The Regents of the University of California

COMMITTEE ON EDUCATIONAL POLICY
November 16, 2000

The Committee on Educational Policy met on the above date at Covel Commons, Los Angeles campus.

Members present: Regents Atkinson, Bagley, Bustamante, Connerly, Davies, O. Johnson, Fong, S. Johnson, Lansing, and Montoya; Advisory members T. Davis, Morrison, and Seymour

In attendance: Regents Hopkinson, Khachigian, Kohn, Kozberg, Lee, Miura, and Preuss, Faculty Representatives Cowan and Viswanathan, Secretary Trivette, General Counsel Holst, Interim Treasurer Bowman, Provost King, Senior Vice Presidents Darling and Mullinix, Vice Presidents Broome, Drake, Gurtner, Hershman, and Saragoza, Chancellors Berdahl, Bishop, Carnesale, Cicerone, Dynes, Greenwood, Orbach, and Yang, Vice Chancellor Desrochers representing Chancellor Tomlinson-Keasey, Executive Vice Chancellor Grey representing Chancellor Vanderhoef, and Recording Secretary Nietfeld

The meeting convened at 9:03 a.m. with Committee Chair Montoya presiding.

1. **APPROVAL OF MINUTES OF PREVIOUS MEETING**

Upon motion duly made and seconded, the minutes of the meeting of September 14, 2000 were approved.

2. **REPORT ON GRADUATE EDUCATION INITIATIVES**

Provost King explained that the presentation on graduate education initiatives had several purposes:

- To outline the importance of the University's plans to increase graduate enrollments substantially;
- To demonstrate the need for enhanced graduate student financial support for accomplishing that planned growth; and
- To point out issues about UC's competitiveness for attracting graduate students.

Provost King recalled that for many years the University had emphasized the importance of educating undergraduate students. While undergraduate enrollment has doubled in the past thirty years, graduate enrollment has grown hardly at all. As a consequence, the percentage of graduate students has decreased from 30 percent thirty-five years ago to 17 percent today. The University's

percentage of graduate students is much lower than the percentages at UC's four private comparison institutions and also lower than at the four public comparison institutions, for both graduate academic and professional students.

Provost King observed that these statistics do not convey the full dimensions of why growth in graduate enrollment is important. California needs a highly skilled workforce. Because its economy is based heavily upon innovation, California must rely on highly educated professional workers to provide a competitive advantage in the global marketplace. The University's role is apparent in industries such as biotechnology and electronics. This role will become more important as emerging industries continue to locate near UC campuses in order to capitalize on collaborations with faculty and graduate students and to be near sources of future employees.

In addition to the needs of a technology-based economy, California faces many social challenges that require highly trained individuals who can think creatively in order to analyze and solve problems as they shape the future of the state.

California's college students will need dedicated, well-prepared faculty to teach them. California's higher education institutions depend heavily on the University of California for their faculty. One of every five UC and California State University faculty members holds a UC doctorate, and over the next decade thousands of new faculty across all fields will be needed to teach the increased numbers of students who constitute Tidal Wave II. The University is planning to add 11,000 graduate students over the next decade. Given the undergraduate growth that is also planned, this planned increase will bring graduate enrollment up to18 percent of total general campus enrollments by 2010-11.

Provost King turned to the issue of financial support, noting that graduate and professional education are different from undergraduate education and from one another. The primary goal of undergraduate education is to provide a foundation of knowledge and analysis across many disciplines. The University has stressed access for California's students in its admissions process. The focus in financial aid is on ensuring that no one is unable to attend for financial reasons.

For professional students, the educational purpose is to produce graduates who will contribute to the professional workforce of California. Many of these professions generate high earning power for the student. The focus in admissions is national, but the proportion of California residents is high. The financial aid offerings vary by field but tend to be limited because of the potential earning power and the short length of the programs. As a result, financial support for professional graduate students consists of a much higher percentage of loans than for other students. There is also a significant amount of fellowship support.

Graduate academic students are primarily those enrolled in Ph.D. programs which require intensive study, highly honed analytical skills, and original contributions to knowledge. These graduate

academic programs are designed to foster creativity and create researchers and scientists for both universities and the private sector, as well as the faculty for the next generation of undergraduates. During their studies, these students are apprentices to and colleagues with the faculty in the research and instructional enterprise. The University seeks to attract the highest-caliber students from across the country to its graduate programs. A high proportion of the Ph.D. recipients choose to remain in California and to contribute to its economy.

Graduate student financial support is based in part upon the fact that it is directed at independent adults who do not rely upon parental support. The University competes with other institutions and the workplace for its graduate students, and the financial aid it provides must reflect this fact. The University provides student support with a more complex structure of funding sources than at the undergraduate level. There is a high level of fellowships that come from a variety of non-State sources. Teaching assistantships are largely funded by the State, while research assistantships are funded by research grants to UC faculty. The support for graduate students, however, differs from one field of study to another. Students pursuing Ph.D.s in health sciences disciplines receive considerably more on average in fellowship aid than students in other disciplines, while students in engineering and the sciences receive more research assistantships. Students in the humanities and social sciences rely more on teaching assistantships and fellowships.

Growth is not the only concern with respect to financial aid for graduate students. The University must determine the competitiveness of the packages that it offers, and studies are now under way to analyze that competitiveness. At the present time, the University faces three major issues with respect to graduate student support:

- Ensuring that the amount and types of funding are competitive
- Generating additional revenue to cover the planned growth in the number of students
- Ensuring that all funding sources keep pace with inflation.

Provost King referred to the commission on graduate education to be appointed by President Atkinson. The commission's members will include Regents, chancellors, vice chancellors, graduate deans, Academic Council representatives, and students, and it will function in a manner similar to the Outreach Task Force. The purpose of the commission is to devise a strategy that will address the issues outlined in the presentation. Provost King reported that the commission would be chaired by Chairman Johnson and himself and would hope to issue a report by the end of summer 2001.

Regent Bagley drew attention to statistics regarding law school admissions at Berkeley and Los Angeles, pointing to the low proportion of underrepresented minority students who have applied

and enrolled following the passage of Proposition 209. He stressed the need for the University to increase its graduate student outreach efforts.

Provost King introduced Mr. Ted Smith, a trustee of the UCI Foundation and the chairman of FileNet and asked him to comment on the importance of graduate students to private industry. Mr. Smith noted that his remarks would focus on the computing industry. He reported that when companies hire graduates of engineering schools, these graduates lack two key ingredients: experience in working in a disciplined commercial research organization doing real design work and experience using advanced design tools and methodologies that are taught in advanced-degree programs. Managers strongly prefer to hire people who will be productive immediately. One of the most visible companies in Orange County is Broadcom. The firm employs 1,400 engineers, of whom 161 hold Ph.D. degrees and 647 hold Master's Degrees. At present the firm is hiring only engineers with advanced degrees because they meet the required qualifications. Mr. Smith reported that 90 percent of the undergraduate students enrolled in the Irvine campus' information and computer science program intend to pursue advanced degrees. However, of the 1,350 students enrolled in the program, only 265 are graduate students. He pointed out that 40 percent of the workers who come to the United States from abroad have advanced degrees, indicating the need for this country to produce a more highly-educated workforce.

Provost King introduced Mr. Tom Burnham, Vice President of Human Resources at Allergan. Mr. Burnham observed that a four-year degree is no longer adequate preparation for the needs of the new knowledge-based economy. He believed that the University had an important role to play in helping to define the importance of graduate programs to this new economy. Mr. Burnham explained that Allergan is a technology-based pharmaceutical company that relies upon the use of innovative technology to meet the unmet medical needs of the patients it serves. A major focus of the company is to find a cure for conditions such as glaucoma and skin cancer. The company, which is located in Irvine, is a global business with over 6,200 employees and five manufacturing centers throughout the world. In Orange County the company is second only to Broadcom in total sales. The firm employs 1,200 scientists who are involved in technological innovation, with over 200 Ph.D.s and 20 M.D.s developing products to drive the firm's success. Mr. Burnham noted the difficulty in locating individuals with the intellectual capacity to lead this innovation. The company offers postdoctoral fellows a salary of $80,000 per year and still finds it difficult to attract them. The firm must turn to foreign workers as a result. The state requires more graduate students to fuel the intellectual engine. The University of California needs to provide the leadership that will encourage the continued growth in graduate programs.

Regent O. Johnson asked whether graduate outreach would be integrated into the University's outreach program that is led by Vice President Saragoza. Provost King recalled that the University had been limited by capacity rather than by demand for graduate student enrollment.

There is a major need to provide advanced training to all sectors of California, and that will be a thrust of the outreach program. The University is requesting $1.5 million in State funding in the 2001-02 budget for graduate and professional student outreach.

Regent Preuss pointed out that the University employs the top scientists in many fields, but they are not being used to capacity due to the low graduate student enrollment. The State is not receiving the numerical output of graduate students that these faculty should be expected to produce due to the lack of appropriate funding for graduate student support.

Regent S. Johnson observed that the growth in undergraduate enrollment is driven by demographics, while growth in graduate student enrollment is determined by policy. The State has chosen not to provide adequate funding for graduate student support over the past few decades. The commission on graduate education will be looking at ways to improve the financial packages the University offers to graduate students in order to attract and retain them. She asked how private industry could assist the University in this area.

Mr. Smith responded that companies have begun to work with the University to provide funding for graduate students. Many CEOs in Orange County are involved with programs on the Irvine campus. Mr. Burnham continued that corporations recognize that they have obligations in this endeavor. Allergan has underwritten fellowships for students at the Irvine campus in acknowledgment of the fact that relationships with potential employees must begin early. He emphasized the importance of partnerships between industry and the University given the rapid innovation in the basic sciences and the knowledge explosion in industry.

Regent Kohn observed that while collaboration between higher education and private industry is a fact of life, there is a sensitivity on the part of many faculty members that such collaboration should not overshadow the University's role as a great research institution in the quest of new knowledge. He recalled the remarks made by Mr. Henry Samueli at the dedication of the Samueli School of Engineering at the Irvine campus, during which he commented that he viewed his gift to the campus as an investment that ultimately would benefit private industry even though it was not directed towards any particular program. He asked whether private industry would be willing to make contributions that are not tied specifically to a research project.

Mr. Smith pointed out that while there is no expectation on the part of industry that research programs will be redirected as a result of outside contributions, it is important for the chairs of departments to operate in recognition of advancements in industry. There will be significant corporate funding of joint projects that will drive technology forward.

Regent Khachigian asked that a future conversation consider the issue of the small number of women who choose careers in mathematics and science. She believed that women were not being encouraged to pursue this career path, and asked for comments from the industry standpoint.

Mr. Burnham reported that the entering workforce at Allergan was almost equally men and women in fields such as chemistry and biological sciences. He believed that this concern might be more heightened in fields like engineering. Mr. Smith continued that the new chair of the computer science department at UC Irvine is a woman. She should serve as a role model to encourage women students to consider studying computer science. He did not believe that there was any resistance in industry to hiring women engineers.
Regent Lee stressed the fact that, in order for California to produce sufficient engineers, it would need to attract students from other states and countries. Regent Montoya noted that the issue of international students would be a top priority for the commission on graduate education.

Regent Bustamante observed that the presentations had underscored the need for the state to provide a workforce that it is currently not providing. The state must make a commitment to higher education if such a workforce is to be created. Regent Bustamante referred to the MESA program, which identifies high school students throughout the state who are interested in engineering programs. He believed that investing money in MESA to encourage students who are interested in areas of engineering such as computer sciences would be beneficial. The program already produces 20 percent of the Latino engineers in the state.

Regent Lansing spoke in favor of strengthened relationships between the University and industry. She suggested that the commission on graduate education address this relationship in light of the fact that many people who want to attend graduate school cannot afford to do so. She believed that industry would need to supplement the support that graduate students receive from the State.

Mr. Burnham reported that Allergan provides approximately $1 million per year to enable its employees to continue their graduate education. He agreed that there is a need to balance the basic research performed by the University and the needs of the business community as they are interdependent.

Regent-designate T. Davis pointed out that the recruitment and retention of graduate students are two very separate issues. Graduate students at UC must survive on small budgets in tight housing markets, while other universities offer to fund more than basic student needs in order to attract and retain them. The University is at risk of losing graduate students through its failure to provide adequate support.

Regent Bagley suggested that the presenters from private industry make a similar presentation to key members of the state legislature and to members of the Business Roundtable.

Regent Connerly pointed out that the workforce problem is not confined to the high-technology industry but rather cuts across all occupations. Industry is paying for this shortage in the form of higher salaries. He concurred with Regent-designate Davis in the need for funding to assist in the retention of graduate students and suggested that some of this funding could be provided by private

industry. He urged the commission to look at ways to implement this suggestion. Regent Connerly suggested that it would be useful to have information on graduate programs that have been successful at increasing their enrollments.

Regent Miura referred to the difficulty in recruiting and retaining faculty to teach engineering and computer science courses in light of the competition from private industry, particularly in areas located in and around Silicon Valley. Chancellor Orbach reported that increasingly new faculty members are being recruited from private industry, thereby creating a tight bond between the University and industry. The engineering curriculum is beginning to be driven by the highly sophisticated advances in the private sector.

Regent Bustamante asked whether private industry would be willing to support a bonus program to support graduate students enrolled in critical areas. Mr. Burnham felt that companies were not willing at this time to make large unrestricted gifts to universities. There are opportunities for joint collaboration which could offer graduate student support. Most of the companies that began with venture capital support have not been involved in philanthropic activities. He did not believe it would be realistic to expect companies to make contributions for a specific student early in the student's academic career.

Regent Fong stressed the need for the University to support educational disciplines that are not directly tied to private industry.

[For speakers' comments, see the minutes of the November 16, 2000 meeting of the Committee of the Whole.]

3. **REMARKS OF NOBEL LAUREATES HEEGER AND KROEMER**

President Atkinson recalled that the Royal Swedish Academy had announced that three UC faculty members had been awarded Nobel Prizes for their pioneering achievements. He read the following congratulatory message from Governor Davis:

> It is a great pleasure to congratulate you for being awarded the 2000 Nobel Prize from the Royal Swedish Academy of Sciences.
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> As a Nobel laureate, you have joined an elite group of scientists whose extraordinary contributions have made a positive and lasting impact on our world. Your exemplary innovation and expertise as a scientist and as a faculty member of the University of California fosters success in your students and is an inspiration for all Californians. I salute your hard work and outstanding commitment to excellence.

On behalf of the people of the State of California, I extend best wishes for continued success.

Chancellor Yang reported that two faculty members at the Santa Barbara campus had received the Nobel Prize: Professor Alan J. Heeger in chemistry and Professor Herbert Kroemer in physics. He recalled that two years previously Professor Walter Kohn of the Santa Barbara campus had addressed the Regents concerning the research which had earned him the Nobel Prize in chemistry. Chancellor Yang introduced Professor Heeger, who joined the Santa Barbara campus in 1982, where he teaches in the departments of physics and materials. His honors include the Buckley Prize for condensed matter physics and the Balzan Prize in the science of new non-biological materials category. Professor Heeger shares the Nobel Prize for the discovery and development of conductive polymers. He and his colleagues discovered that plastic, after certain modifications, can be made electrically conductive.

Professor Heeger discussed his research on conducting polymers which began in the late 1970s. It has become possible over the past twenty-five years to demonstrate conducting polymers with electrical conductivity that approaches that of copper and a strength which is greater than steel. This class of novel materials has the electrical and optical properties of semiconductors and metals in combination with the processing advantages and mechanical properties of polymers. Current research centers on the area of transport in and light emission from semiconducting polymers. Some of the products which his group has developed are poised for manufacture by international companies, including light-emitting diode (LED) displays for cellular telephones and portable electronics. At research laboratories here and abroad, people are demonstrating integrated circuits printed on plastic. A revolution in plastic electronics is envisioned.

Chancellor Yang introduced Professor Herbert Kroemer, who serves in the department of electrical and computer engineering and the department of materials. In 1963 he proposed the concept of the double-heterostructure laser, the central concept in the field of semiconductor lasers. Professor Kroemer's awards include the Alexander von Humboldt Research Award and the Jack Morton Award from the Institute of Electrical and Electronic Engineers. In 1985 he was the UCSB Faculty Research Lecturer. He shares the 2000 Nobel Prize in physics for developing semiconductor heterostructures used in high-speed electronics. The inventions that have resulted from his research are the basis for the necessities of daily life in the era of information technology, including bar-code readers and laser pointers. Powerful LEDs are being used in traffic lights and may eventually replace traditional light bulbs.

Professor Kroemer reported on his research, noting that the field of modern electronics is based on semiconducting devices, including silicon. His early research recognized the importance of compound semiconductor technology. In the 1950s he pointed out that performance advantages could be gained by incorporating heterostructures into semiconductor devices. In 1976, he persuaded the department of electrical and computer engineering to put its limited resources not

into mainstream silicon technology but in the emerging compound semiconductor technology. By 1980 the technology had progressed to the point that heterostructures dominated compound semiconductors. The technology has made possible the development of products such as the compact disc player.

Regent Kozberg observed the Nobel Prize is often awarded in recognition of life-time achievements and asked how it would blend into the their academic careers. Professor Heeger reported that a company that he founded in 1990 was acquired by a major chemical firm. He had intended to retire from the University until receipt of the prize. Professor Kroemer continued that it also his intention to remain at the University longer than he otherwise would have.

Regent Kohn pointed out that the University had provided the support that Professor Kroemer required to carry out his research without any specific application to industry. He believed that there was a need for ongoing sensitivity to this issue.

The meeting adjourned at 11:00 a.m.

Attest:

Secretary