2005 Report

To

Interim Chancellor Karl S. Pister

February 20, 1992

Members of the Committee on 2005:

Victor Burgin
Robert S. Coe
Catherine Cooper
Michael H. Cowan
Jorge Hankamer, Chair

Table of Contents

0. Preface

This document is the report of the Committee on 2005, appointed by former Chancellor Stevens to advise the administration on academic planning for the UCSC campus over the next fifteen years. This committee, consisting for 1990-91 of the undersigned, took as its charge not only to explore directions in academic development that seem to make sense for the campus, but also to identify existing sources of energy and strength which might serve as the basis for promising initiatives.

In our search for principles which might guide academic planning for the campus over the next fifteen years and beyond, we have benefited from advice from all of the deans, several committees of the Academic Senate, and a number of individual faculty and faculty groups. At the same time, we have tried to stimulate forward thinking and planning, and we believe our efforts have begun to have perceptible effect.

We present this report in the hope that it will be received in the spirit in which it is intended: not as a blueprint for the shape of the campus in the year 2005, but as a guide for making decisions which might lead us toward a campus which we as a faculty regard as a worthwhile goal.

Many people assisted us in this effort, and we will not attempt to thank them all. We are particularly appreciative, however, of the excellent assistance provided to the committee by Kathie Kenyon and Kathy Chetkovich.

1. Executive Summary

The Committee on 2005 was appointed by Chancellor Stevens in 1989-90 to develop a guide for making academic planning decisions at UCSC through the year 2005.

The 1990-91 membership of the 2005 Committee has identified several key problems and opportunities facing California as we approach the next century: ethnic and cultural diversity, education, the environment, technology, and global systems and transformations. The committee suggests a direct connection between these societal needs and the campus educational mission.

In addition, UCSC needs to plan for the challenges posed by its own growth as a campus, apportioning that growth among the undergraduate, graduate, and professional sectors. We have concluded that it will be impossible to follow the growth plan laid out in the 1985 Twenty-Year Plan unless we devote a substantial portion of that growth to professional programs. At the same time, we need to address the currently unbalanced development of our academic graduate programs. Finally, we need to ensure that we maintain excellence in undergraduate education, building a faculty devoted equally to research and graduate training and to high-quality undergraduate education.

In order to meet these challenges, the 2005 Committee proposes adopting a number of particular emphases where we, as a campus, intend to build strength. Specifically, these include education (especially in science, mathematics, and technology); environmental issues; visual studies and technology; language; cultural diversity and integration; and global systems and transformations. These emphases would affect campus planning at all levels, including graduate professional and academic programs as well as the undergraduate curriculum and structure of the colleges.

At the post-baccalaureate level, the committee strongly recommends that the campus move to develop professional schools and programs to complement the array of academic programs currently in place and under consideration. The proposed School of Engineering is the first step in this direction, and it should be followed by the establishment of several other professional programs. Possibilities to be entertained include engineering, education, architecture/design, environmental issues, public health, and information technology. The committee also puts forward a number of general and, in some cases, specific recommendations regarding the development of academic M.A. and Ph.D. programs on campus.

Recommendations specifically in support of undergraduate education include the development of a campus vision of "the educated person" to inform the establishment of curricular offerings, facilitation of undergraduate research, re-establishment of the colleges as intellectual and academic entities with appropriate differentiation between colleges, and the recognition of excellence in major programs in terms of course support and target workload.

In the end, we must define the character of UCSC as a UC campus. As a UC campus, we have the challenge of balancing undergraduate, graduate, and professional programs. UCSC needs to reaffirm its fundamental values in regard to undergraduate education while at the same time undertaking a course toward the expansion of graduate academic programs and the development of new professional programs.

2. Introduction

Campus Mission

The state of California faces several problems and opportunities as we approach the 21st century. Prominent among these are the growing ethnic and cultural diversity of the state, with attendant problems of education and opportunities for development; the increasingly complex problem of human interaction with the environment; the problem of and opportunity for developing a system of education to prepare young people for life in the 21st century; the problems and opportunities associated with the advance of technology, particularly computer and electronic technology; and the problems and opportunities presented by the complex mutual interdependences of all aspects of the physical, social, and cultural worlds.

The UCSC campus mission for the next decade and a half should be, in part, to shape teaching, research, and service programs to address these problems and opportunities. Our aspiration as an institution of higher education will of course be to achieve higher levels of excellence in every area open to us; but we should specifically seek to develop our programs in ways that are responsive to these clear needs, as outlined below.

1. Ethnic and Cultural Diversity

The need is to bring all the ethnic groups that make up California society into effective participation in citizenship, including participation in industry, government, and education. This is clearly in part a problem of education, and UCSC should confront it head on.

Our efforts should include measures to increase access to the university for underrepresented segments of the population, as well as measures to increase the chances of success by those students once they are here.

In the development of new graduate programs and professional schools, we should devote particular attention to the attraction and retention of a diverse faculty and student body. We should commit resources to programs that explicitly seek to meet these goals, especially in technical areas such as mathematics and engineering.

Examples of contemplated programmatic directions on behalf of multicultural goals include a program in Asian cultural history, spanning the subfields of art history, history, and literature; a Ph.D. program in American studies, which would emphasize cultural diversity and establish links with the existing research groups in world literature and Pacific studies; and a program in contemporary visual culture, in response to the growing impact of visual media on the mutual perceptions of different national, ethnic, and racial groups. These and other programs would interact with existing research initiatives in cultural studies. The Center for Cultural Studies, boosted by its recent large Rockefeller Foundation grant, would certainly play an important supporting role in the development of these efforts.

2. Education

Overall, we must pay particular attention to issues of immigration and social class which affect access to higher education. To address this need, we should establish a graduate program in Education focussed on improvement of California schools, particularly those serving multicultural populations. This program would be practitioner-oriented, designed

to train high-quality teachers in an effort to begin to reverse the deterioration of education in the schools and to begin to prepare the young of California for full participation in society, including, in the long term, supplying the university with students and professors in the 21st century.

The campus should also develop a focus on mathematics and science education, which is currently a major problem for the state and the nation. It should be part of our mission to provide qualified teachers of science and mathematics for the schools, and to provide direct services for the improvement of teachers and teaching in these areas.

In the areas of language and cultural diversity, UCSC already has a significant development in place, in the form of the National Center for Research on Cultural Diversity and Second Language Learning, recently funded by the U.S. Department of Education and working closely with the Bilingual Research Group FRA. With this development, UCSC is in a position to participate in the development of a national center for language research and pedagogy in the area, combining our campus strengths with those of nearby institutions: the Defense Language Institute in Monterey, and Berkeley and Stanford, with their strong programs in language and linguistics. UCSC's particular contribution should focus on the educational aspects of language research, particularly as applied to problems of minority- group education, and on the development of techniques in language pedagogy, particularly those involving the use of computer and electronic/advanced media technology.

3. The Environment

The state, the nation, and the world face urgent questions regarding the impact of human enterprise on the environment. We need both research and teaching initiatives addressing these complex questions. UCSC is well positioned to play a leading role in furthering environmental studies through a number of related programs that are currently under discussion at the campus level. As an outgrowth of the existing undergraduate program, a graduate program in Environmental Studies is in the proposal stage, and a two-year interdivisional graduate program in Environmental Management is being considered. A separate program in Environmental Toxicology has been proposed and is undergoing systemwide review. UCSC would also be an excellent place to establish a postdoctoral program for professionals, as well as a research center on matters relating to the environment. Such a research center would probably have useful interactions with the Institute of Marine Sciences, which already has significant efforts in this area.

4. Technology

Advances in technology, particularly computer and electronic technology, pose both opportunities for and challenges to California. Technological developments offer the promise of solutions to some of our environmental problems, better defenses against disease, vastly enhanced possibilities of communication and information management, and unimaginable new possibilities in research in many fields. However, these same technological advances will make it all the more imperative that the citizenry of California be well educated in science and mathematics, and that a significant proportion of our able students be trained in technical disciplines.

UCSC has already forwarded to the Office of the President its formal proposal for a school of engineering. Plans for the school include a major focus on computer and electronic engineering, with a second emphasis in biotechnology. There will be a significant interface with natural and social science programs related to the environment. We also recommend exploring the possibility of a school or program in information technology, building on our existing strengths in Computer and Information Sciences and on the development of the Engineering School. This program would also have connections to the humanities, social sciences, and arts, as one of its emphases would be imaging technology and its relation to contemporary visual culture.

5. Global Systems and Transformations

There is a growing need for understanding of global systems and transformations, in the physical, political, cultural, and economic domains. Citizens of the 21st century will need to be educated to understand a multiplicity of cultures in the world as well as within the state, to intelligently engage both local and global political issues, and to understand and control the natural environment on a global scale. UCSC has begun and should continue to develop some significant research strengths in global systems, particularly on the oceanographic and geoscience sides; this should be coupled with a determined effort to build understanding of the whole world --physical, cultural, economic, and political -- into the academic program at all levels. The current development of International Economics is a good example. These objectives are intertwined with the initiatives mentioned in sections 1 and 2 above, and are supported by a recent proposal of the campus Committee on International Programs and Activities, recommending that UCSC concentrate its efforts in the international arena on the twin themes of environment and culture.

Challenges Facing UCSC

In addition to responsibly addressing the particular needs of the state, UCSC needs to plan for the challenges posed by its own growth as a campus.

The Twenty-Year Plan (1985) proposes that the campus should grow to a total of 15,000 students by 2005, with 15-20% of the total enrollment at the graduate level. Recent budgetary setbacks have imposed a slowdown on the trajectory of growth, especially at the graduate level. Studies carried out by Acting Dean of Graduate Studies and Research James Gill indicate that the attainment of a 15-20% graduate enrollment ratio will be impossible unless the campus radically alters its mix of academic and professional programs.

The first issue to consider, then, is what the campus should do in a period of low resources and no growth. We recommend the following:

a. Take measures to maintain quality. b. Remove weaknesses and weak programs. c. Enter the second five-year period with space cleared for growth of new programs (come out leaner and ready for growth when the time for growth comes).

During this period, new programs might be launched; but the campus must be aware that every program launched during this time is a mortgage on the future, and only those with strong promise of lasting benefit to the campus mission should be forwarded. Their number should be few. The second issue is how to plan for growth, and how to apportion growth among the undergraduate, graduate,

and professional sectors. Here the campus has some fundamental choices to make.

We do not believe that no growth is a possible choice. The agreements reached between the campus, the town, and the Regents have mapped out a program of growth that represents a reasonable compromise between the needs of the state for university expansion, the concerns of the town about population growth, and the capacity of UCSC for sensibly paced growth. Our choices are about the apportionment of that growth, and these are important choices.

At one extreme, the campus might choose to maintain its present proportion of graduate to undergraduate enrollments, and to introduce no new professional programs. A slight departure from this extreme would be a move to 10% graduate enrollments, retaining 90% undergraduate enrollments. Either of these scenarios would be possible, but there would be consequences which have to be recognized.

Because of the way resources are distributed to the campuses from the UC system, a 90% undergraduate enrollment would mean that UCSC as a campus would receive considerably fewer resources in FTE and other instructional support than it would at a higher graduate/undergraduate ratio. This would dictate the continued devotion of a high proportion of faculty effort to undergraduate education, which is not a bad thing in itself; but it would present a deterrent to the attraction of outstanding research faculty, and consequently to the establishment of UCSC as a first-rank research university.

Further, given that we have accepted the necessity of growth to approximately 15,000 students, UCSC is not going to be a small undergraduate university any more. If 13,500 of those students are undergraduates, it will be a large undergraduate university.

Our thinking has been based on the assumption that it is desirable for the UCSC campus to move toward a distribution of programs and student levels more like those of the other campuses in the UC system. Arguments in support of this assumption are to be found in a document titled "Academic Planning Study" (Office of the Academic Vice Chancellor, July 1988). We will not repeat those arguments here, but simply note that they are based on careful studies of the size and program-distribution characteristics of highly ranked universities.

We assume that the campus is to grow in the manner laid out in the Twenty-Year Plan, particularly that we are aiming for a total enrollment of 15,000 with 15-20% of that enrollment in graduate and professional programs. (Depending on the length and severity of the current fiscal crisis, it is possible that we will need to push the target further out than 2005; for expository purposes, however, in this document we will continue to assume 2005 as the target for the growth contemplated here.)

Our considerations have led us to the conclusion that up to 50% of our post-baccalaureate enrollment in 2005 should be in professional degree programs (as opposed to academic master's and doctoral programs). Thus a major challenge facing us in the next ten years is the development of professional programs, an area where we are currently underdeveloped. We have taken the first steps toward this goal with our proposal to establish a school of engineering, as mentioned above. This will be our first professional school, and getting it started and established will be one of the major endeavors of the next decade.

It is clear, however, that the engineering school will by no means fulfill our need for development in professional areas. A second challenge will be to determine in which other areas we should propose to develop professional programs. With an eye towards the needs of the state, we have begun considering schools of education, architecture/design, information technology, and public health. Others should be considered, and early in the next ten-year period we will need to come to some conclusions about which directions the campus should pursue. While current economic conditions indicate a slowdown in the development of new programs, we must remain aware that the long-term demographic trends will inexorably require the university to respond. One of our most difficult tasks is to foresee what service will be needed ten years from now, and to put it in place in time.

A third challenge facing UCSC is posed by the currently unbalanced development of our graduate programs. Through accidents of history, the campus developed a full range of graduate programs in the Natural Sciences, while the slowdown in the seventies left the Arts, the Humanities, and (to a lesser extent) the Social Sciences Divisions with an incomplete array of programs at the graduate level. [1]

We must fill the gaps by developing a suitable array of graduate programs in these divisions, programs that both reflect the existing strengths at UCSC and respond to the needs of the state and the nation. This process is already well under way, with new graduate-program proposals in the three underdeveloped divisions being put forward with remarkable vigor compared with the past two decades.

As the campus moves toward the profile of a mature university, increasing the number and scope of its graduate and professional programs, our fourth major challenge is to maintain excellence in our undergraduate education. We must build a faculty devoted equally to research and graduate training and to high-quality undergraduate education. One key to success in these two realms will be the integration of our educational mission across the various levels of development, involving faculty in the pedagogical training of graduate students and graduate students in the complex fabric of undergraduate education.

3. Preview of Major Emphases of the Report

In this report, the Committee on 2005 will propose a number of major emphases for the campus in planning for the next fifteen years. We want to make the conclusions of the report easy to challenge, in the sense that our thinking should be out in the open. At the fundamental level, we have tried to make clear what we take as given, and why we take those things as given. A challenge to our thinking at this fundamental level would take the form of an argument that we should not have taken such and such as given.

At the strategic level, we have tried to outline some strategic principles which we think should be followed, and have tried to make it clear why we think those strategies are wise, given our fundamental assumptions. Clearly, these suggested strategies can be challenged by arguments to the effect that other strategies would be more likely to lead to the results that our given assumptions dictate.

At the tactical level, i.e., at the immediate level of what to do in a particular instance, this report should not have anything to say. Where we refer to particular programs, we mean to do so in connection with some strategic consideration. It will be up to the people involved in tactical decisions,

the faculty and board chairs and Senate committees and deans, to implement any plans made and agreed on at the campus level.

Here we summarize the major emphases in strategic planning that we will elaborate on in subsequent sections of the report.

Professional Degree Programs

We argue that a major development in professional degree programs must be part of the strategy of development of UCSC. We believe that this follows from the fundamental assumptions of growth and directions of growth laid out in the Twenty-Year Plan.

In particular we suggest that certain professional programs are particularly promising in terms of existing campus strengths and the general thematic direction which we have recommended for special attention. These include, but are certainly not limited to, programs in architecture/design, education, and information technology.

Development of Academic M.A. and Ph.D. Programs

The development of academic M.A. and Ph.D. programs should be guided by the need for balance in development among the divisions and by opportunities to achieve pinnacles of quality. We also propose that the campus should examine the distribution of resources among divisions at mature institutions, and where we wish to differ from those established patterns we should know exactly why we wish to differ.

Language Emphasis

The theme of language cuts across several of the major areas identified above as areas of importance in UCSC's academic development. There are obvious language issues in the areas of ethnic/cultural diversity, education, and global concerns.

In the area of technology, there are less direct but equally important opportunities to build the study of language and languages into the programs that address technology issues. For example, it is increasingly important for engineers to be able to communicate effectively with their counterparts in Japan, Korea, and China. In the near future, it is likely that the same needs will arise with respect to the languages of eastern Europe.

Thus, both from the local (California multicultural) perspective and from the global (international, technological) perspective the study of language and the ability to use languages is going to be of considerable importance.

In the area of language, we have some existing strengths to build on. The existing Language Program at UCSC is of high quality, according to a recent review, and the program in Linguistics is also quite strong. There are also significant relevant strengths in Psychology and Education, as evidenced by the Minority Language Project and the Bilingual Research Group (BRG). These are real strengths, as noted above in the discussion of education.

From all of this, the committee concludes that an emphasis in language would be an obvious focus for the building of further strength and distinction at UCSC. This might be accomplished by

systematically including language issues in the planning of future programs such as Engineering or International Economics; by offering a guarantee that every student who wants to study one of the languages offered at UCSC will find a place in an appropriate language course; by carefully and selectively expanding the language offerings; by encouraging the development of language emphases in colleges; by investing in technological advances that enhance language instruction and experience; and by working on the development of techniques and technologies of language instruction, which may ultimately help to reduce the need for the high workload ratio in language courses or introduce alternative methods which are effective while being less resource intensive.

Visual Technology

In the area of technology, we believe that visual technology in particular will be a crucial interdisciplinary area in the next two decades and that existing strengths at UCSC provide a platform to build on. This area provides opportunities for interaction between interests in all the divisions (Arts, Humanities, Social Sciences, and Natural Sciences).

Environmental Emphasis

In view of existing campus strengths and the clear needs which we identify as concerns of the state and nation, we believe it would be a great mistake if UCSC did not have a significant national presence in environmental issues in the year 2005. This presence can be realized in a number of ways, and many of them will be touched on below.

College Planning

Since the physical expansion of the campus is to be a continuation of the college model, it is crucial that we carefully integrate the planning of the remaining colleges (Nine, Ten, Eleven, Twelve, Thirteen) with the overall academic plan. The planning of these colleges, and the retrofitting of the existing colleges, must take into account the changing emphases of the campus. Graduate and research space must be built into the plans, and at the same time the role of the colleges in undergraduate education must be clarified and enhanced. We propose greater differentiation of the colleges, both through different associations with graduate and professional emphases and through college-specific requirements at the undergraduate level.

4. Graduate and Professional Programs

UCSC currently enrolls 9,720 students, 756 (about 7.5%) of these at the graduate level (figures for academic year 1990-91). The UCSC Twenty-Year Plan calls for growth in overall enrollments to approximately 15,000 by the year 2005, with growth at the graduate level paced so that graduate enrollments account for 15 to 20% of this total. If we are to follow this growth path, assuming the 20% figure for graduate enrollments, we will be almost tripling the current percentage of graduate students enrolled here and quadrupling their absolute numbers, while undergraduate enrollment grows by only about 30%. At the lower (15%) level assumed for graduate growth, we would be doubling the percentage of graduate enrollments and tripling absolute numbers. This would also indicate an undergraduate enrollment increase of about 40%, if the total of 15,000 students is held constant. These figures have consequences which constrain the ways in which the growth envisioned in the Twenty-Year Plan can be achieved.

Graduate students at UCSC receive more support, per capita, than their counterparts on any of the

other UC campuses. There are two reasons for this: first, almost all of our graduate programs are academic M.A. and Ph.D. programs in the letters and sciences, where it is difficult or impossible to attract top-quality students unless substantial support can be offered; second, we are able to supply support at this relatively high level because our unusually low proportion of graduate to undergraduate students allows us a much higher proportion of TA support per graduate student than is possible at campuses with a more normal percentage of graduate students.

TAships at UCSC account for fully half of the total support for graduate students, compared to one-third systemwide. TA allocations to the campus are based strictly on undergraduate enrollment, and our lean graduate-to-undergraduate ratio translates into a rich TAship-to- graduate student ratio. The growth plan assumes a rise in the ratio of graduate students to undergraduates, which means a decrease in the amount of TAship support per graduate student. It does not seem likely, given current conditions and projections over the next fifteen years, that the deficit in graduate-student support created by this change in the ratio of graduate to undergraduate students will be made up through increased fellowships or research assistantships. There should be some increase in the latter as our faculty research effort advances, but it is not likely to close the gap.

An inescapable conclusion is that we have no hope of following the growth path outlined in the Twenty-Year Plan solely through expansion of the graduate programs we now have, or through development of new programs of the same kind. Students will not come to these kinds of programs without assurance of substantial support; the better students in particular will receive full-support and multi-year offers from competing universities.

An examination of other universities, both inside and outside the UC system, shows that UCSC is anomalous in its virtually total emphasis on academic graduate programs. In public universities, it is uncommon for much more than 10% of the student body to be in academic Ph.D. programs; where graduate students make up more than 10% of the total enrollment, half or more of them are usually enrolled in professional programs. The reason for this is straightforward: professional programs require less student support (25% of graduate students in the UC system are in professional master's programs and receive on average only $1,300 in merit-based financial support, compared to $7,700 for students in academic programs). In general, students pay to attend such programs -- which they tend to regard as an investment that will pay off almost immediately with their first job after graduating -- and the institution thus bears only the cost of instruction, not of full student support. These are programs that not only pay for themselves but help fund academic programs as well; without them, a graduate enrollment of more than 10% becomes insupportably expensive.

Having researched the status of our own funding sources and the graduate-program profiles of other campuses, the committee shares Acting Dean of Graduate Studies and Research James Gill's view (elaborated in his report to the 2005 Committee, attached as appendix B) that it is unrealistic to think that this campus can meet its goals for graduate growth by simply doing more of what it has done with success in the past: by relying primarily on TA support to fund a costly line-up of academic Ph.D. programs. We agree with his assessment that, if we are to grow to 20% graduate students, half of those students should be in professional programs that are market-oriented enough to attract students who will attend primarily at their own expense.

If these arguments are accepted, it is inescapable that our plan for growth must include plans for the development of appropriate professional programs. We remain committed to maintaining the quality of our academic programs as well; indeed, we recognize that the advent of professional programs,

far from threatening their academic counterparts, will help ensure their future as first-rate programs with the means to select and retain first-rate students.

We are consequently recommending that the growth to a total of approximately 3,000 students at the graduate level (an increase of approximately 2,250 graduate student FTE over present numbers) should be apportioned so that two-thirds of that growth is in professional programs. This plan still leaves room for 750 new student FTE in academic Ph.D. programs, representing a doubling of present numbers.

At the same time, the campus must also see to the rational filling-in of academic Ph.D. and M.A. programs in those areas left underdeveloped when campus growth was halted in the 70s; and it must manage this growth so that undergraduate education is not neglected, but rather enhanced, as a result of overall campus development toward maturity.

4.1 Professional Schools and Programs

Here we discuss a number of areas which the committee found promising as possibilities for the development of professional programs at UCSC. These areas have been investigated to varying degrees, and we are not assuming that all of them can be pursued nor that they represent the whole range of professional areas that should be seriously considered. Our recommendation is that the campus proceed to establish some committees to investigate the prospects in these or similar areas, in order to establish a more articulated plan for movement to a campus in 2005 which will enroll 1,500 students in such programs.

School of Engineering

An important component of the campus plan for professional growth will be the school of engineering. Although plans for a School of Engineering at UCSC were approved by the Regents in 1966, the program fell victim to budget reductions in 1968 and was cancelled. Attempts were made to re-establish aspects of the program over the next several years, and a B.S. program in Computer Engineering was finally established in 1984, with M.S. and Ph.D. programs following in December 1988. In 1989, Chancellor Stevens appointed a Committee to Study a UCSC School of Engineering. The result of that committee's work was a proposal for the establishment of a school of engineering at UCSC, which was transmitted to the Office of the President for systemwide review during spring quarter 1991.

Research conducted by the Committee to Study a UCSC School of Engineering indicates that the demand for engineering programs is outstripping the supply, as existing programs are typically running at full capacity, and U.S. and California state statistics are projecting an increased need for mechanical and electrical engineers. Our own analysis indicates that environmental and materials sciences aspects of engineering should also be seriously considered as central components of the UCSC Engineering School. The environmental emphasis we endorse would be advanced significantly if the UCSC Engineering School offered appropriate aspects of civil engineering such as marine and geotechnical (seismic, hydrological, soils and slope stability). These developments would also strengthen a school of architecture, if the campus decides to develop one.

According to the local industry representatives we consulted, computer, electrical, and mechanical engineers are needed, as are those with specific training in biotechnology engineering. These representatives also agreed that new educational initiatives are needed in management and

manufacturing (as aspects of undergraduate curricula rather than as separate programs).

In addition to answering the demands of potential students and the needs of industry, the proposed school should benefit the UCSC campus in several respects. Besides the obvious increase in enrollments and concomitant support for general education courses in other disciplines, the school would provide greater balance for UCSC, which remains to date the only general campus of the system lacking professional schools.

The research benefits to be expected from a school of engineering include cross linkages with many existing UCSC programs (e.g., Physics, Marine Sciences, Earth Sciences, Environmental Studies, Astronomy, Biology, Biochemistry, Psychology, Art, and Economics), resulting in collaborative efforts among faculty. In addition, the school should also enhance the campus's external visibility and attract extramural resources. Finally, we would expect the school to help increase both faculty and student diversity on the campus (engineering has proven to be a very attractive career choice to ethnic minority and foreign students).

Proposed Foci and Administrative Structure

The proposed School of Engineering would build on existing Computer Engineering (CE) and Computer and Information Sciences (CIS) programs and would intersect with the proposed Department of Applied Mathematics. Potential areas of strength include biotechnology engineering and manufacturing engineering. In terms of research areas, the CE and CIS Boards of Studies currently focus on the following areas: computational theory and logic, artificial intelligence, information and communication, programming languages and environments, parallel and distributed computing, and computer graphics and image processing. Proposed new areas for research, selected in part to complement those already underway and to connect fruitfully to existing programs at UCSC, are very large scale integrated circuits (VLSI), imaging, vision and visualization, robotics and automation, computer systems and management, dynamical systems, fluid dynamics, solid mechanics, and biotechnology engineering.

The submitted proposal suggests that the school might consist of the following departments, each of which would have degree-granting responsibility: 1) Computer and Information Sciences, 2) Computer Engineering, 3) Applied Mathematics, 4) Electrical Engineering, 5) Mechanical Engineering and Applied Mechanics, and 6) Biotechnology Engineering. The exact number and distribution of departments and degree programs in the school is subject to further deliberation and planning.

By 2005 (when overall campus enrollment is expected to reach 15,000), a school of 90 faculty FTE (including the 27 currently assigned to CE/CIS -- altogether representing roughly 11% of the campus total), approximately 34 teaching-assistant FTE, 32 professional and research staff FTE, 500 graduate students, 1200 undergraduate majors, and 200,000 assignable square feet is anticipated. We consider this the minimum size necessary to mount the teaching and research programs envisioned.

Degrees and Curricula

In all, 22 degrees are proposed, four of which are graduate-only programs. B.S., M.S., and Ph.D. degree programs are proposed in the following areas: Computer and Information Sciences, Computer Engineering, Electrical Engineering, Mechanical Engineering, Applied Mechanics, and Biotechnology Engineering (a five-year B.S./M.S. program). In addition, M.S. and Ph.D. programs

are proposed in Applied Mathematics and Engineering Management, and a five-year B.S./M.S. program is proposed in Manufacturing Engineering. Undergraduate curricula should be augmented by a strong liberal-arts component; students should be required to satisfy the same general education requirements as students in other majors. The principal degree focus will be the M.S.

Other academic and advising programs might include an outreach program to encourage and assist high-school students, a bridge program to assist students with basic courses in math and science, an advising program to assist with articulation from community colleges, and a grants-in-aid program to provide financial assistance to those students who need more than the normal time to degree. Under a proposed dual-degree program, students could major in engineering and one other discipline.

Sources of Support

Seed money from UC would likely attract large amounts of external funding. Industry also represents a promising source of student and research support, with its anticipated contributions of funds and equipment (provided the school would serve its needs). In addition, industrial firms could be expected to provide the consulting opportunities that help to lure first-rate faculty, as well as internships for students.

Note that, as planned, the School of Engineering will account for approximately a quarter of campus growth at the graduate level. Since we need professional programs to account for about two-thirds of that growth, it remains essential that the campus explore other professional schools and programs.

Education

In keeping with several of our major themes, and building on the strength of our present program in Education, it would make sense for the campus to consider the possibility of expanded graduate offerings in Education and (after the establishment of a Ph.D. program and a five-year period of careful building) the establishment of a school of education.

This will be a major decision for the UCSC campus. There are great risks involved in the establishment of a school of education, as evidenced in the troubled status of existing schools of education in the UC system. Schools of education tend to get isolated from the other academic units, to fall into second-class status, and to stagnate. On the other hand, it will be difficult for our campus to have a significant impact on education in the state unless we establish some broader base of influence than is possible through a small Ph.D. program.

What we suggest here is bold and risky. We propose that the campus consider establishing a "school of education" very different in conception and purpose from existing ones.

A major goal of the UCSC School of Education would be to help to bring all ethnic groups that make up California society into effective participation in citizenship, including participation in industry, government, and education. It would thus take advantage of existing campus strengths in the study of cultural and linguistic diversity (Center for Research on Cultural Diversity, Bilingual Research Group). The school would also have a strong component in math/science/technology education, with fruitful interaction with the existing natural sciences programs, as well as the environmental and engineering initiatives.

A consultant team which visited the campus in January 1989 strongly recommended that UCSC

should proceed to establish a school of education. The gist of their advice was that the kernel of the school would be the present cluster of faculty concerned with issues of language acquisition and minority culture, with augmentations to broaden the strength in faculty leadership; that despite strong potential ties to the humanities, present connections are not tight and would need to be cultivated; and that the state does not need another general- purpose school of education, but does need the sort of unique specialization that would be possible at UCSC.

In addition to the Ph.D. program in Education, the team recommended the establishment of a graduate school of education dedicated to the preparation of excellent practitioners, to shaping teachers who intend to teach rather than become administrators. Further, according to the external advisors, our graduate school of education should focus on linguistic and cultural diversity, and mathematics and science education; it should not attempt to emulate traditional schools with comprehensive arrays of programs.

It seems to the committee that the advice from the external advisors is sound, and that we should act on it. A school of education should be considered, and if the decision to establish such a school is taken, the shape of the school should be along the lines suggested. In particular, the school should focus on language issues, in accord with our recommendation that the campus should adopt a language emphasis; on issues in science, mathematics, and technology education, in accord with our existing strengths and the intersecting areas identified in our mission statement; and on the training of practitioners, because we believe that this will be the best way to have an effect on education in the state.

School of Architecture/Design

The Committee on 2005 invited a panel of distinguished advisors, experienced in the field of architecture and design, to visit the campus on March 25, 1991 and advise us about the feasibility of developing a school of architecture at UCSC. The report of this panel is available.

The advice committee found that by building on existing strengths in critical theory and on developing strengths in environmental studies, UCSC is in a position to establish a first-rate school of architecture/design. Members of the committee recommended that the campus consider a small focussed program concentrating on theory and the bridge between theory and practice, with special emphases in environmental and seismic issues. Their opinion was that such a program would fill a notable gap, particularly on the West Coast. A look at the national market shows an increasing demand for programs which approach architecture from interdisciplinary and theoretical points of view.

Faculty in such a school would find connections with faculty in the History of Consciousness program (especially in the new study emphasis in contemporary visual culture) and in Environmental Studies. Computing and engineering connections could also be developed, particularly in imaging technology, if there is a design aspect.

The external advice committee made the following specific recommendations:

1. Consider one of the following structures as a beginning:

    a. A master's degree program in architecture, including a design program and interdisciplinary course work, with emphasis on experiment and critical

discourse; or

b. A small Ph.D. program devoted to history, theory, and criticism which would be related first to the existing cultural studies initiatives here and then to the design school. This would indicate careful integration of such a program with existing and newly developed programs in the humanities and arts.

2. Focus on some specific problem, such as the design and architecture of suburbs, rather than taking a global approach. In focussing on this problem, keep in mind that issues such as affordable housing are not simply architectural problems, but are social, economic, and political issues. This indicates that we should pay attention to relations between the Architecture/Design School and programs in the social sciences.

3. Consider including a landscape architecture or environmental design component. While landscape architecture is being abandoned in some of the larger, more traditional schools, our geographical location provides a perfect setting for this study. Mutually beneficial ties might be cultivated with other programs dealing with environmental issues.

The 2005 Committee recommends that this possibility be vigorously pursued. If the architecture/design program is to be small, as recommended by the advice committee, it should probably not be an independent school but rather housed within an existing division. The most obvious division at present would be the Arts, though, depending on the emphasis of the program, it might also conceivably become part of the Engineering School. If, on the other hand, it is envisioned as large enough to be a school, its development should be planned in close connection with planning for the Arts Division and the School of Engineering. It will require further study to determine how big such a school ought to be.

Environmental Programs

It is clear that control of the environment is going to be essential to the quality of life in the 21st century. Environmental change affects everybody, and local changes often have global effects. Environmental issues transcend disciplinary boundaries, and programs designed to address these issues will of necessity be interdisciplinary.

At UCSC we have the institutional flexibility and widespread conviction required to mount an integrated approach to environmental issues. This effort will draw principally from the social and natural sciences, but should also reach out to education, engineering, the arts, and humanities.

Significant education and research on the environment are already going on at UCSC, but these efforts are not optimally coordinated and lack a center. The undergraduate program of the Environmental Studies Board is in the Social Sciences Division, whereas most of the environmental instruction and research at the graduate level takes place in various programs in the Natural Sciences Division (Biology, Chemistry, Earth Sciences, Marine Sciences). To have an important impact in the environmental field, UCSC must mount new and coordinated programs at the graduate and postgraduate levels. Such programs would, at the same time, benefit undergraduate education in Environmental Studies, by widening the range of course offerings and professional opportunities and by the synergistic effects of graduate- undergraduate student interactions in both instruction and research.

A proposal for a graduate program (M.A. and Ph.D.) by the Environmental Studies Board is currently being reviewed on campus. When approved, it will bring a graduate component in political economy and sustainability, conservation biology, and agroecology to the Social Sciences Division. During the coming decade and beyond, the 2005 Committee recommends that UCSC address the challenge of environmental change by taking the following further steps:

1. Research and graduate education in science programs that bear on the environment should be intensified and selectively expanded within the Natural Sciences Division, with links where possible to the political economy and sustainability components of the Environmental Studies program.

2. A two-year master's degree program in Environmental Management should be established.

3. A postdoctoral/postgraduate environmental program (or school) should be considered, which would provide opportunities for professionals to become certified environmental experts within their respective fields.

4. An environmental issues center should be established, in coordination with the above- mentioned programs, which would serve as a magnet for the best minds in the field and enhance the drawing power of all UCSC environmental enterprises.

5. Environmental Studies at UCSC should be intimately connected to the engineering programs.

The UCSC environmental program should emphasize a comprehensive approach that recognizes the need to conduct analyses on local, regional, and global scales; to combine observation, experiment, and theory; and to understand the temporal variations of natural systems over the short, intermediate, and long term. Although concentrated in the Divisions of Social and Natural Sciences, it should be manifest directly or indirectly in academic units all around the campus. It should also be coordinated where appropriate with plans for professional schools. For example, aspects of a UCSC environmental program might be fruitfully incorporated into schools of engineering, education, and architecture/design.

Health

The Deans of Graduate Studies and Research, Natural Sciences, and Social Sciences are currently undertaking a study of the possibility of developing a professional program in public health. Their report is not in, but dimensions to be explored include environmental health and interactions with the proposed program in environmental toxicology.

Information Technology

The 2005 Committee only just began to explore this topic, but we found considerable interest and we see much promise in the concept of a professional program in information technology. Such a program would build on existing strengths in Computer and Information Sciences, Computer Engineering, and other components of the proposed School of Engineering; it would also have potential connections to developments in the humanities, social sciences, and arts, particularly in the area of visual studies. The impact of information technology on both "mass media" and the more traditional media has greatly increased the cultural importance of the visual image. The global proliferation of media networks, brought about by such space- contracting technologies as satellite television, has given images an unprecedented power to affect national and international opinion. The

role of the increasingly image-saturated environment in the formation of beliefs and values is not addressed by traditional approaches, which have tended to study only the optical-perceptual aspect of the image, or its purely aesthetic dimension. Work in the semiotics of visual culture is, however, already well underway on the UCSC campus, with strengths in Film/Video, Art History, and in the new History of Consciousness study emphasis in contemporary visual culture. Other possibly fruitful connections might be with the developing program in psycholinguistics, and with a geographic-information component of Environmental Studies. Thus, the development of a focus in information technology with a particular emphasis on the visual would find natural support and connections with existing strengths in the humanities and arts, in addition to the obvious connections to work in the natural and social sciences. We recommend that the administration commission a feasibility study on this matter.

The above areas do not exhaust the directions considered by the 2005 Committee, nor should they be taken as exhausting the directions which the committee believes the campus should explore. What is essential is that the campus should develop a plan for the appropriate amount of growth in professional areas.

4.2 Academic M.A. and Ph.D. Program Development

Our recommendation is that one-third of campus growth at the graduate level should be in academic M.A. (including M.F.A. and similar programs) and Ph.D. programs over the next fifteen years. That will represent an increase of approximately 750 student FTE, a doubling of present enrollments in such programs. While we have argued that campus growth in professional programs is essential, it is equally essential that we manage the growth in our academic M.A. and Ph.D. programs carefully.

The sudden slowdown in growth in the 70s left the campus unbalanced in the development of academic graduate programs, with the natural sciences fairly well developed but with serious gaps in all of the other academic divisions. Some of these gaps are beginning to be filled, as new graduate programs are being developed (Anthropology, Linguistics, International Economics, Theater Arts); and some existing programs which had been languishing are being rebuilt.

Natural Sciences

In the natural sciences, one of the main concerns will be the development of programs in relation to the School of Engineering. Some of the programmatic directions described here will eventually be part of the Engineering School, and others will have close relations with it.

Environmental Toxicology

As a result of the recognition of the importance of toxicology, a major opportunity and responsibility has emerged for public universities. The campus is preparing a proposal for a doctoral and master's degree program in Environmental Toxicology with a research focus on aquatic toxicology. This program would have two general aims and objectives: The first would be to educate and train predoctoral graduate students in the broad principles and concepts of environmental toxicology. The second would be to teach students how to identify important research problems, design and evaluate experimental protocols, conduct research in environmental/aquatic toxicology, and interpret data to assess their significance. These two sets of related aims and objectives are designed to increase the scientific pool of highly trained people who can contribute toward resolving significant problems in environmental/aquatic toxicology and to advance scientific knowledge in this field.

Applied Mathematics

One of the programs to be established within the proposed School of Engineering is Applied Mathematics, which embraces all those mathematical theories and techniques which are indispensable for applications and data analyses in science and engineering. These applications increasingly include problems of interest to the social sciences, humanities, and arts. The establishment of a unit in Applied Mathematics would provide strong interactions between applied mathematicians and other faculty in the Natural Sciences Division, aiding the successful development of emerging interdisciplinary programs such as Nonlinear Sciences, Tectonics, and Marine Sciences. It would also benefit established ORUs such as UC Observatories and the Institute for Particle Physics. It would be complementary to the existing Mathematics Board, which is strongly oriented toward pure mathematics. The Applied Mathematics program would provide essential training for undergraduate scientists and engineers, while its graduate component would provide training for academic as well as industrial careers.

Electronic Engineering

Electronic Engineering is a logical extension of our existing program in Computer Engineering, and would also become part of the School of Engineering. Electronic Engineering encompasses the study of analog electronic devices and circuits, communication, signal processing instrumentation, and electromagnetics. The program would relate directly to existing programs in Computer Engineering, Physics, Geophysics, and Astronomy. In addition, Biology and Marine Biology would likely be involved, as the search for new structures for solid-state electronic devices that will be tolerant of manufacturing defects and later failures has led to exploration of biological structures as models.

Marine Sciences

The current M.S. program in Marine Sciences is both sound academically and very popular among our students. The establishment of a Ph.D. program in Marine Sciences is the next step. (Doctoral programs in marine sciences do not currently exist in the UC system.) The program is presently viewed as one that would award a doctoral degree jointly with other existing boards of studies, i.e., Chemistry, Biology, and Earth Sciences. The joint degree would emphasize the credentials of graduates both in the basic science disciplines and in the marine area. Job opportunities include those available to Ph.D. holders graduating in the basic science discipline in which the joint degree is awarded; in addition, graduates in some areas (e.g., marine analytical chemistry, marine microbiology) would find jobs in industry and government concerned with environmental monitoring and regulation.

Social Sciences

The social sciences, as perceived and practiced at UCSC, are comprised of a distinct set of questions and methods which seek to understand the human condition and, significantly, enhance that condition. Like other academic divisions of the university, the social sciences are affected by both internal and external forces. The internal forces are not different in kind from the intellectual forces felt in all academic domains. The external forces, however, include the social aspects of the human condition which society deems in need of attention. These internal and external forces are each individually significant but also act together to define the social sciences at particular points within institutional contexts.

Present external forces require the social sciences to respond to a number of important challenges in the near future. The state, the nation, and the world are shrinking dramatically (in the sense of closer interaction between formerly distantly related processes), resulting in the need to understand and effectively respond to cultural, economic, social, political, and educational transformations which are occurring rapidly at local, regional, national, and global levels.

Long-term and recently accrued faculty expertise in the area of "global transformations" offer the possibility of a UCSC leadership role in this area. Faculty in Anthropology, Community Studies, Education, Economics, Latin American Studies, Politics, Environmental Studies, and Sociology have individually or as teams distinguished themselves in this area of "transformational" analysis. New programs in Economics and Anthropology, coupled with interdisciplinary research efforts within and across divisional boundaries (Bilingual Research Group, Feminist Studies FRA, Cultural Studies, Race and Ethnicity Research Council), will add to strength in this area, as will the new National Center for Research on Cultural Diversity and Second Language Learning.

Society is also increasingly recognizing the social costs of our failure to understand and effectively respond to our natural environment. Partly due to our physical location, and partly due to the existing areas of concern and expertise of our faculty, we are well positioned to take a lead in the exploration of these critical issues. The present national and international visibility of Agroecology, combined with the revitalization of Environmental Studies marks the domain of "environmental sustainability" for specific prominence. The present and potential links with divisional academic and research programs in Community Studies, Education, Economics, Politics, and Sociology, plus interdivisional ties with the natural sciences, strongly indicate the intellectual vitality of this domain for the Social Sciences Division and for the campus.

Graduate programs in the social sciences at UCSC are fairly well developed, and the division is in the process of rounding out the array of graduate programs with a new Ph.D. program in Cultural Anthropology and another in International Economics.

In response to both internal and external forces, the division is prepared to invest resources in the development of programs at the M.A. and Ph.D. level in Environmental Studies, as discussed elsewhere in this document. These initiatives will require close cooperation between the Social Sciences and Natural Sciences Divisions.

The development of a Ph.D. program in Education should also be a high priority for this division. (The division would, of course, also be integrally involved in any development of a school of education.) Finally, development of programs in communication or information science would also require Social Science collaboration.

Humanities

The humanities at UCSC, as elsewhere, are in a state of ferment and redefinition. We can, nevertheless, identify some clear convergences of energy and some obvious places that need building.

The central program for the next decade should be what Dean Lease has called "the revitalization of the historical sciences". This will require careful attention both to new faculty appointments and to the cultivation of faculty interaction, since the gap between historiographers and theorizers has grown rather large. The re-establishment of the graduate program in History, now under way, should

be a top priority for the division.

Women's Studies and American Studies, both important pieces in the diversification of the humanities curriculum, need to be developed to the point where they can assume board status and begin to contemplate launching graduate programs. In both cases great care should be taken to establish programs capable of assuming leading positions in the mainstream of similar programs nationwide.

Cultural studies is currently an academic "growth area", with its own academic journals and international conferences, and an ever-increasing number of university programs dedicated to it. UCSC already has a Center for Cultural Studies, which organizes conferences and other events, but which has no formal teaching program. Additionally, there are a number of other programs on campus-- for example, Women's Studies -- which offer courses and represent research interests within the general rubric of "cultural studies". A de facto "program" in cultural studies, therefore, already exists on campus -- but in the form of a jigsaw puzzle whose various pieces are currently scattered among different departments. The campus might consider ways to combine these pieces into a more coherent approach to graduate work in cultural studies.

The possibility of an interdivisional program in Contemporary Visual Culture is discussed below in the section on the arts.

Philosophy and Linguistics should be closer intellectually than they currently are. These programs do not have other close connections within the humanities, nor are their links to programs in other divisions strong. The search for a philosopher of language should be renewed, and other possible ties between the programs should be cultivated at the board level. A goal for 2005 should be to have a strong Linguistics program with a first-rate semantics component and a strong Philosophy program with a first-rate component in analytic philosophy and philosophy of language. Both of these in turn should have connections to artificial intelligence and formal language interests in Computer and Information Sciences and Computer Engineering.

An emerging field of inquiry which seems certain to take root and become a standard component of the university of the future is "cognitive science". While we are not recommending the establishment of a program with that name, we should not overlook the possibility of planning for such a component in the UCSC of the 21st century. Long-range planning of developments in Linguistics, Philosophy, CIS, CE, and Psychology should be done with this in mind.

Arts

In the arts, a major concern will be the establishment of appropriate graduate programs while maintaining the quality of existing undergraduate offerings. Guiding principles should be (a) the development of an Arts Division that is known to combine theoretical rigor and historical consciousness with artistic practice; (b) an active focus on new arts technologies and mass- mediated forms of artistic production; and (c) the development of a curriculum which is less Eurocentric and more responsive to the notion that art is a sociological and ideological practice as well as a form of individual expression.

Shakespeare/Renaissance

A proposal has been submitted for the establishment of a program leading to the M.F.A. degree in Shakespeare/Renaissance performance and dramaturgy. This program's careful

integration of theory, history, and practice is in accord with the first principle above. It would build to existing strength in Theater Arts, and its close relation to Shakespeare Santa Cruz would provide an opportunity to develop a very visible program which could achieve national prominence.

Contemporary Visual Culture

Building on an already impressive faculty in the contemporary visual arts (photography, film, video, etc.), the Arts and Humanities Divisions should jointly commit resources to the development of an interdisciplinary and interdivisional Ph.D. program in Contemporary Visual Culture. This development should be accompanied at the undergraduate level by the development of a major in Film/Video Studies or in Contemporary Visual Culture. These programs would incorporate current and future faculty in film, video, photography, computer arts, and art theory.

In general, the plan for the Arts Division in 2005 should envision a program that consciously integrates history, theory, and practice, and that devotes an appropriate percentage of attention to new technologies and mass-distribution forms.

5. Undergraduate Education

UCSC has from its inception been a campus particularly committed to undergraduate education. With undergraduates representing over 90% of our current student body, this remains true, at least in terms of the percentage of faculty effort devoted to teaching undergraduates. We are now contemplating a development plan in which the ratio of undergraduate to graduate students will gradually be brought more into line with the distribution characteristic of a mature campus of the University of California (though even under this plan we will remain a predominantly undergraduate campus, with undergraduates accounting for 80% of total enrollment). As we proceed with this development, we must pay careful attention to the maintenance of excellence in undergraduate education even as we devote an increasing percentage of our total resources to graduate and professional education.

Despite the rhetoric generally associated with the idea of UCSC's commitment to undergraduate education, our campus does not in fact have any particularly well articulated pedagogical mission or philosophy. In order to develop a campus mission at the undergraduate level, there are several things we clearly must do. First, we must develop an understanding of the nature of our student body as it is and as it is becoming; that is, we need to know who our students are, and who they will be in the years to come. This means undertaking much more detailed and fine-grained studies of our student body and potential- applicant pool than has been done in the past. We need in particular to understand the multiplicity of issues raised by the increasing diversity of the population of the state and of our student body. In addition, we must decide what range of courses and curricula we will offer, as well as what we will not offer. Most importantly, we must choose a few areas in which we intend to excel, and systematically devote the necessary resources to establish and maintain excellence in those areas.

One important factor in any plan for the enhancement of undergraduate education at UCSC in the next fifteen years will be the interaction between growth at the graduate level and undergraduate education. This committee believes strongly that with careful planning and thoughtful management of

the interactions between undergraduate and graduate programs, the development of graduate study at UCSC can be brought about in a way that provides overall improvement in undergraduate education.

In defining and developing our mission, we should attend to the three main components of undergraduate education at UCSC: general education, the majors, and colleges. In each of these components, we face challenges that must be met as well as strengths that must be protected as the campus develops toward maturity.

5.1 General Education

In January 1989 a Committee on Undergraduate Education (CUE), appointed by the chancellor in fall 1987, submitted a report recommending a number of steps for the improvement of undergraduate education at UCSC. These recommendations have not been fully accepted by the UCSC Academic Senate, but the Committee on Educational Policy is currently considering measures to introduce some of the improvements recommended in the CUE report.

While there is disagreement about how best to provide it, there is a remarkably firm consensus about what an excellent undergraduate education is. The CUE report frames the problem in terms of the properties of a well-educated person, which are identified as follows: understanding of world culture; ability to learn; facility with intellectual tools; understanding of and appreciation for human creativity; and mastery of the methods and results of at least one area of disciplinary inquiry. The characterization concludes:

An educated person is one who can integrate these various kinds of knowledge, understanding, and ability into a whole and useful life, and be a responsible participant in society. This requires an understanding of the connectedness of science, technology, social institutions, values, aesthetics, and ethics. It requires recognizing science, technology, mathematics, literature, philosophy, music, art, social organizations, economies, and virtually everything else we study as manifestations and creations of the human spirit. It requires the ability to accept ideas and concepts without prejudice, to bring to bear critical and analytical tools in making judgments, and to do it always in the context of an understanding, based on knowledge and thought, of the human condition. ("Report of Committee on Undergraduate Education", p. 4.)

One major challenge still facing our institution in this decade will be the arrangement of curricular offerings and requirements so as to assist our undergraduates in approaching this ideal of the excellent undergraduate education. General education courses and requirements will clearly play a central role in this endeavor. Since these curricular decisions are in the domain of the Academic Senate, no planning document can determine what they will be; as an institution, however, we should continue to press for a more coherent and purposeful definition of the general education component of our curriculum.

Included in the area of general education are two components traditionally assigned to the humanities and one traditionally assigned to the natural sciences: writing, languages, and mathematics. The foundational skills represented by these areas must be supplied at the university level. They are presupposed in all advanced work, and they are not adequately provided in high-school education. A major challenge for UCSC in the next decade will be to determine how best to offer advanced training in these fundamental skills to our students.

One of our major recommendations is that the campus adopt a systematic approach to language education. Steps should be taken to ensure the stability of the language-instruction program, to provide the necessary leadership, and to allow for smooth transitions to expanded offerings at appropriate points. One example: we anticipate that along with Chinese and Japanese, Korean will become an important international language of commerce in the very near future. Our proposed international focus for the campus, together with the expected developments in International Economics, leads to the conclusion that we should be thinking about the introduction of Korean (and probably the expansion of offerings in Chinese and Japanese) at some point not too far off. As things are currently structured, it would be the responsibility of the Humanities Division to look after the health of this component.

Writing education at UCSC appears to be well organized and structured. The integration of basic writing instruction in the college core courses provides a first-quarter introduction to college writing for every freshperson, while a subsequent composition course provides further guidance toward writing proficiency. We recommend, however, in accord with the recommendations of the CUE report, that a further (upper-division) writing-intensive course be part of the general education requirements.

In the area of mathematics, this campus still has no provision to assure that every graduate gains some competence in quantitative or formal methods. The "Q" requirement is insubstantial, and the students all know how to get around it. If we are to assume responsibility for the education of our students in quantitative and formal thinking, we must do something that we have not been doing. We recommend that the campus adopt a substantive requirement in quantitative and/or formal reasoning as part of the general education requirements.

5.2 Majors

A number of the undergraduate major programs at UCSC are recognized (by external committees brought in for program review, for example) as particularly excellent, and their contribution to the overall excellence of undergraduate education for both their majors and other students who take advantage of their courses must be counted as one of the campus's great resources. Through the program-review process, and the vigilance of the Committee on Educational Policy, we must jealously guard the quality of those already excellent undergraduate major programs, and press for increased levels of excellence in all programs.

In addition to pursuing the overall academic excellence of the major programs, we should focus on further developing one of UCSC's particular strengths: the tradition of encouraging and facilitating undergraduate research. In many of our undergraduate programs, research is well integrated into the work for the major; collaborative research involving faculty and undergraduate students is not uncommon; and undergraduate research is recognized in various ways (honors for senior thesis, Chancellor's prizes, departmental or divisional undergraduate research awards, exhibitions). There are also excellent models of research collaboration in which faculty, graduate students, and undergraduate researchers work on a project. This area of existing strength should be not only protected but enhanced as we grow toward maturity. The integration of research and other creative activity into the undergraduate experience could in fact become one of the distinctive marks of the UCSC campus. For this to be accomplished, it will be necessary for the campus to carefully avoid the identification of research solely with graduate training, and to explicitly reject the false opposition between research and teaching at the undergraduate level.

5.3 Colleges

The colleges at UCSC present both challenges and opportunities in the campus's attempt to shape undergraduate education. To the extent that the campus has not been able to articulate a coherent academic mission for the colleges, they have represented a precious but underutilized resource.

The campus is now moving to meet this challenge. In 1990-91 the UCSC Academic Senate, through the work of a CEP/CPB joint Subcommittee on the Colleges, developed a plan for the academic rejuvenation of the colleges. This plan, which has been approved by a vote of the UCSC Academic Senate, endorses location of certain general education functions (specifically, advising and first-year writing/composition) in the colleges, and further provides a mechanism for the development of college-based enhancements of undergraduate and general education in the spirit of the recommendations of the Smelser report ("Lower Division Education in the University of California: A Report from the Task Force on Lower Division Education", 1986).

Specifically, the UCSC faculty have committed to offering one- to three-unit undergraduate seminar courses, in addition to their existing commitments, at the rate of one such course per faculty member every three years. These courses will go in part to the expansion of offerings in the colleges, and in part to a similar extension of board offerings. The new resolutions also call for the appointment of one or two faculty in each college to provide further enhancements to teaching and advising.

The college provosts will provide leadership in shaping the academic mission of each college. Each provost will be expected to teach in the college core course, which is an important part of general education; oversee advising in the college; and coordinate other curricular offerings and academic activities in the college.

The Senate resolutions provide a foundation on which to base academic development of the colleges. The challenge in the coming years will be to build on that foundation in ways that best enhance the education of the students and their interaction with faculty. The job of meeting that challenge will fall largely to the provosts and deans, with the Committee on Educational Policy playing a major oversight role.

Possible Directions for the Colleges

In this section we put forth some proposals which have not been part of the recent debate regarding the academic role of the colleges and which are in a sense orthogonal to the central strands of that debate. These suggestions concern ways in which the UCSC colleges could become more distinctive academic and intellectual communities.

Some colleges already differentiate themselves from others by having college-specific courses or graduation requirements. (Stevenson, for example, still has a three-quarter core course; Cowell has a computer-literacy requirement.) This differentiation and establishment of intellectual identity could be developed much more richly. If, at one extreme, we could imagine strictly residential and social colleges with no specific academic offerings or requirements of their own, we could similarly imagine, at the other extreme, each college autonomously offering a whole curriculum, with majors, graduation requirements, and general education all contained within the college. As an intermediate position, each college could set the general education requirements for its own students, as is the case at UCSD.

Our colleges are currently only a small step above the lower extreme. It is clear that the higher extreme is not realistic, given the small size of our colleges and their faculty distribution. It would not be unreasonable, however, to contemplate moving somewhat closer toward the model of UCSD, where college identity is largely determined by the college's own set of graduation and general education requirements. This could be tried at UCSC without either moving fully to college determination of general education requirements or endowing the colleges themselves with greater responsibility for offering courses.

One example that we propose for serious consideration is the concept of a bilingual college, an idea that has been suggested before but never seriously pursued. This might require that a particular college propose that by the academic year 1995-96, for example, it would be fully bilingual in Spanish and English--that is, every member of the college, including all faculty, staff, and students, would be able to communicate in those two languages. The five-year preparation period would allow sufficient time for movement of students and faculty differentially attracted to the idea of a bilingual college, and for language learning on the part of those attracted but not prepared.

The college itself would not necessarily have to offer language courses, though this possibility is not ruled out a priori. The campus as a whole would certainly experience an increased demand for Spanish language classes, but if the recommendations of this report are followed, the campus will be putting resources into language instruction in any case, and the increased demand would be welcome.

Another college might simply have a two-year language requirement, without specifying the language. The result of this would be a concentration of students interested in language, possibly with large proportions of Literature, Language Studies, Education, Linguistics, and Psychology majors (though of course students interested in language would be found spread much more broadly than this).

These particular college-specific requirements could provide a way for the campus to resolve its ambivalence about a foreign-language requirement. Nearly every statement on general education recognizes that the study of language is central to the formation of a well-educated individual, but the barriers of individual resistance and high cost have prevented us from establishing a universal language requirement for our students. If more students elect to study language, of course, the cost to the institution will go up; but as an institution we are sufficiently committed to the value of language study that that should not prove a serious deterrent.

On a different dimension, a college could require that every student become proficient in the use of some musical instrument, including knowing how to read musical notation and possessing some understanding of music theory. There are surely students of physics and Italian who would find it pleasant and enriching to be in a college where every member is a musician.

Finally, a college might create an academic identity for itself without necessarily mounting any courses by requiring all of its students to master some basic areas of mathematics: probability and statistics, calculus, logic and set theory. None of these should be beyond the abilities of any student who meets the entrance requirements of the University of California; and while a college with such a requirement might attract a disproportionate share of science and engineering majors, it would probably in the long run encourage an interesting mix of people. (In this case, as in the previous examples, the faculty should of course be able to satisfy the requirements expected of the students.)

There are two crucial differences between the college emphases suggested here and the old notion of college "theme". The first is that these emphases focus more on abilities than on subject matter. The second is that the recommended emphases are cross-disciplinary rather than inter-disciplinary: they represent such fundamental intellectual arenas that a person in any area of disciplinary interest might well also have an interest in one or more of these intellectual foci. For this reason, a college focus on language, music, or mathematics should attract a reasonably wide variety of people, both at the faculty and at the student level.

There is, of course, no obstacle to the development in colleges of thematic areas of interest which might complement the more traditional offerings of boards and programs. Such areas might include educational technology, scientific instrumentation, international studies, bilingualism, and cultural diversity. No college should try to do all of these, but a well- planned collegiate focus on one or two such areas could help to define the college as a distinctive intellectual community.

Another approach to establishing a college intellectual identity might be the establishment of regular research forums. Many departments have a custom that once a month, at a standard time and place, a member of the faculty gives a presentation on his/her recent research. There is no reason that this custom could not be adapted to colleges. Similarly, a college might sponsor a monthly student research forum, perhaps offering separate forums for undergraduate and graduate students.

We assume here that graduate students should and will be associated with colleges, a concept that has been supported by the Senate Subcommittee on the Colleges. In fact, it is the opinion of the 2005 Committee that the integration of graduate-student presence in the colleges is absolutely essential to their development as viable intellectual and academic communities within the UCSC campus. Given the direction in which we have chosen to develop, any college that remains exclusively undergraduate in composition will isolate itself from the interests of the main body of faculty, and will needlessly deprive itself of the benefits of the natural maturity gradient that results when less advanced students share a community with more advanced ones. The colleges should move actively and thoughtfully to begin to establish a place for graduate students, and by the same token a more integrated involvement of more advanced undergraduates, in their social and intellectual fabric. Housing for graduate students in the colleges should be an integral part of this thinking.

In sum, there are other ways, independent of curricular offerings or requirements, in which a college could establish an intellectual identity. The suggestions offered above are intended to be suggestive. For any given approach to work in the long term, it will need to be driven by the interests of the faculty and students, and those interests will change. Nevertheless, the point remains: a college can establish intellectual traditions that are tied not to particular subject matter, but to the developing interests of the students and faculty of the college.

We recommend that the colleges pursue the development of individual identities along the lines suggested above. We realize that this can only happen if the colleges have faculties who concern themselves with the requirements and intellectual identity of the college, and if the Committee on Educational Policy approves of the necessary delegation of some level of authority to the colleges.

There will no doubt be many problems to solve along the way, and the re-establishment of the colleges as academic as well as social environments is likely to be the work of many years. But this is a task worthy of our planning and patience, because how well we manage this re- establishment will be the major determinant of success in establishing uniqueness and general excellence in

undergraduate education at Santa Cruz.

5.4 Involvement of Graduate Students

It is impossible to divorce the question of the quality of undergraduate education from the quality of training of graduate students in pedagogy. Graduate students provide a significant proportion of the instruction delivered to undergraduates in a modern university. We recommend that this campus adopt as a goal that every graduate student should get both significant experience in teaching and significant instruction in pedagogy.

5.5 Summary of Recommendations

The major recommendation of the 2005 Committee with regard to undergraduate education is that the campus should choose a few things to do well, and really do them well. We have identified three areas that could contribute both to the distinctiveness of UCSC and to the excellence of undergraduate education here: general education, outstanding major programs, and the colleges. In each of these areas, we should be selective.

In general education, we should deliberately set out to develop a campus vision to guide and inform the establishment of general education offerings and requirements. In this domain, the committee recommends that the campus focus be on mathematics, writing, and languages.

In the maintenance and development of major programs, we should pay particular attention to the integration of research and creative activity into undergraduate programs. The administration and CEP should monitor indications of such integration and reward it with recognition and appropriate incentives.

The colleges should be carefully re-established as academic and intellectual entities with distinctive elements all consistent with a common purpose. Whatever particular directions the campus decides to take in revitalizing the colleges, it is essential that the process be undertaken with care, recognizing that it will take a long time but that the potential rewards are significant. We recommend specifically that the colleges adopt specific academic requirements that differentiate them from other colleges, following the UCSD model.

As the campus grows toward maturity, so does the need for a well-defined pedagogical mission. If we are to succeed at the University of California's twin goals of excellence in research and teaching, we must develop a more coherent and deliberate approach to undergraduate education, taking into consideration the realities and opportunities created by the expansion of our graduate programs. In particular, we need to establish a more coherent vision for our general education requirements, and we need to develop a clearer picture of the identities and needs of our increasingly diverse student body.

6. Recommendations

We conclude our report with a small number of general and specific recommendations.

General Recommendations

The following general recommendations represent conclusions that we have come to regard as

absolutely essential to the development of the campus toward maturity in keeping with its fundamental mission.

Recommendation 0

As an important part of the campus mission UCSC should recognize and address the following first-order problems and opportunities that face the state and nation: ethnic and cultural diversity, the environment, education, technology, and global interdependence.

Recommendation 1

The campus must continue to investigate possibilities for the development of graduate and professional programs.

This is the area where we are presently most out of line with the profile of a mature teaching and research university. We are already taking steps in this direction, with the proposal for a School of Engineering and several new graduate program proposals in process or under development. Yet the growth planned for the campus leaves room for much more, and our studies indicate that the majority of that growth must be in professional areas rather than in the academic M.A. and Ph.D. programs that we now offer almost exclusively. For each area in which professional degrees are offered, we need to carefully consider whether we should be offering a program in that area; and if we should not, we need to know exactly why not. The chancellor and academic vice chancellor should establish committees similar to the committee which reported on the School of Engineering to develop proposals for specific programs.

Recommendation 2

UCSC should carefully select a few things to do well, and then plan carefully to do those things really well.

Our growth plan will not bring us to the size of a large university in the next fifteen years; we will be a middle-sized or even smallish university. For a university of that size to be counted as excellent, it must do a few things very well; it cannot be expected to offer the range of programs and emphases that a large university might offer. Thus it is important for us not to try to do too many things. This recommendation holds at both the undergraduate and graduate levels.

Recommendation 3

We must establish a reserve of resources from which the launching of new initiatives can be supported.

If we are to make a good start on major new initiatives, we will need to have resources in reserve to support these initiatives. A high priority for the campus, and for each division, should be the establishment of a reserve pool of FTE, and other hoardable resources, sufficient to allow us to launch new initiatives with a substantial dowry.

Recommendation 4

It is extremely important for our institution to continue to pay careful attention to the integration of

undergraduate and graduate education, of teaching and research.

The University of California has established for itself a very difficult goal: to be at once a major graduate and professional university, and an excellent undergraduate university; to be at once a major research university, and an outstanding teaching university. UCSC must accept that challenge, and manage its growth toward maturity with extreme vigilance, so that graduate and undergraduate education, research and teaching are not only in balance, but actively reinforce one another.

Recommendation 5

Continued planning is essential. The long-range academic planning process should be repeated at five-year intervals. Further, the planning process should be spelled out and made public, so that all concerned understand what is being attempted and what is being accomplished.

Specific Recommendations

In consonance with the above, the 2005 Committee offers the following specific recommendations.

Professional Schools and Programs

1. Engineering: vigorously develop the proposed School of Engineering, with possible expansion to include environmental and materials science engineering.
2. Education: develop a graduate program, and possibly a non-traditional school, dedicated to the preparation of excellent practitioners of teaching.
3. Architecture: develop a school of architecture/design, with special focus on critical theory and environmental issues, and attention to integration with the
4. School of Engineering and the Division of the Arts.
5. Environment: pursue a multi-pronged approach including expansion of graduate education and research on the environment in existing social and natural science programs, and development of a two-year interdivisional Environmental Management program, a postgraduate Environmental Certification program or school, and an environmental issues research center.
6. Other areas: explore other promising possibilities such as public health, information technology, etc.

Academic Graduate Programs

1. In the natural sciences, develop a program in Environmental Toxicology. This will interact with the developing program in Environmental Studies as well as with aspects of the School of Engineering, if an Environmental Engineering component is developed.
2. Develop a Ph.D. program in Marine Sciences.
3. In the social sciences, pursue the theme of global transformations. (It will be necessary to carefully delineate what this means.)
4. In the Social Sciences and the Natural Sciences Divisions, cooperate in the development of programs in Environmental Studies and Environmental Sustainability.
5. Develop a Ph.D. program in Education, with a focus on cultural-diversity issues, mathematics, science and technology, and language.
6. In the humanities, in cooperation with the Social Sciences Division, revitalize the historical sciences. This will require careful re-building of the graduate program in History.
7. Establish faculty and programmatic links between Linguistics, Philosophy, and Computer and

Information Sciences, developing a strength in cognitive science. Such a focus would also eventually involve Psychology and Computer Engineering.
8. In the arts, develop the Shakespeare/Renaissance M.F.A. program.
9. Establish an interdivisional Ph.D. program in Contemporary Visual Culture, involving the Arts and Humanities Divisions.

Undergraduate Education

1. Develop a campus vision of "the educated person" that will guide and inform the establishment of curricular offerings in general education.
2. Encourage and facilitate undergraduate research, in collaboration with both faculty and graduate students.
3. Carefully re-establish the colleges as intellectual and academic entities.
4. Facilitate differentiation in the colleges, through increased college-specific academic requirements.
5. Administratively recognize excellence in major programs, in terms of course support and target workload.

7. Bibliography

Sources consulted by 1990-91 Committee on 2005

Santa Cruz Campus Documents

"Academic Planning Study," Office of the Academic Vice Chancellor, UC Santa Cruz, July 1988.

Committee on 2005 notes and documents from 1989-90.

Consultant reports for potential schools of Arts (1988), Education (1989), and Public Policy (1989) at UCSC.

"Enrollment Fact Sheets, UC Santa Cruz, Fall 1990," Office of Finance and Planning; released in December 1990.

"Final Report of the Committee on Health Care Education," UC Santa Cruz, December 12, 1974.

"Integrating Physical Planning with Academic Planning," by Wendell Brase, Vice Chancellor for Finance, Planning, and Administration, UC Santa Cruz. Paper presented at the 1987 Forum Association for Institutional Research, Kansas City, Missouri, May 1987.

"Long Range Development Plan, 1988," UC Santa Cruz, May 1989.

"Personal Characteristics of Santa Cruz Freshpersons: A Twenty-Year Summary," report prepared by Harley Baker, Office of Analysis and Planning, UCSC; released in January 1991.

"A Proposal for a School of Engineering at the University of California, Santa Cruz," Final report of the Committee to Study a UCSC School of Engineering, May 1990.

"Provisional Academic Plan for the Santa Cruz Campus," by Clark Kerr (Office of the President) to

Members of the Committee on Education Policy, November 9, 1962.

"Reasons Freshpersons Come to UC Santa Cruz," report prepared by Harley Baker and Randy Nelson, Office of Analysis and Planning, UCSC; released in December 1990.

"Report from the Committee on Undergraduate Education," December 23, 1988.

"Retention and Graduation Update, 1990-91," Office of Analysis and Planning, UCSC.

"Survey of Spring 1988 Graduates," report prepared by Harley Baker and Randy Nelson,

Office of Analysis and Planning, UCSC; released in February 1990.

"Twenty-Year Plan, July 1985," UC Santa Cruz, Final Campus Version.

Documents from Other Campuses

DAVIS: "Future Directions," UC Davis, September 21, 1989.

IRVINE: "Visions for the 21st Century," UC Irvine, 1990.

LOS ANGELES: "Academic Planning Statement," UC Los Angeles, January 1990.

RIVERSIDE: "Academic Planning Statement," UC Riverside, February 20, 1990.

SANTA BARBARA: "Academic Planning Statement," UC Santa Barbara, June 1989.

"Proposal to Establish a Professional School of Environmental Science and Management at the University of California, Santa Barbara," October 24, 1989.

Systemwide Documents

"Distribution of Professional Schools and Colleges, University of California," Appendix I of "Report on the Advisory Committee on Professional Education," June 10, 1989.

"Lower Division Education in the University of California: A Report from the Task Force on Lower Division Education," 1986 (often referred to as "the Smelser report").

"Preliminary Guidelines on Academic Planning for New Campuses," draft for discussion, April 7, 1989.

Profile 1990, University of California, produced by University Relations, Office of the President, February 1990.

"The University of California: A Multi-Campus System in the 1980s," Report of the Joint Planning Committee, Berkeley, September 1979.

Books

Education Without Compromise: From Chaos to Coherence in Higher Education, by William D. Schaefer. San Francisco, CA: Jossey-Bass, c1990.

A Handbook for Institutional Academic and Program Planning: From Idea to Implementation, by Raymond N. Kieft et al. Boulder, CO: Center for Higher Education Management Systems, 1978.

How Administrators Can Improve Teaching, by Peter Seldin and Associates. San Francisco, CA: Jossey-Bass, c1990.

Opportunity from Strength: Strategic Planning Clarified with Case Examples, by Robert G. Cope. ASHE-ERIC Higher Education Report No. 8. Washington, D.C.: Association for the Study of Higher Education, 1987.

The Quest for Quality, by Lewis B. Mayhew. San Francisco, CA: Jossey-Bass, c1990.

Successful Program Review, by Robert J. Barak. San Francisco, CA: Jossey-Bass, c1990.

Surviving the Eighties, by Lewis B. Mayhew. San Francisco, CA: Jossey-Bass, 1979.

The University: An Owner's Manual, by Henry Rosovsky. New York, NY: W.W. Norton, c1990.

Using Goals in Research and Planning, ed. by Robert H. Fenske. New Directions for Institutional Research series, number 19. San Francisco, CA: Jossey-Bass, 1978.

Additional Articles and Publications

Oral Exams: UCSC Founders Evaluate Their Creation on its 25th Anniversary, by Christina Waters. Pacific Magazine, September 1990.

A Report on Teacher Supply: Enrollments in Professional Programs During 1987 and 1988, by the Commission on Teacher Credentialing for the State of California, July 1989; principal author: Robert Gomez, Consultant.

8. Appendices

APPENDIX A: Summary of Twenty-Year Plan

APPENDIX B: Academic Planning to 2005 (Memo from Acting Dean of Graduate Studies and Research James Gill to 2005 Committee, 12/18/90)

FOOTNOTES

[1] In terms of numbers of graduate students in each division, UCSC is not out of line with systemwide norms (except, of course, for the skewing due to the absence of professional schools). Graduate students in natural sciences, for example, constitute approximately 60% of our graduate students, and that is the normal percentage systemwide. Where we are out of line is in the array of graduate programs in the different divisions.

[2] There is a problem that we can't think of anything to do about, but we believe we must point out: it is that the policies of the state and UC regarding nonresident tuition threaten to make it next to impossible to recruit excellent students from other countries. This will surely erode the quality of the university.