton and the University of Michigan are both research universities but clearly different in size, in the array of academic disciplines, and in the make-up of their professional schools, so the University of California's campuses can be seen as variations on a single theme, each pursuing excellence in different ways.

What are the implications for the future of viewing UC from this perspective?

- Each campus will be differentiated, even at the level of individual disciplines. All campuses will have mathematics and history, for example, but not every sub-field. This is consistent with the philosophy that guided the creation of three new UC campuses in the 1960s, each distinctive in academic emphases, organization, and physical design. The idea was not to replicate Berkeley or UCLA but to develop new university options for the people of California. And the fiscal reasons are clear: prospects for State support are such that we cannot afford to offer the complete array of disciplines and subdisciplines, graduate and undergraduate courses, at every campus.
- There will be greater decentralization of authority from the Office of the President to the campuses. This, too, is consistent with trends in the University's development since the late 1950s. At the same time, the Office of the President must play a leadership and coordinating role, as, for example, ensuring that all campuses comply with Universitywide policy and regulations, evaluating the quality of programs systemwide, and determining which fields to emphasize at which campuses. An example of the Office of the President's role in setting systemwide academic priorities is UC's engineering initiative. Business leaders have expressed their concern that unless this state produces more engineers, California companies cannot remain competitive. Our own studies have substantiated this concern. In response, the Office of the President initiated a plan to increase significantly undergraduate and graduate enrollment in engineering and computer science programs across the UC system.
- The reciprocal of greater decentralization is greater accountability. Campuses will be held responsible for fulfilling campus and Universitywide priorities, while the Office of the President will concentrate on outcomes and monitoring accountability.

- The ratio of graduate to undergraduate students will vary from campus to campus, department to department, discipline to discipline. Traditionally this ratio has been driven more by the teaching and research needs of faculty than by the marketplace. In the future the marketplace will be a principal determiner of how many doctoral students we produce in various fields.⁽³⁾ Over the past several years we have been modifying our graduate enrollments in various disciplines as a function of student demand, market demand, societal need, and our ability to support graduate students. I do not mean to imply that the University's current graduate enrollments are too high; in fact the opposite is the case. The proportion of graduate students at the University has declined from 29.4 percent in 1960 to 17.8 percent today. To put these figures into perspective, it is useful to look at graduate enrollments at the eight universities with which UC compares itself for faculty salary purposes. As of 1993, the percentage of graduate and professional students at UC's public comparison institutions averaged 30 percent; the average for our private comparison institutions was 52.8 percent. It is clear that, at less than 18 percent, UC's graduate enrollments are far too low.
- To help the University maintain both quality and access, campuses have been given greater flexibility in how they use resources. Campuses have freedom to set campus priorities and deploy resources, but they also have to enter into an agreement with the Office of the President that reflects both universitywide and campus-specific expectations.

Goals and initiatives

The purpose of these changes is to organize the University to carry out its missions of teaching, research, and public service in ways that capitalize on its strengths and that respond to society's demands for new knowledge and well-educated people. Meeting those demands will require that we pursue the following goals and initiatives.

- The quality of the entire University enterprise depends on the quality of its faculty. UC's ability to recruit and retain the very best scholars and scientists is fundamental to its capacity to remain a great university.
- The University must be prepared to educate its share of the estimated 538,000 new students seeking a college or university education between 1994 and 2005--an increase in enrollment demand of 31 percent for California higher education generally. According to the California Education Round Table, these figures translate to an enrollment growth rate two and a half times that expected for the nation as a whole. The shorthand term for this phenomenon is Tidal Wave II, and it is surely the single most significant issue facing higher education in this state. We estimate that UC will grow by about 45,000 students between now and the year 2010, with almost half of that expansion occurring before 2005. UC's planned tenth campus in Merced, which will open its doors in 2005, will help accommodate some of this demand.
- UC plays a critical role in research as it affects the economic vitality of California. UC will not become a "job shop" for industry, and will not compromise the quality, independence, or breadth of its research enterprise. What we will do is explore new forms

of collaboration with industry to bring UC's tremendous intellectual resources to bear on stimulating productivity and economic growth. The UC Industry-University Cooperative Research program is an important step toward that goal. Its aim is to build partnerships with industry to mine promising research areas for new products and processes that will create jobs and prosperity for California. The doubling (from 12 to 24 percent) of the tax credit industries receive for investing in university research makes this an especially auspicious time to expand research partnerships with industry. The tax credit encourages more industry investment in R&D generally; UC's cooperative research program targets specific, next-generation research in areas of California's greatest strength and opportunity. Together, they offer an historic opportunity to forge a strategy for California's economic preeminence into the next century.

- We must maintain UC's world leadership in the application of digital technology to problems of instruction. An incredible array of instructional technologies has been developed on each of our campuses, and we must continue to be a leader in this field. We want to be sure, too, that the K-12 schools are on the cutting edge of instructional technology. Toward this goal, we have mounted a systemwide initiative called UC Nexus to promote a statewide partnership between UC and the K-12 schools in encouraging high-quality teaching and learning through instructional technology.⁽⁴⁾ UC's role will be to help train and support teachers in the use of computers for instruction and to help develop K-12 curricula.
- The University will explore new paths to teaching and learning. Among these paths will be closer linkages between the campuses and University Extension. The emergence of new professions, the restructuring of the workplace, and the transition to an information-based economy are requiring individuals to renew skills throughout their lifetimes. This means that today UC Extension is more important than ever: it offers continuing education to over 500,000 Californians annually, at no cost to the State, and there can be no question about the excellence of its contributions to educating California's workforce. But I believe our view of Extension's potential has not been broad enough, and that this potential can be best realized by integrating Extension more closely into the University as a whole. A new initiative called the Master of Advanced Study is a step in that direction. This program will offer professional education and liberal studies beyond the bachelor's degree at times and places that are convenient for working adults. Courses will be offered by UC academic departments in partnership with University Extension, and the curriculum will be supervised by regular faculty members.
- Every university worthy of the name embraces a diversity of thought and opinion. As a public university in one of the most diverse states in the nation, the University of California has the further obligation of reflecting the mix of the state's population in the mix of its students, faculty, and staff. Both forms of diversity--a wide range of intellectual perspectives and a broad representation of California's population--are indispensable to our mission as a public university.

In enacting new policies on graduate and undergraduate admissions in July 1995, The Regents called for a task force on outreach to help establish new paths to diversity. The Outreach Task Force finished its work last year and The Regents approved its recommendations. To implement

the Task Force's report, we have launched a major initiative called the Outreach Action Plan. We are committed to doubling our investment in outreach from \$60 to \$120 million a year. At the heart of the plan is a renewed partnership between the University and the K-12 schools. Implementation of the Outreach Action Plan is among the University's highest priorities.

Scholarship and teaching in a research university

The most important single contribution we can make to California--the one from which all others flow--is to keep the University intellectually vital. To accomplish this, we need a broad range of intellectual activity both in and across disciplines. Research is constantly exploring the boundaries between what we know and what we do not know. Sometimes the pace of discovery is greater in one discipline or era than in another, as in the blossoming of art in fifteenth-century Florence or the revolution in physics early in this century. But the exploration of all domains of knowledge is the daily business of the University. As one scholar has put it, lyric poetry and magnetic resonance imagery may be very different, but both are ways of giving us access to information that would be otherwise inaccessible. We do not expect every faculty member to win a Pulitzer Prize or become a Nobel Laureate. We do expect every faculty member to be engaged in innovative and intellectually challenging work.

And part of that innovative and intellectually challenging work is educating undergraduates. As a research university--not a research institute--we regard students as indispensable to everything we are and aspire to be. Given public perceptions about the academic performance of American students and the problems of American schools, it may come as a surprise to some that the students who enroll in the University today are the best prepared in history. These students are entrusted to us during what is, for many of them, one of the most critical and intellectually passionate periods of their lives. The process of education should help them focus their curiosity and enthusiasm and bring them into contact with the rigor and objectivity that are essential to the life of the mind. A research university--full of bright individuals with their own passionate commitments to learning--is a wonderful place in which to pursue such an education.

Much has been made in recent years of the notion of a core curriculum--a specific body of knowledge every student should master. Everyone has a different prescription for what the core curriculum should include. I am less committed to a core set of ideas. Rather, I prefer the Aristotelian approach that stresses knowledge of many areas and deep experience in at least one. My conclusion after many years on the San Diego campus--where five undergraduate colleges offer five core curricula, all different, all rigorous, all intellectually demanding--is that there are many equally valid curricular paths to intellectual growth.

What is ultimately going to matter to students when their college years are over is not the particular books they read or the specific curriculum they followed but the cognitive skills they acquired. An in-depth knowledge of a particular subject is essential to knowing how to *do* something--to make a life's work. To master knowledge in one domain is also to master the grammar of learning, the intellectual and problem-solving skills that can be applied to learning virtually anything. Every student who possesses this grammar has the foundation on which future learning can be built.

In recent years there have been thoughtful dialogues in the University of California about undergraduate education with impressive results.⁽⁵⁾ Our undergraduates have the opportunity to engage in supervised research and to learn in an environment of discovery from professors who are on the cutting edge of new developments. Those students who can thrive on its demands find that education at UC offers unrivaled opportunities for learning. Students graduating from UC leave with a superb intellectual foundation and they make a contribution to this state precisely because they are so well educated.

One of the criticisms often leveled at research universities is that they do not adequately reward the faculty for excellent teaching. The report of UC's Universitywide Task Force on Faculty Rewards emphasized the importance of recognizing "the scholarship of integration, application, and teaching" as well as "the scholarship of discovery."⁽⁶⁾ Furthermore, academic career rhythms are not uniform, nor is the relationship between research and teaching the same in different disciplines.⁽⁷⁾ The Task Force recommended that criteria for advancement be flexible in allowing faculty to shift emphases on teaching and research over the course of their careers. We need this kind of flexibility not just for the sake of our faculty but also for our students, who deserve exceptional teachers and teaching.

Concluding remarks

The University of California is an \$11.5 billion-a-year enterprise. The State of California contributes about two billion of that \$11.5 billion, which means that for every dollar the State provides we generate almost five dollars in other funds.⁽⁸⁾ One reason is that UC is a major recipient of federal research dollars, attracting over 10 percent of all federal funds spent on research in American universities.

Because of its extraordinary size and unparalleled strengths in teaching, research, and public service, the University of California is a major contributor to the well-being of the state and the nation. The University's future, therefore, matters far beyond our campuses and research stations. What more can we say about where UC is headed?

Externally, the University is moving towards closer integration with society because of the tremendous potential of knowledge to leverage economic growth and to improve the quality of life for Californians. Internally, the University is moving towards greater autonomy for individual campuses and new ways of providing education and performing research. Another way to put it is that the future is drawing the University of California in two seemingly contradictory directions. One direction is towards greater diversity and decentralization as a strategy to use our resources most effectively. The other direction is towards greater unity as a result of the revolution wrought by the marriage of computers and telecommunication, which is opening up new modes of learning and expanding exponentially the boundaries of the university.

The future of the University depends on our success in balancing the tensions and opportunities inherent in a ten-campus enterprise. This means realizing the possibilities of our unity as well as our diversity. In the past, thanks to a fortunate combination of leadership, circumstances, and determination, UC has been one of the most successful balancing acts in higher education. Our responsibilities in today's knowledge-based society require us to embrace the future with realism,

intelligence, and a clear sense of the University of California's destiny as this nation's preeminent example of that vigorous American hybrid, the research university.

Endnotes:

1. "Supporting Research and Development to Promote Economic Growth: The Federal Government's Role," The Council of Economic Advisors, October 1995.
2. "California's Library Without Limits," University of California Office of the President Web page, <http://www.ucop.edu/ucophome/pres/>.
3. "The Numbers Game and Graduate Education," University of California Office of the President Web page, <http://www.ucop.edu/ucophome/pres/>.
4. "The Schools and UC: A Commitment to the Future of California," University of California Office of the President, January 1996.
5. See, for example, "Lower Division Education in the University of California," University of California Task Force Report, June 1986.
6. "Report of the Universitywide Task Force on Faculty Rewards," University of California Office of the President, June 26, 1991.
7. Richard C. Atkinson and Donald Tuzin, "Equilibrium in the Research University," *Change*, May/June 1992.
8. "UC Means Business," University of California Office of the President, 1995.