Appendix B to "2005 Report" and "15K Report"

26 December 1990

To: COMMITTEE ON 2005

From: Jim Gill, Acting Dean, Graduate Studies and Research

Academic Planning to 2005: Graduate Division

Being a UC campus with <8% graduate students is anomalous and was unintended. The original campus plans expected that within ten years the student body would be 16% in graduate and 20% in professional programs. Even those figures are low for public research universities, and 25 years later there is no evidence that UCSC can prosper yet be atypical in these regards. The net result of this "vision statement" would be a more conventionally-constituted university. In my view, UCSC needs to be more conventional in structure in order to be more innovative in instruction; for historical and fiscal reasons, we have become the opposite.

Our currently-stated goal of having a 20% graduate student body is necessary if we are to rank among the top 100 research institutions in the nation, a goal of the 1985 20 Year Plan. Also it is necessary if we are to attract a representative range of Californian students, and to be full participants in UC's effort to meet California's need for future university professors and for a technically sophisticated work force. Although the 20% figure is somewhat arbitrary, it is based on the post-war experience of American public research universities and is an attainable goal. The attractiveness of our physical site, our reputation for high quality research, and our tradition of attention to undergraduate teaching all are sound bases on which to build.

1) What are the major challenges in our development of graduate studies and research? a) To develop world-class Ph.D. programs while retaining unusually strong undergraduate degree programs; b) to move beyond our present Arts and Sciences emphasis to develop professional programs that identify, clarify, and help to solve urgent environmental, economic and social problems on State, national, and international scales; c) to develop programs which attract and retain faculty of excellence in research as well as teaching in an increasingly sellers market; d) to attract graduate students to a small town with little local employment in a State with weak secondary education.

2a). What are our major strengths? At the graduate and research level, "strength" is externally recognized distinctiveness, excellence, and potential. I see little that is distinctive about our graduate education. For example, Syracuse, not UCSC, is the national model for TA training. We could carve out a niche in which we paid special attention to the preparation of university teachers, e.g., by expanding TA training, experience, and supervision for Ph.D. candidates, and by conducting research about national and international tertiary education. Although that is part of my "vision," UCSC faculty do not seem to be keen to do more in this regard now.

As regards excellence, my judgment is no better informed than yours. No UCSC program has been ranked in the top 10% nationally, although we are top-ranked nationally in citation frequency in the physical sciences and 9th-ranked in the life sciences. Although there are small groups of internationally acclaimed scholars in many fields, in terms of research productivity, professional awards, contracts and grants, and citation frequency, our highest concentrations of excellence in

graduate studies and research seem to me to be in Astronomy and Astrophysics, Biology, Biophysics, Developmental Psychology, Earth Science, History of Consciousness, Marine Science, and Particle Physics. Too many other academic programs have potential to list them.

More broadly, UCSC's geographic location relative to other UC campuses gives us natural advantage in several areas: biotechnical, computer, electrical, and other fields of engineering related to Santa Clara Valley; environmental and marine studies; town (vs. urban) planning; natural resource management (e.g., marine, forestry, agroecology, water); etc.

2b). Major weaknesses. As a consequence of our institutional history, a smaller fraction of faculty are oriented and motivated toward entrepreneurial development of research programs than is typical in UC. Our number of graduate students and amount of external support per faculty are below UC averages except in a few fields. This is a natural consequence of hiring people also seriously interested in undergrad teaching, and of our investment in student services which make the undergraduate experience more pleasant. Although newer faculty often differ, I think this history is sufficiently entrenched and beneficial that it will always limit our research infrastructure relative to UC norms. Good teachers often are not good entrepreneurs, and vice versa.

Costs and competition. Lacking as many entrepeneurs per capita, there will be less extramural support and fewer cost-effective ideas bubbling up.

Geographic location. Only Davis is as non-urban. This deprives us of local industry support and employment for grad students and spouses. Few public universities with 3000 graduate students are in such small towns.

Arts and Sciences-only tradition. It is uncommon for much more than 10% of the student body to be in academic Ph.D. programs in public universities; UCB is the only UC campus for which this is true. Within Letters and Sciences, only 11.9% of UC enrollment was graduate in 1985-86. In 1988-89, Systemwide graduate enrollment was 50% academic Ph.D., 12% academic master's, 24% professional master's, and 14% health science doctorates. Arguably, our existing programs are 2/3 of the way or closer to their carrying capacity now.

3. Where should we go? Table 1 presents the current plan for graduate student enrollment at UCSC to 2005. It was only intended as a preliminary plan, but it is quite instructive because I think it is unrealistic for three reasons:

a) We cannot support that many students in academic Ph.D. and programs. Table 2 illustrates this point. Currently, with about 7.7% graduate students, the mean support per grad student is about $12,800. If grad students were 20% of the student body, TA support would drop from its current $7268 to $2540 per grad student. To support 3000 students at the same level as now would require the campus to provide about $19 million more in annual Fellowship support than it does now. In contrast, were the graduate student body 50% in master's programs in which they receive only $2000 to $5000 support per year, then we would need to increase our Fellowship support base by only about $3 million provided that at least 1/3 of the faculty produced the same level of GSR support as does the average NSE faculty now.

Obviously the other principal leverage is GSRs. Average GSR support per faculty member at UCLA during 1988-89 was $27,000 in engineering, $21,700 in the physical sciences, $10,700 in the life (not health) sciences, $5700 in the social sciences, $2400 in the humanities, and $1500 in the arts.

(Figures are unavailable to me from other campuses, and UCLA may be anomalously high due to GSRs in old ORUs.) For example, were our faculty in 2005 15% in engineering, 23% physical sciences, 10% life sciences, 25% social sciences, 15% humanities, and 10% arts, and the average UCLA figures were applied, then per capita GSR support for 3000 graduate students would be $3200, which is close to our status quo and twice what is used in Table 2. This would, in turn, support a higher ratio of academic to professional students.

Systemwide levels of average GSR support per faculty probably are unrealistically high for a campus which gives special attention to undergraduate education. Even so, 25% of graduate students Systemwide are in professional programs and receive on average only $1300 in merit-based financial support. That is why the weighted student workload formulae benefit graduate campuses; students pay to attend so that only the costs of instruction, not of full student support, are borne by the institution. Some graduate schools can trade on their reputation for awhile and attract students with below-market support.

I see no reason to believe this will be true of many programs at UCSC by 2005.

The fundamental choice, therefore, is between two poles: growing to 10% graduate students, mostly in academic Ph.D. programs; or growing to 20% graduate students, half of whom are in master's programs which are market-oriented enough that students will attend primarily at their own expense. Reality lies in between.

Excellence could lie at either pole. Our current strength is built on Ph.D. programs and could continue to be so, albeit with a permanent fiscal disadvantage within the UC formulae that weight student workload as at present. Professional programs don't lead to Nobel prizes or high citation frequencies, and industry-oriented students take a lot of faculty time without contributing much to the research effort. However, professional schools create linkages with local industry and with government (improving the job market for all our graduates, breaking down out-dated images of UCSC, and establishing a better base for private-sector fund-raising), serve the public more directly than do most academic research programs, are important in affirmative action recruiting, and can generate significant external funds which trickle down to academic programs (at least through overhead).

b) The distribution between Divisions is out of synch with Systemwide growth plans and with most research universities. Table 1 anticipates that 50% of UCSC graduate students will be in natural sciences and engineering (NSE) at 2005, 25% in social sciences, 18% in humanities, and 7% in the arts (SSHA). This reflects neither current State practice, State priorities, nor existing campus strengths. In 1988-89, 22% of UC graduate students were in the health sciences and another 17% were in other professional studies. We cannot afford to write off such students. Excluding them, 59% of the rest were in NSE, 20% in social sciences, 14% in humanities, and 8% in the arts. Finally, Systemwide growth plans (Table 3) call for 65% of the growth in graduate student FTE to be in NSE but only 12% in SSHA, whereas Table 1 calls for 54% of our growth to be in SSHA.

Our pattern of existing strength in NSE is typical of research universities. We should return to 60% NSE graduate students in order to meet State needs, to best utilize present strengths as bases for centers of excellence, and to pay for graduate education (and other bills). Both present practice and future plans reflect the job market and those social needs which society will pay to address. We should consciously plan to differ from typicality only when (a) we have a clear academic rationale and (b) we know how to pay for it differently from other universities.

c) I think the plan overestimates the ability of existing programs to add and enlarge graduate programs, but this should emerge from the Divisional Deans' visions. Here is my view.

Table 1 assumes that all Boards now at UCSC will have a graduate program. About 49% of the growth is expected to occur in new versus existing graduate programs. Subtracting the growth projected for the engineering school, 94% of the balance (1100 graduate students) is expected to come from new graduate programs in SSHA. Many of these programs are struggling to be born, and I find the idea of relying on them for so much of our growth frightening.

Arts. Table 1 calls for 217 graduate students. Even assuming "U1" is Visual Culture, I'll be surprised if there are more than 150 non-certificate Arts graduate students. Top-ranked Art History and Theater Art departments have 3 grad students per faculty, but student support and faculty interest in grad programs are limits here.

Humanities. Table 1 calls for 546 graduate students. Top-ranked Humanities departments have 2-3 grad students per faculty and currently UCSC has 1.8 per permanent faculty. Even were programs added in Creative Writing, Philosophy, and Feminist Studies (none of them straightforward), I'll be surprised if there will be financial and intellectual support for more than about 325 Humanities graduate students.

Natural Sciences and Engineering. Table 1 calls for 1,489 graduate students, or growth of about 1,000. The engineering school expects to have 522 graduate students (growth of about 425). (The sum of App. Math, U1 to U3, and the three engineering departments in Table 1 is about the size of the new programs proposed for the engineering school; the chief difference between Table 1 and the engineering proposal is that Table 1 envisions 300 in CE+CIS, whereas the proposal envisions 200.) I find these NSE targets too low, disproportionately in engineering, and too little in life sciences. As noted above, overall UC graduate schools in science are about 40% physical, 40% engineering, 20% life. Individual universities commonly have 2:1 science:engineering graduate enrollments. Consequently, I think the problem with NSE is that too few new non-Engineering programs have been planned, especially in the life sciences and in professional master's degrees.

Social Sciences. Table 1 calls for 748 graduate students. Top-ranked social science departments have 3-4 graduate students per faculty whereas currently UCSC has 1.5 per permanent faculty. Significantly increased GSR support is possible in several Boards. Nonetheless, I think the estimates in Anthropology, Politics, and Social Documentation are too high, and U1+U2 seem fictional. I would guess that 600 is more realistic unless large professional master's programs emerge.In summary, my guess is about 1075 graduate students could be accommodated in SSHA were there enough GSR support. The balance will need to be in NSE and other professional programs.

4. My Vision (with the disclaimers and humility appropriate to an Acting stand-in Dean; "For every vision there is an equal and opposite revision"):

a. Build-out most existing graduate degree programs until they reach a typical number of graduate students and ratio of graduate students to faculty characteristic of smaller top-ranked public university departments in those fields. This means roughly 3-4 graduate students per faculty.
b. Add graduate programs to some existing Boards which lack one. These might include professional master's degree programs in some of Theater Art, Studio Art, Creative Writing, Social Documentation, or Applied Law; and Ph.D. +/- master's degree programs in some of Philosophy, Feminist Studies, Visual Culture, Politics, or Environmental Studies.

c. Adopt the goal of training college and university professors for the 21st century as an explicit "State need" that UCSC will help to meet. To do so: (i) we need to be a comprehensive university in which all faculty have the opportunity to train graduate students. (It does not mean that all departments will have graduate programs.) (ii) We should emphasize TA experience, TA training by faculty, and TA supervision. (iii) We might build on our undergraduate teaching tradition to create another Center for the Study of Higher Education within an Education School, that focuses on analysis of college and university teaching and administration.
d. Develop graduate programs around each of the five themes mentioned at your 12.12.90 meeting: cultural, ethnic, and linguistic diversity; environmental studies; K-12 education, especially emphasizing multi-lingual, math, science, and environmental education; technology; and global systems.

   In addition, break out the Pacific Rim as an explicit target area within which to focus on languages, economics, technology transfer, regional marine, biological, and earth science, and cultural anthropology. (That is, keep "global systems" global, and separately emphasize that California is not Eurocentric.) Envision a small East-West Center emphasizing our strengths vs Hawaii's or UCSD's. Use College Nine to advantage.

   Stress the inter-relatedness of our response to the themes. Each theme has important cross-Divisional components built on existing multi-Divisional interest if not yet strength. Each has both undergraduate and graduate, both academic and professional, components. Do this in such a way that about 1500 students are in master's programs which are sufficiently market-oriented that little financial support is necessary to attract students.

e. Leave room, indeed create momentum, for professional programs that aren't high priorities of your committee. I think academic programs are well-represented and can fight effectively for themselves, but there is no constituency besides you for other fields that might help us reach our goals. Further, it will be hard to meet our objectives or to enroll 1150 students in non-engineering professional master's programs using only those you've already identified. Examples of additional programs include the health training fields (perhaps in association with UCSF), library and information science (a mix between engineering and education schools), technical journalism (a mix between the science writing program and engineering), and architecture (which could have strong ties to environmental studies). These may need to have Ph.D. components in order to distinguish them from CSU programs; I know little about inter-segmental issues.
f. Re-open your consideration of a satellite campus in the San Jose area. The Santa Cruz Mountains are one of the biggest barriers to the growth of our graduate school; i.e., to students who need to be largely self-supporting. If we had instructional and office space in the San Jose area we could attract more commuter and night graduate students, and permit some faculty who live there both to reduce their commute and to have easier access to non-university colleagues. More expensive research facilities and undergraduate programs would remain here, graduate lecture classes could meet at either site via electronic media, and it would be environmentally foresightful. True, it would be better for UCSC to have all activity centralized, but I think the truer choice is between having or not having >10% graduate students.
g. Obviously there are many matrices through which to combine these various goals, and distinctions are somewhat arbitrary between academic and professional master's programs, or between Divisions when multi-disciplinary programs are envisioned. Nonetheless, and for illustration only, Table 4 is one example of how these elements could be combined. In it the

distribution is 50:50 between professional: academic students, and the distribution between Divisions is: Arts, 5%; Humanities 11%; Social Sciences 20%; Natural Sciences 27%; Engineering 17%; Other Professional 21%, mostly in the social and natural sciences.

In summary, I doubt that UCSC will be able to financially support much more than 1,500 graduate students in Ph.D.-intensive Arts, Sciences, and Engineering programs such as we have now. Even then, in order to generate GSR support and overhead-generated Opportunity Funds, and to meet identified State needs in graduate education, they should be closer to the 60% NSE percentage that has characterized UCSC historically than to the 50% figure that characterizes Table 1. In order to meet our goal of being in the top 100 research institutions, and to meet the thematic goals of your 2005 plan, it is desirable to have up to an additional 1,500 additional graduate students in professional master's programs. To reach those objectives by 2005, some radical rethinking of graduate programs is needed, perhaps including a satellite campus.

Table 1

GRAD ENROLLMENT BY BOARD 1990-2005

	90/1	91/2	92/3	93/4	94/5	95/6	96/7	97/8	00/1	05/6
Art MFA	0	0	0	5	10	15	20	25	35	45
Art History	0	0	0	5	10	15	20	25	35	35
Music	9	13	16	19	20	24	30	35	40	45
Theater MFA	0	0	6	15	19	23	30	35	40	50
U1	0	0	0	0	0	0	0	0	15	42
Total Arts	**9**	**13**	**22**	**44**	**59**	**77**	**100**	**120**	**165**	**217**
Appl Math	0	0	5	10	15	20	25	30	50	60
Astro	34	35	38	40	40	45	45	45	50	50
Bio	94	95	98	105	115	120	125	130	140	150
Chem/BioChemistry	64	65	68	77	81	85	90	95	110	125
ES	70	74	76	80	83	86	90	95	110	125
ET	0	5	10	15	20	25	30	35	55	85

MS	28	30	32	34	36	40	44	48	60	80
Math	39	41	43	45	47	50	52	54	65	75
Physics	40	44	46	48	52	56	62	64	80	95
U1	0	0	0	0	0	5	15	25	50	90
U2	0	0	0 0	0	0	0	10	30	75	
U3	0	0	0	0	0	0	0	0	15	64
Total	**369**	**389**	**416**	**454**	**489**	**532**	**578**	**631**	**815**	**1074**

CE	43	44	55	60	70	85	90	95	120	150
CIS	56	58	65	70	77	85	90	95	120	150
EE	0	0	0	0	10	20	30	40	75	115
Total Eng	**99**	**102**	**120**	**130**	**157**	**190**	**210**	**230**	**315**	**415**
Total NatSci	**468**	**491**	**536**	**584**	**646**	**722**	**788**	**861**	**1130**	**1489**

Amer St	0	0	0	0	0	5	9	14	32	50
Creat Writ	0	0	0	6	10	13	16	20	35	50
History	24	27	32	37	40	43	45	48	60	80
HCC	57	61	64	65	65	65	65	70	70	80
Ling	15	17	20	24	27	27	30	30	35	40
Lit	69	72	75	80	83	85	87	90	115	126
Phil	0	0	0	0	0	5	9	14	30	40
U1	0	0	0	0	0	0	0	0	18	40
WS	0	0	0	0	0	0	5	9	20	40

Total Hum	**165**	**177**	**191**	**212**	**225**	**243**	**266**	**295**	**415**	**546**
Anthro	0	8	14	17	24	26	30	35	48	60
Econ App.	22	23	24	25	26	27	30	33	42	42
Econ Int	13	20	28	34	40	42	46	50	60	60
Educ	30	30	30	33	38	45	54	63	87	106
Env St	0	0	5	10	15	17	20	25	50	65
Politics	0	0	0	0	0	5	10	15	40	60
Psych	46	49	51	52	56	58	62	65	85	100
Soc Doc	0	0	0	5	10	14	18	22	31	45
Soc	50	54	56	57	61	63	67	70	85	100
U1	0	0	0	0	0	0	0	5	30	60
U2	0	0	0	0	0	0	0	0	9	50
Total SocSci	**161**	**184**	**208**	**233**	**270**	**297**	**337**	**383**	**567**	**748**
Grand Total	**803**	**865**	**957**	**1073**	**1200**	**1339**	**1491**	**1659**	**2277**	**3000**

Table 2

Graduate Student Support

A. CURRENT SITUATION

No. Grad Students:	787	1990-91	Per Capita
1 TA		$5.72 m	$7,262

2 GSR+Tuition Remission		$2.62 m	$3,329
3 Fellowships		$1.84 m	$2,338
			$12,929
1 $635 per undergrad (9,000 undergrads)			
2 if entirely in NSE then about $18,700 per perm faculty			
3 About $300,000 is discretionary campus money			

B. SITUATION IN 2005

No. Grad Students:	3,000	2005-06	Per Capita
1 TA $635	12000 UGS	$7.62 m	$2,540
2 GSR @ $18,700	265 NSE FTE	$4.96 m	$1652
3 Fellowships @ $2,238		$6.71 m	$2,238
4 Other UCSC fellowships		$19.22 m	$6,407
		$38.51 m	$12,837

C. IMPACT OF 50% PROFESSIONAL STUDENTS

1125 students in prof. masters @	$2,000	$2.25 m
375 students in eng. masters @	$5,000	$1.88 m
1500 students in acad. PhD @	$12,835	$19.25 m
		$23.38 m
Less items 1-3 in B above		($19.29)m
Shortfall to be met by other UCSC fellowships		$4.09 m

Table 3

FUTURE OF GRADUATE EDUCATION IN UC 10/90

UNIVERSITIES GRADUATE ENROLLMENT PROJECTIONS, 1985-86 - 2005-06

	Enroll 1985-86	Demand 2005-2006	Increase	% Incr.*	Efficiency Correction	Enroll 2005-2006
NSE	10,535	24,568	14,033	133%	(1950)	22,600
SSHA	6,893	11,263	4,370	63%	(2,250)	9,100
EDUC	1,450	3,100	1,650	114%	(300)	2,800
PROF	5,916	7,833	1,917	32%	--	7,800
NEW	0	1,200	1,200	--	--	1,200
TOTAL	**24,794**	**47,964**	**23,170**	**93%**	**(4,500)**	**43,500**
October 1988 plan (modified in December 1989):						**47,300**
LAO estimate:						**41,500**

NOTES: The difference between the first and last columns constitute Systemwide's growth plan. Table 1 calls for UCSC growth of 1176 in SSHA or 53% of Systemwide growth in these areas. Even Table 4 calls for UCSC's fraction of Systemwide growth to be 40% of SSHA, 20% of Professional and New, 15% of Education (assuming only 200), and only 8% of NSE.

*Demand for degree recipients and the increase in demand are for the years 1988-2008, lagged three years to coincide with the related enrollment.

Table 4

	Academic Ph.D. + Master's	**Professional Master's**
Arts	50	100 MFA Theater, Studio Art
Humanities	275	50 MFA Creative Writing
Social Sciences	300	175 Education
		50 App. Economics
		50 Env. Studies
		25 Soc. Doc.

SUBTOTAL		300
Natural Sciences	700	100 Earth Marine Biology
Engineering	150	350 *
Other Professional		
Architecture	--	100
Town Planning		
Applied Law		
Resource Manag. Global Systems	--	150
Health	25	150
Technical	--	100 *
Journalism		
Library and Info Science	--	100 *
TOTAL	1,500	1,500

* Courses potentially taught at satellite campus