Academic Year 2008-09
Strategic Plan

School of Engineering
University of California, Merced

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1 Introduction: Academic Vision

The goal of the School of Engineering at University of California, Merced is to develop a program that fosters fundamental research advances, the education of exceptional students, and the continued support of alumni who will assume leadership positions at all levels of engineering professions. Our highest priority is to create an environment for research and education that is aimed at changing the world around us. This document presents a strategic plan for faculty hiring for the School and discusses how this will assist us in achieving our full potential as a leader in engineering research, education, and professional service.

A major constraint in achieving our goal is the necessarily limited size of our faculty over the next few years. But it is imperative that we grow steadily and deliberately—particularly in our signature areas—and that our momentum in student recruiting, infrastructure development (both teaching and research support), and space and facilities not be hindered. In order to continue to compete with other universities, for which a sufficiently large Engineering faculty is essential, the School must exploit its small size by integrating our activities with those of the rest of the University. Anticipating that over the next decade, we will grow in size only to approximately 100 faculty, in part through joint appointments with other Schools in areas of mutual interest, a clear hiring strategy that is aggressive yet realistic is particularly important. This strategy is timely and essential, taking advantage of the fact that research in the sciences is rapidly becoming more technology based, allowing UCM to take the lead in applying engineering methodologies to new scientific frontiers.

The central theme of our strategic plan is our choice of selected research areas for investment and growth. We plan to emphasize six areas of research that we believe are critical for UCM's continued success: (1) Energy and Materials Technologies, (2) Biological Engineering, (3) Nanoscale Systems, (4) Environmental Science and Engineering, (5) Computational Science and Engineering, and (6) Modeling Sciences. These areas represent research activities that stretch across the School and the campus, and have the potential for strong and nourishing linkages across the University system, thus further leveraging our multi-disciplinary emphasis. At the same time, we realize the need to maintain strength in core disciplines and to balance these thrusts with disciplinary needs. This is specifically supported through the use of a hiring matrix that promotes this balance, and recognizes explicitly our responsibility to build a strong program for education of undergraduates, and support of the engineering professions. The School is also committed to combine teaching efforts, research activities, and public/community service through creative partnerships at the local and state levels.

Our graduate and undergraduate education will continue to provide a science-based, research-oriented curriculum that educates the next generation of innovators and leaders in engineering and enabling technologies. The School is committed to attracting and educating students from populations that have traditionally been underrepresented within the engineering profession, and to broadening their participation at all levels. To the extent that the development and timely evolution of new facilities can be coupled with *a long-term space plan* for the School, we will be able to provide an exceptional environment for research and education. The plan presented here represents a view of our School that will guide our detailed decisions over the next several years.

1.1 Focusing on Research Synergies

In response to the comments provided by CAPRA to the AY 05-06 School of Engineering Strategic plan, the faculty established a planning framework (matrix) that would guide future faculty FTE requests consistent with strategic and emerging research opportunities. This framework has as its central focus, an articulation of the research synergies not only between academic programs within the School of Engineering, but also between and among our sister Schools, graduate groups, and research institutes. It was offered as a framework that could be used to enhance communication among these entities, and was put forth as a means of providing continuity to the overall university strategic planning process.

The updated strategic planning matrix from AY 07-08 is reproduced herein as Table 1. The objective behind the use of this framework was to relate the faculty hiring plan of the School of Engineering for both current and future (requested) positions more explicitly to (1) our strategic intra-School research areas, and (2) strategic cross-School research areas set forth as listed in all three Schools original strategic plans. Because of the importance of Engineering's goal of developing (ABET) accreditable degrees, the academic undergraduate majors are also included as an important dimension of this framework.

The rows of the matrix are the strategic areas that have guided the School of Engineering's strategic planning process. The first areas listed are those that were agreed upon by the Schools as areas of particular interest for possible joint hires last planning cycle, and that motivated the allocation from the Provost of the cross-school positions currently being recruited. The columns of the matrix list research focus areas within Engineering—grouped by what would be departments at most universities—*majors*, at UC Merced, and areas of particular interest for recruiting Engineering faculty. The remaining areas listed—those below the double line—are those that were considered more likely to be of interest between or among engineering subdisciplines than between Engineering and other Schools.

The entries in this matrix described both our current faculty hiring profile at that time, and requested FTEs. The green cells denoted those faculty already hired, or anticipated to be hired to fill our inaugural 20 positions, and reflected their relationship with their specialty within Engineering, their principle teaching responsibilities, and their major multidisciplinary synergies with other academic entities (Schools, grad groups, institutes, etc.).

1.2 Scope of this Document

Before being able to propose confidently a specific hiring plan for the coming year and future years, it is important to establish a foundation for requesting a feasible number of faculty FTEs. A foundation that ties our annual faculty FTE request to student numbers and the evolution of our programs is presented in Section 2 with an overall review of projected student growth, followed by a discussion of targets for the fraction of UC Merced students who are engineering students, leading to targets for engineering student/faculty ratio. Section 2 concludes with a profile of our revised 5-year hiring plan, and our request for FTE positions to be hired during the next academic year.

Based on this FTE request—number of faculty positions that can reasonably be expected—our strategic cross-disciplinary hiring strategy is updated—as Table 10—showing the anticipated impact that allocation would have on the strategic research opportunities for the School of Engineering and UC Merced. The document concludes with a discussion of our space challenges. Further details of resource needs associated with the hiring of new faculty

are given in the Resource Plan submitted by the Dean of the SOE to the Provost for AY 2008-2009 (Appendix I of this document).

Table 1 – Framework proposed last year—AY 2006-07—by Engineering for strategic cross-Schools hiring plan.

Strategic Research Priorities within the School of Engineering

Strategic Faculty Hiring Planning Matrix--This matrix is intended as a framework for displaying the structure of faculty hiring within the School of Enigneering at UC Merced. The left column presents the strategic research priorities within Engineerring. Each area is further categorized by potential cross-School priority areas. The columns to the right reflect research emphasis areas grouped by disciplinary categories, also reflecting our current and future undergraduate majors. Entries in the table correspond to current, pending, and desired future faculty hires.

Current and Planned Undergraduate Majors witin the School of Engineering

Strategic Cross-School Research Opportunities	ENVE					CSE				BIOE					ME					MSE					EE						
	Hydrology	Microbiology	Water Quality	Air Pollution	Environmental Sustainability	Energy water & resource management	Networking	Data Base Mining/Informatics	Robotics/Autonomous Agents/AI	Graphics/Multimedia	Architecture/Systems	Bioelectronics	Biomaterials Engineering	Cellular Bioengineering	Tissue Bioengineering	Bioprocess Eng	Energy and Environment	Computational Mechanics	Complex and Intelligent Systems	Multiscale Physics and Modeling	Bioengineering	Nanomaterials	Composite materials	Materials Synthesis	Materials characterization	Environmental Aspects Materials	Materials Processing	Microelectronics and Nano Technology	Communication Networks	Bioelectronics	Optics and Photonics	MicroElectroMechanical Systems	Signal Processing	Circuits	Linear/Nonlinear Systems, Control
Energy and Materials Technologies: Energy; including optics, material sciences					☒																	☒									■				
Energy and Materials Technologies: Mechanical and electromechanical systems														■		☒			■					☒							☒				
Biological Engineering: Human biology, health and enviroment, including management and policy														☒																					
Biological Engineering: Regenerative medicine													■		☒																				
Nanoscale Systems: Nanotechnology												☒													☒		■								
Nanoscale Systems: Human dimesions of engineering and science																																			
Environmental Science and Engineering: Atmospheric & climate sciences, air resources			☒	☒		■																													
Environmental Science and Engineering: Energy, Water & Environmental sustainability, including policy	☒		☒		■	☒																													
Environmental Science and Engineering: Geography and spatial analysis and global change						☒	☒	☒			■																								
Computational Science and Engineering: Cognitive and computational sciences								☒	■	☒																									
Computational Science and Engineering: Media arts and Technology																																			
Computational Science and Engineering: Cyberinfrastructure and system							☒		☒		■																								
Modeling Sciences: Management and decision sciences					■	☒																													
Modeling Sciences: Mathematical sciences, applied mathematics, and applied statistics								☒						■			☒	■	☒		☒	■													
	8						9					6.5					6					5					1.5								

- Engineering faculty (first 20)
- ☒ Engineering faculty already hired
- Joint (cross-school) faculty hires or joint hires requested
- Joint (cross-engineering) faculty hires or joint hires requested
- Current faculty searches
- To be requested; need to be distributed into the matrix

This framework was used by the School of Engineering to articulate the relationship between cross-School strategic research faculty hiring requests and the majors within the School. It was suggested that an extended version of this framework be used in support of a comprehensive UCM hiring map with strategic cross school areas included as the rows of the table, with more School-specific research areas grouped by respective School undergraduate majors be used in considering future faculty hires, particularly cross-School hires.

The School of Engineering has refined this framework, and updated the matrix in presenting our AY 2008-09 hiring request, as presented in Table 10 of Section 3 of this Strategic Plan.

2 Academic Programs Development

The key resource for the strengthening and growth of academic programs within the School of Engineering is the faculty. Provided that we can hire a sufficient number of faculty having sufficient experience in building strong scholarly programs, we will grow at a reasonable rate into a leading engineering program. This is particularly challenging because of the extreme burden placed on faculty time required for program building—infrastructure, curriculum, programs to promote student success, etc.—all while maintaining the requisite high level of academic stature essential for a UC campus. The challenge is made even more daunting by the specter of inadequate future space for programs development, difficulty in attracting top graduate students, and continued substantial responsibilities for involvement in shared governance spread among relatively few—in contrast to established campuses—individuals. It is therefore unfortunate that future faculty FTE allocations to the Schools is based primarily on numbers of potential undergraduates who, as early high school seniors, are required to make a selection about the School and major through which they intend to matriculate.

This is especially challenging for Engineering because more than other professional disciplines or academic areas, the fields of engineering or the nature of what engineers do is not well known or understood by the general public and certainly not by typical high school students when they are presented with the need to commit to a Major course of study on an application form. The failure of UC Merced to succeed in our early goal of having a common freshman year across Schools preempted our vision of creating a first-year learning experience designed to help students make better decisions about their field of study. While this may not have increased the numbers of students choosing Engineering as a career choice, it would very likely have helped improve the retention rates among those who do.

Nonetheless, in order to prepare a realistic plan for faculty hiring in Engineering, we must begin with the reality of using potential undergraduate student Majors designation as a basis for potential faculty FTE allocations to the School. Section 2.1 of this document presents our perspective on the anticipated growth of student numbers and the resulting implications for FTE allocation to Engineering over our 5-year planning period and beyond. This provides the foundation for a more detailed discussion about how the anticipated allocation of FTEs to Engineering would be strategically allocated among disciplinary areas, and supports a subsequent discussion about the potential for hiring faculty for purposes of exploiting potential synergies across the Schools and among our graduate groups and institutes.

2.1 Anticipated Student Growth at UC Merced

The growth targets for UC Merced remain unchanged from those set forth in the original planning projections of the University as contained in the UC enrollment plan for the system. Column 2 in Table 2 presents these growth targets for UC Merced modified to reflect the 2005-06 actual admissions[i], and extending through 2011-12. Starting from a first-year enrollment of 875 students, it has been projected that UC Merced will enroll sufficient students each academic year that will result in a net increase of 600 student FTEs each year for the next 5 years resulting in a total student population in the fall 2010 of approximately 4,000 student FTE.

Table 2 – Projected student growth at UC Merced and implications for faculty hiring rates over the next decade.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Academic Year	Student Enrollment	Targeted Engineering Student Fraction	Resulting Engineering Student Count	Resulting S:F Ratio	Engineering Faculty FTE (total)	Anticipated Engineering FTE Request for Next AY
2005-06	875	15%	135	7	20.0	
2006-07	1190	19%	222	9	26.0	
2007-08	1815	17%	307	11	29.0	3.0
2008-09	2447	18%	440	13	35.5	6.5
2009-10	3002	19%	570	14	40.5	5.0
2010-11	3524	20%	705	15	47.0	6.5
2011-12	4084	20%	817	16	51.0	4.0
2012-13	4548	20%	910	17	53.5	2.5
2013-14	4968	20%	994	18	55.0	1.5

Source UC Merced Instructional Planning Office

At present, the number of students who have designated Engineering as their School of matriculation is 307 (Column 4). Thus, Engineering students account for 16% of the total UC Merced student population (Column 3). The resulting engineering student count in future years, derived from the projected growth in overall student enrollment and assuming a 20% engineering student fraction, is shown by year in Column 4. These figures do not take into account attrition of engineering students or selection of engineering as a major by students who are currently undeclared, since these figures are difficult to project given only one year's worth of data. Attrition of engineering students who entered UC Merced in AY 2005-2006 was 15%, far below the national average attrition rate of about 25% for first year engineering students. It should be noted that engineering attrition rates generally decline sharply after the Freshman year. With a current faculty of 29 FTE, the current undergraduate student faculty ratio (S:F) within the School of Engineering is 9 (Columns 6 and 5, respectively). This ratio jumped to 11 in AY 2007-2008 and continue to increase in subsequent years

While the School of Engineering employs a common freshman year, and as such does not hold students to initial major declarations made upon enrollment, estimates for matriculation across undergraduate majors over the planning horizon are shown in Table 3. These estimates are based on initial designations, and national trends in Engineering enrollments at other top Engineering programs and within the Engineering programs at other UC campuses.

Table 3– Anticipated distribution of students across Engineering majors over the 5-year planning horizon.

	2006-2007		2007- 2008		2008 -2009		2009- 2010		2010 - 2011		2011 - 2012	
	SoE Student Count											
Targeted Annual Enrollments for UCM[1]	**1190**		**1815**		**2447**		**3002**		**3524**		**4084**	
Percent Engineering	**19%**		**17%**		**18%**		**19%**		**20%**		**20%**	
Engineering Student Count	**222**		**307**		**440**		**570**		**705**		**817**	
BioE	23%	50	20%	62	20%	88	20%	114	20%	141	20%	163
CSE	36%	79	31%	96	30%	132	29%	165	29%	204	27%	221
EnvE	8%	17	10%	31	10%	44	10%	57	10%	70	10%	82
MSE	12%	26	1%	4	3%	13	4%	23	4%	28	5%	41
ME	1%	2	22%	69	23%	101	24%	137	24%	169	25%	204
Undeclared	23%	51	15%	45	14%	62	13%	74	13%	92	13%	106

[1] **UCOP Data**

2.2 Prognosis for Growth of Engineering Faculty Ratios

Because the size of the faculty within a school is effectively being dictated by the number of students working towards degrees in that school, two factors that are important in developing an estimate for the number of faculty FTEs that will be allocated to that school:

1. What is the total fraction of the student body that can be counted for that School; and
2. What is the desired student/faculty ratio within that School?

At the present time, insufficient data exist to be able to base such allocations on student success, or trends and norms for faculty productivity in other areas. Consequently—and because there is no direct mechanism at present for controlling Engineering student enrollments—an indirect means of influencing such an allocation is to consider what would be the most appropriate targets for these measures, and base the resulting request for faculty FTE allocations on these assumptions.

2.2.1 The desired fraction of Engineering students at UC Merced

Because UC Merced aspires to become a leading academic institution in all areas of scholarly endeavor that we undertake, and in particular because of our commitment to achieving the high status level of our sister campuses, it is important to consider carefully and realistically our goals for student recruitment and success. Specifically, a comparison among the Engineering programs at the 9 UC campuses having Schools of Engineering is presented in Table 4. Each column of that table displays current faculty and student data for each UC campus; faculty FTEs; graduate and undergraduate numbers for each engineering program; and for similar numbers for the campus as a whole. For example, the first column of Table 4 reports that engineering students at Berkeley (UCB) account for 13.4% of the total student population at Berkeley—resulting from 2,894 engineering undergraduates, and 1,590 graduate students—and that approximately 13% of the regular full time faculty at Berkeley are Engineering FTEs.

Reflecting the heavy emphasis on research within the School of Engineering at Berkeley, graduate students account for 35% of all UCB engineering students. In contrast, the fraction of graduate students within all departments at Berkeley is 30%. This general characteristic is

common across all UC campuses. Indeed, a very obvious characteristic of Engineering on UC campuses is a very strong emphasis on graduate research and education. Systemwide, the total fraction of engineering students who are graduate students is nearly 28%, compared with the fraction of graduate students in all other departments; 19%. The total number of graduate students assigned to faculty in the School of Engineering at UC Merced is currently 23.5 (10% fraction of all engineering students), with this number expected to increase significantly when two new graduate groups with a strong emphasis in engineering (Biological Engineering and Small-scale Technologies, and Mechanical Engineering and Applied Mathematics) became available in AY 2007-2008. For UC Merced to take its place among our sister engineering programs, we must place having a strong research program, with requisite need to develop research infrastructure to maintain that program, at the top of our list of priorities.

A similar comparison with other top engineering programs in the U.S. is consistent with the observation that the best engineering programs place a very strong emphasis on graduate research and education. Table 5 presents similar data for 10 top engineering programs in the US—our Comparison 10 universities. While the range is understandably larger, these top schools of engineering place a relatively greater emphasis on graduate research on their respective campuses than for other disciplines, at least with respect to the distribution of students. It is interesting to note that in contrast with the data for UC campuses, in general the fraction of students who are engineering students at these top institutions tends to be higher than within the UC—UCSD being a glaring exception.

The faculty of the School of Engineering at UC Merced has established a goal of achieving a level of 20% of total enrolled students with a corresponding—though yet to be defined explicitly—emphasis on graduate student fraction. Not only will this result in a very healthy research foundation for our student community, but will accelerate UC Merced's goal of enhancing economic growth in the Central Valley through the enhancement of its technical workforce.

2.2.2 Targeted student/faculty ratio within the School of Engineering

Tables 4 and 5 also contain data on the student/faculty ratio within engineering programs within the University of California and at the 10 of the top engineering research programs in the country (respectively). Because of the heavy emphasis at UC Merced on undergraduate declarations of academic major upon application, the student faculty ratio considering only undergraduate student numbers is presented separately from the corresponding ratio of all engineering students considered. For example at Berkeley, the student/faculty ratio considering only undergraduates is 13.3:1 whereas the overall ratio considering all engineering students at Berkeley is 20.6:1. In contrast, the current undergraduate student/faculty ratio in Engineering at UC Merced is 9:1, while the overall engineering student/faculty ratio is only slightly higher at 10:1. This is projected to increase to an undergraduate student/faculty ratio of 13:1 and an overall student/faculty ratio of 15:1 in AY 2009-2010. Our goal is to grow steadily yet deliberately to a level where the overall student/faculty ratio is in the low 20s, with the undergraduate student/faculty ratio in engineering being somewhere between 15:1 to 17:1

Maintaining a balance in growing these metrics at a gradual rate is important while the campus is in its infancy. For example, increasing the undergraduate fraction too abruptly would excessively burden the faculty during a time when they are already overloaded with

responsibilities of building the university. It is also important to note that regardless of the faculty to student ratio, courses necessary for students to graduate must still be taught. As a result, faculty at UC Merced currently have a high teaching load. The need for a parallel growth in graduate student numbers is not only important while faculty are developing their research programs, but to insure that we have sufficient numbers of graduate students to support our undergraduate programs (TAs, lab assistants, etc.).

Attaining this balance while maintaining the overall fraction of engineering students at 20% will, we feel, provide a robust and strategically positioned academic program, and one that will serve well both our undergraduate and graduate student populations.

Table 4 – Data on student enrollment in engineering within the University of California system (2005 data).

		UCB	UCD	UCLA	UCI	UCM	UCR	UCSB	UCSC	UCSD	System
Engineering	Undergrad	2,894	3,059	2,269	3,252	225	1,275	1,468	759	4,035	19,011
	Grads	1,590	1,116	1,256	995	22	291	694	274	1,147	7,363
	Total	4,484	4,175	3,525	4,247	247	1,566	2,162	1,033	5,182	26,374
	Faculty	218	176	150	154	26	73	125	66	166	1,128
	% UG	65%	73%	64%	77%	91%	81%	68%	73%	78%	72%
	% Grads	35%	27%	36%	23%	9%	19%	32%	27%	22%	28%
Campus	Undergrad	23,447	22,618	24,946	19,930	1,191	15,089	18,114	13,669	20,679	158,492
	Grads	10,036	4,051	10,771	3,774	76	1,965	2,905	1,344	5,121	39,967
	Total	33,483	26,669	35,717	23,704	1,267	17,054	21,019	15,013	25,800	198,459
	Faculty	1,671	1,450	1,692	839	90	610	781	542	984	8,569
	% UG	70%	85%	70%	84%	94%	88%	86%	91%	80%	80%
	% Grads	30%	15%	30%	16%	6%	12%	14%	9%	20%	20%
Engineering % of Campus	% UG	12.3%	13.5%	9.1%	16.3%	18.9%	8.4%	8.1%	5.6%	19.5%	12.0%
	% Grads	15.8%	27.5%	11.7%	26.4%	28.9%	14.8%	23.9%	20.4%	22.4%	18.4%
	% Total	13.4%	15.7%	9.9%	17.9%	19.5%	9.2%	10.3%	6.9%	20.1%	13.3%
	% Faculty	13.0%	12.1%	8.9%	18.4%	28.9%	12.0%	16.0%	12.2%	16.9%	13.2%
S/F R	Undergrad	13.3	17.4	15.1	21.1	9	17.5	11.7	11.5	24.3	16.9
	Total	20.6	23.7	23.5	27.6	9.5	21.5	17.3	15.7	31.2	23.4

2.2.3 Implications for faculty Engineering FTE requests

The faculty of the School has established a target schedule for extending and expanding our program consistent with those of the engineering programs at the other UC campuses, and those of the top engineering programs in the country. It is reflected in terms of a 10-year planning horizon as reflected within the shaded portion of Table 2.[ii]

With engineering students currently comprising slightly over 19% of the UC Merced student body, this places UC Merced in the upper quartile of UC campuses in terms of engineering emphasis during a time when UC Merced is making its mark as a university having a strong emphasis in the STEM areas.[iii]

Realizing the overall student growth based on the targets established for UC Merced, coupled with the decision by the faculty of the School of Engineering to maintain a total student fraction of 20% of students being engineers within the planning horizon, a framework is established that will guide the growth of our faculty numbers. Specifically, our student/faculty ratio will grow from a current level of about 9:1 to somewhat greater than

18:1 by the time our campus student population becomes 5,000 as specified in the original planning documents for the campus.

Table 5 – Data on student enrollment within the top engineering programs in the United States (2004 and 2005 data).

		UCM	UCB	GaTech	UIUC	UMich	Purdue	UCSD	UTAust	TAMU	UCLA	Wiscon
Engineering	Undergrad	225	2,894	5,200	5,329	4,874	6,049	4,035	4,553	5,930	2,269	3,137
	Grads	22	1,590	3,062	2,681	2,704	2,272	1,147	2,013	2,202	1,256	1,378
	Total	247	4,484	8,262	8,010	7,578	8,321	5,182	6,566	8,132	3,525	4,515
	Faculty	26	218	407	408	310	321	166	239	299	150	200
	% UG	91%	65%	63%	67%	64%	73%	78%	69%	73%	64%	69%
	% Grads	9%	35%	37%	33%	36%	27%	22%	31%	27%	36%	31%
Campus	Undergrad	1,191	23,447	11,842	30,452	25,467	30,851	20,679	36,478	36,227	24,946	28,217
	Grads	76	10,036	5,275	9,112	20,986	7,096	5,121	11,282	8,028	10,771	8,973
	Total	1,267	33,483	17,117	39,564	46,453	37,947	25,800	47,760	44,255	35,625	37,160
	Faculty	90	1,671	805	3,973	2,400	1,635	984	2,639	2,500	1,692	2,064
	% UG	94%	70%	69%	77%	55%	81%	80%	76%	82%	70%	76%
	% Grads	6%	30%	31%	23%	45%	19%	20%	24%	18%	30%	24%
Engineering % of Campus	% UG	18.9%	12.3%	43.9%	17.5%	19.1%	19.6%	19.5%	12.5%	16.4%	9.1%	11.1%
	% Grads	28.9%	15.8%	58.0%	29.4%	12.9%	32.0%	22.4%	17.8%	27.4%	11.7%	15.4%
	% Total	19.5%	13.4%	48.3%	20.2%	16.3%	21.9%	20.1%	13.7%	18.4%	9.9%	12.2%
	% Faculty	28.9%	13.0%	50.6%	10.3%	12.9%	19.6%	16.9%	9.1%	12.0%	8.9%	9.7%
S/F R	Undergrad	9	13.3	12.8	13.1	15.7	18.8	24.3	19.1	19.8	15.1	15.7
	Total	9.5	20.6	20.3	19.6	24.4	25.9	31.2	27.5	27.2	23.5	22.6

Blue entries in the table are 2004 data; all others are 2005 data.

After that time we intend to continue maintaining our student fraction at 20%, but will be well established enough to increase our student/faculty ratio well beyond that level as appropriate. Agreeing to do so prematurely would be detrimental to our overall academic stature and to our students. This is a strategy that is both responsible and achievable, and will result in a program that is both technically strong and sustainable, and will be one that will have a strong positive influence in expanding the technical workforce in the Central Valley.

The rationale discussed in Sections 2.2.1 and 2.2.2, and presented in Table 2, is based on growing the S:F ratio in the next few years to a level similar to other comparable universities. It suggests the allocation of 6.0 FTE new faculty positions for the next hiring cycle. However, regardless of student enrollment, a minimum number of faculty in each discipline are necessary to deliver the curriculum. Compelling arguments are presented in each major's section for a total hire of 13.5 FTE new faculty positions in SOE to adequately support teaching needs. Following a review of our current faculty authorizations, and a reconsideration of our proposed expansion of our academic programs, the specific description of these positions will be presented.

2.2.4 Workload Considerations

The academic planning model for the School of Engineering has been expended to include a consideration of faculty workload count as determined by the Office of the Registrar, and summarized in Table 6. It should be noted that the Registrar's data only reflects classes for which Engineering faculty are listed as the primary instructor. Engineering faculty participate in many co-taught courses, both those taught in other Schools and in the general education curriculum. Accordingly, faculty workload is underreported in this matrix and it is imperative that a mechanism of properly crediting shared teaching responsibilities be developed in order to accurately assess Student FTE counts. Anticipated Engineering student FTE count as presented in Table 2 over the planning period is repeated in the first row of Table 6. Normalized student FTE estimates—those student FTE teaching load units resulting from these actual student numbers—are presented in the second row of Table 6. Current

Table 6 Estimated student, faculty, and instructor FTE projections for the planning period.

	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Expected Student FTE	222	307	440	570	705
Normalized Student FTE1	367	400	560	660	760
Targeted Faculty FTE	26	29	35.5	52	60
Estimated Instructor FTE	2.0	3.0	5.0	7.0	8.0
[1] Includes students FTE for Introduction to Comping for NS and SSHA					

(Column 2), future (Column 3) and proposed (Columns 4 – 6), are presented in the third row of Table 6. Based on a detailed estimate of course offerings compared to anticipated teaching loads, including graduate course offerings within each discipline, row four of Table 6 lists the anticipated number of instructors that will be required to support lower division courses offered by the School of Engineering over this planning period.

Adjunct faculty are not included explicitly in this table because the few adjunct faculty we bring on will likely be involved in teaching upper division and graduate courses, and other specialized learning experiences not anticipated to be a regular contribution to our normal faculty workload. In many cases, adjunct faculty will be involved in co-teaching graduate courses with regular faculty, and engaging students with specialized directed reading or projects courses. In any case, the workload of adjunct faculty is not considered in the determination of instructors needed to deliver important elements of the lower division undergraduate program.

Faculty of the School of Engineering are, and will continue to be heavily and directly involved in the teaching activities of College One, including leadership of the Core 1 and Core 100 foundational general education courses; sharing the lecturing burden within these courses; participating equitably in the offering of freshman seminars; and sharing involvement in undergraduate research experiences consistent with the emergence of this program during the coming year.

2.2.5 Summary of current and authorized faculty FTEs (need update)

Searches currently in progress include 2.5 positions as a result of the AY2005-2006, strategic planning process (with 2.0 FTE Engineering allocations indicated by the non-underlined cells shaded yellow, and 0.5 FTE denoted as cross-School positions indicated by

the underlined cells shaded yellow in Table 7); and 3 positions allocated from the AY2006-2007 strategic planning process (shaded brown).

200-06-0108 Mechanical Eng

200-05-0109 Electrical Eng

200-06-0110 Bioengineering

200-07-0131 Bioengineering

200-02-0111 CSE (Systems)

200-07-0112 CSE

200-07-0113 Mechanical Eng/ Complex Systems

200-02-0114 Materials

200-05-0115 Environmental Engineering/Env. Systems (Air Pollution)

200-07-0116 Multiscale Modeling (Mechanical/Bioengineering)

200-07-0117 Sustainability Science (Environmental Systems)

200-07-0134 Cognitive Engineering

This format will be used in the following discussion and strategic plan for faculty hiring both for the 5-year faculty hiring plan, and the AY 2008-09 request for next years faculty FTE allocation (to be hired during Academic Year 2008-09 to be on board by the 2009-10 Academic Year. Additional columns will be added to denote that the corresponding faculty and positions will have responsibilities for launching new undergraduate majors. Descriptions of each position being requested within our 1-year FTE request will also describe research emphases of these individuals, as well as cross-School and cross-Engineering synergies.

Finally, these positions will be reflected explicitly within a revised strategic hiring matrix presented initially in Table 1, and revised in Table 10.

2.2.6 Faculty Diversity

Representation of women and minorities in the faculty ranks has been a high priority in the School of Engineering at UC Merced since its inception. Comparison data with other campuses for the percentage of women faculty members is shown in Figure 1, and that for Hispanic faculty members is shown in Figure 2. There are currently 19% women faculty members and 19% Hispanic faculty members in the School of Engineering. These numbers compare very favorably to those of other UC campuses and our comparison 10 universities. The School of Engineering continues to seek diversity among new faculty joining its ranks. This includes consideration of President's Post-doctoral Fellows in engineering disciplines that match hiring needs (although there are relatively few engineering Fellows awarded each year).

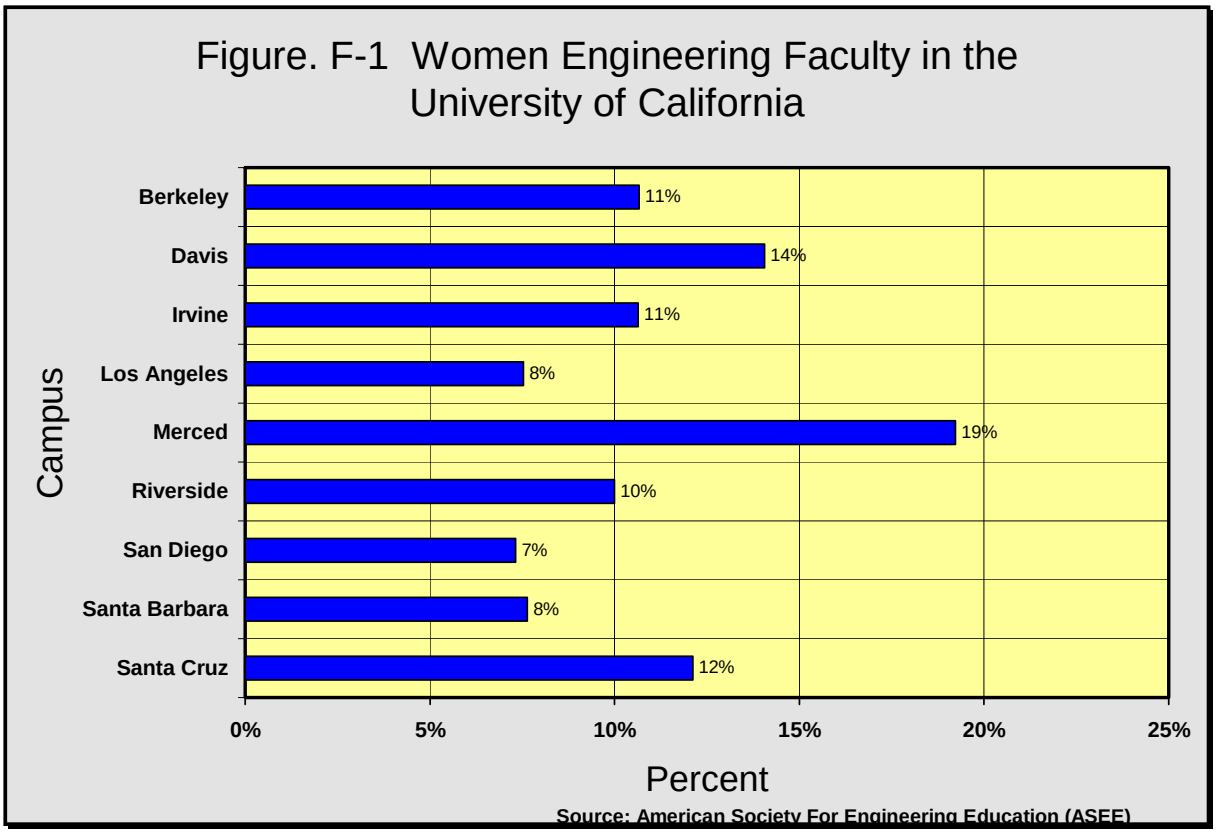
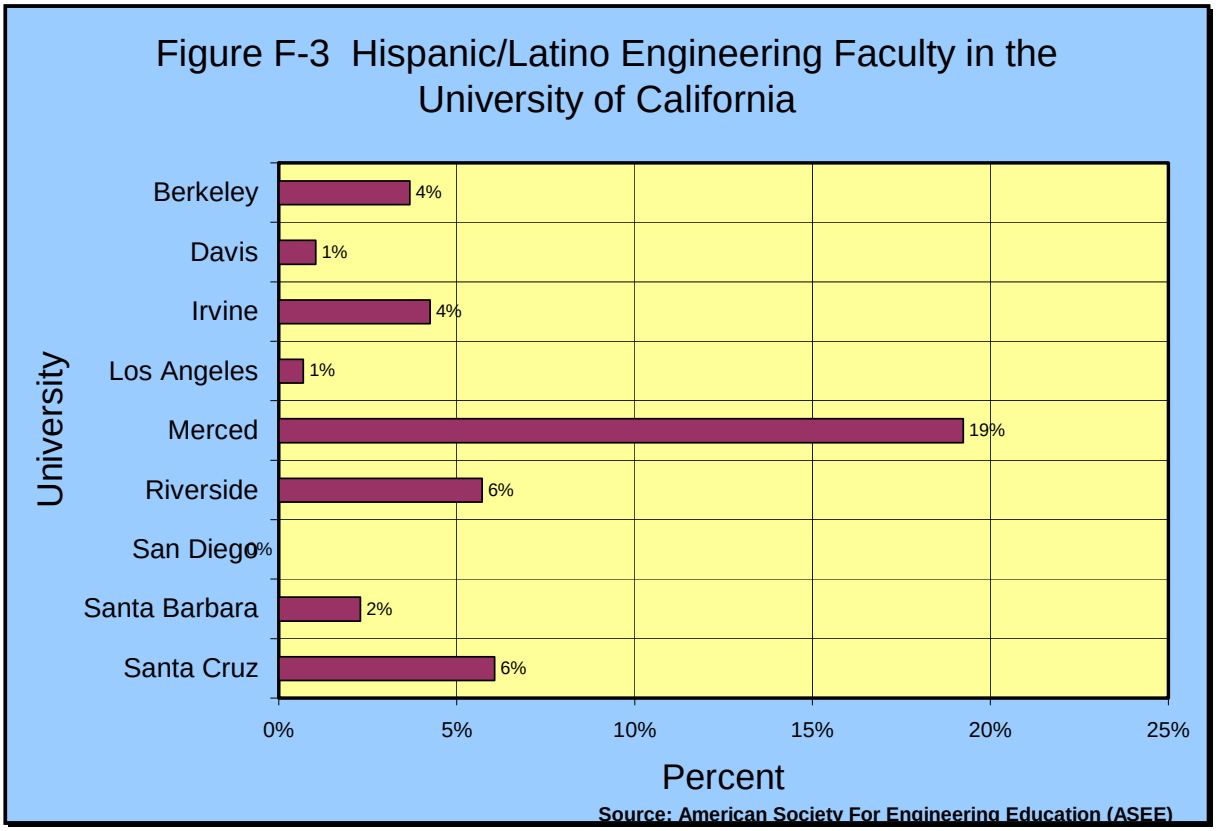


Figure 1 Comparison women faculty UC Campuses



2.3 5-year Plan for Expansion of Academic Programs

Table 7 – Status of School of Engineering faculty hiring reflecting primary disciplinary associations.

Academic Year	ENVE		CSE		BIOE		ME		MSE		EE		ChE		EEM		CE		Cumulaive Faculty FTEs
	Name	FTE	Name	FTE	Name	FTE	Name	FTE	Name	FTE	Name	FTE	Name	FTE	Name	FTE	Name	FTE	
	Bales	1.0	Newsam	1.0	Chin	1.0	Diaz	1.0	**Viney**	1.0	**Chiao**	0.5							
	Conklin	1.0	Kallmann	1.0	McCloskey	1.0	**Sun**	1.0	**Leppert**	1.0	**EE-2**	1.0							
	Harmon	1.0	Cerpa	1.0	Khine	1.0	Coimbra	1.0	Lu	1.0									
	Winston	0.5	Carpin	1.0	**(Escobar)**	1.0	**ME-4 (Fried)**	1.0	MSE-4	1.0									
	Guo	1.0	Carreira	1.0	**BIOE-5**	1.0	**(Modest)**		(Davila)	1.0									
	Rogge	1.0	Oh	1.0	BIOE-6	1.0	*Flex Systems*	1.0											
	Ervans(x)	*0.5*	Noelle	0.5	*Multi Scale*	0.5	*Multi Scale*	0.5											
	Westerling	0.5	CSE-8*	1.0			*Shen*												
	Chen	0.5	**CSE-9***	1.0			*Davinson*												
	Sustain	1.0	CSE-10(x)	0.5															
AY 05-06	5.5		6.0		4.0		2.0		2.0		0.5		0.0		0.0		0.0		20.0
AY 06-07	7.0		6.5		4.0		3.0		4.0		1.5		0.0		0.0		0.0		26.0
AY 07-08	7.0		7.5		5.0		4.0		4.0		1.5		0.0		0.0		0.0		29.0
AY 08-09	8.0		9.0		6.5		5.5		5.0		1.5								35.5
AY 09-10																			0.0
AY 10-11																			0.0
AY 11-12																			0.0

Underlined (x) denotes cross-School hire - *Italics* denote cross-engineering hires - (Paranthetical) entries denote individuals under consideration - **Bold** denotes senior FTE

	Future FTE
FTE	**Current searches**

AY 07-08 UG Enrollment	31	96	62	69	4				
Student Faculty ratio	3.9	10.7	9.5	12.5	1				
				Ratio does not include Shen and Davinson					

Our previous strategic plan called for starting two new majors during 2006-07 (Mechanical Engineering and Materials Science and Engineering), one new major during 2007-08 (Electrical Engineering), one new major during 2008-09 (Engineering Economics and Management), one new major in 2009-10 (Chemical Engineering), and one new major in 2010-11 (Civil Engineering). Budget and space considerations make this less likely than originally envisioned, and consequently we plan to delay the introduction of the Electrical Engineering, Engineering Economics and Management, Chemical, and Civil Engineering majors by one year. In particular, the dramatic shortfall in faculty FTE reduction from the allocation requested last year would, if continued this year and beyond, make even this schedule infeasible.

Adjustments to our 5-year hiring plan are based in part on a reconsideration of these future academic programs. Employment opportunities for graduating engineers in general, and those from disciplines being offered at UC Merced in particular, are expected to continue to be in high demand. Recent data from the Bureau of Labor Statistics indicate that the overall demand for engineers in all industries will increase by nearly 20% during the period of this planning exercise, with engineering jobs in the health service—including computational and information systems support areas—and medical instrument industries—including bioengineering, and several areas within mechanical and electrical engineering—forecasted to increase by more than 33%. Specifically, the 20 fastest growing professional jobs as reported by a recent issue of Fortune Magazine are displayed in Figure 3. Inaugural majors of the School of Engineering are well represented on this list. In addition, Mechanical and Electrical Engineering remain the largest engineering professions both nationally and globally, and are expected to continue to be so in the foreseeable future. While Materials

Science and Engineering is not anticipated to be large in terms of demand by undergraduates,

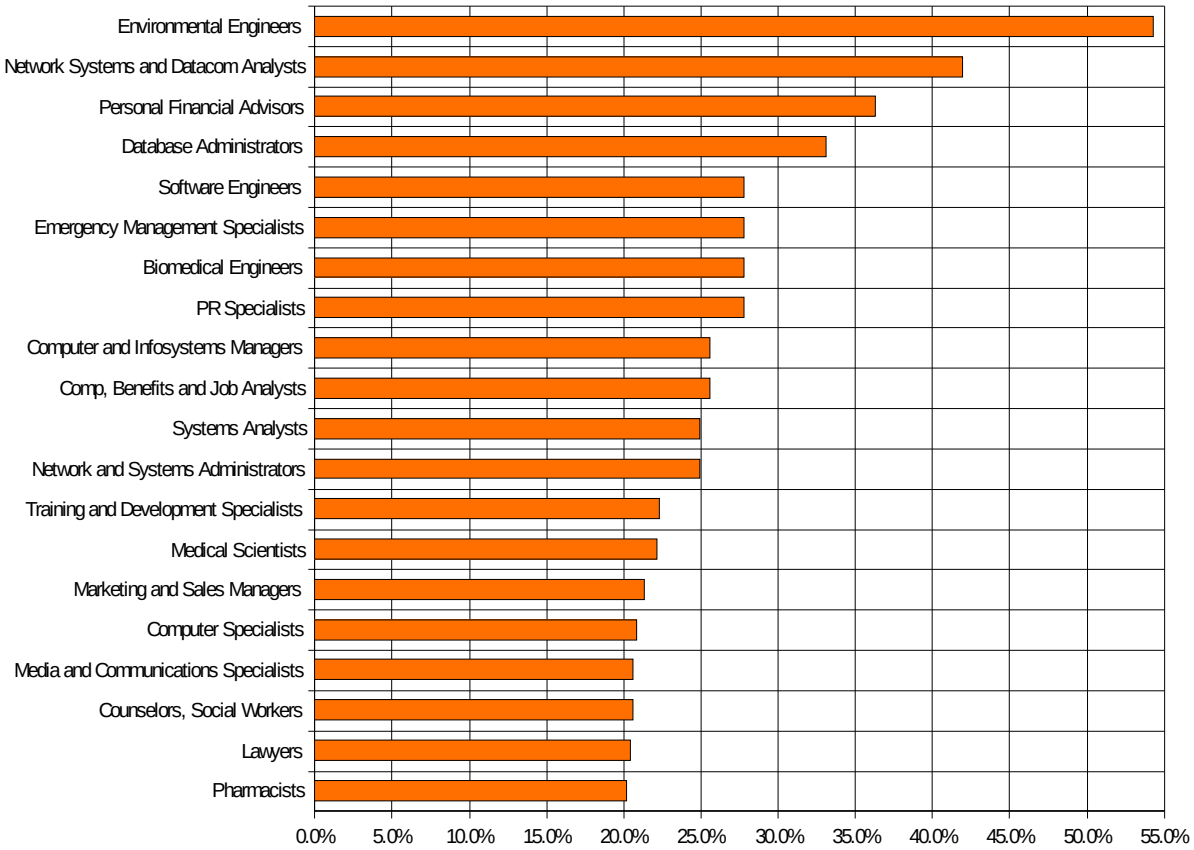


Figure 3: Twenty Most In-demand Professions Between 2002 and 2012 (Bureau of Labor Statistics)

the faculty who will support this major are key to the development of teaching and research programs in nanotechnology (an important and rapidly emerging technology sector), and will synergize extremely well with other emerging Engineering majors, with faculty and graduate student colleagues in the School of Natural Sciences at UC Merced, and those at other UC campuses.

2.3.1 Electrical Engineering

The School of Engineering at UC Merced currently offers an undergraduate degree in Computer Science and Engineering (CSE) and expects to offer an undergraduate major in Electrical Engineering (EE) starting in fall semester 2008. A search is currently underway for a Senior faculty member to guide development of the EE program, but introduction of the major has been delayed by one year due to current budget conditions. In order to better position these disciplines to attract and serve future students at both the graduate and undergraduate levels, and to attract research funding, the Engineering faculty has initiated a discussion about the possibility of merging the undergraduate programs in electrical engineering and computer science and engineering. While this discussion is still at the very preliminary stages, the implications for faculty FTE hiring could be significant. Thus prior to describing our 5-year hiring strategy, a brief discussion of the motivation for considering such a merger is presented.

There is considerable pedagogical motivation for a joint EECS program. The disciplines of CS and EE are clearly related. They are often considered as the endpoints of a linear continuum of disciplines that include CSE and Electrical and Computer Engineering (ECE), as shown in Figure 4.

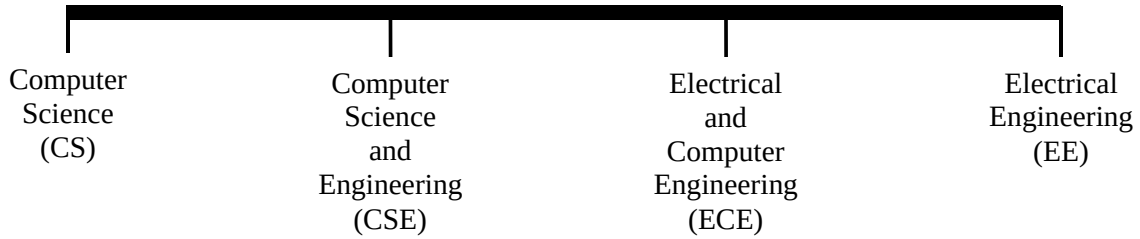


Figure 4 – Continuum of computational disciplines from Computer Science ←→ Electrical Engineering

Another, more revealing perspective posed by Edward Lee (professor and associate chair of EECS at UC Berkeley) and David Messerschmitt (professor of EECS at UC Berkeley) in their article *Engineering an Education for the Future*,[iv] views a circular continuum with three core areas as listed below and shown schematically in Figure 5:

1. Electronics (E)
2. Electronic information systems (EIS)
3. Computer science (CS)

And three overlap areas,

1. Computer hardware (E and CS)
2. Electronic systems (E and EIS)
3. Computer information systems (EIS and CS)

This joint EECS model supports two hallmark principles of the School of Engineering at UC Merced: (1) interdisciplinarity, and (2) common initial coursework that allows students to learn about and explore their interests. The boundary between hardware and software has been blurred through cross-fertilization such as software adopting modular components that were traditional to hardware—i.e., object oriented programming—and hardware becoming software-like via programmable logic. The opportunities for interdisciplinary work extend beyond the hardware/software boundary, however. Two of the three inaugural CSE faculty at UC Merced come from hybrid EE and CS backgrounds. Professor Newsam's research interests include image processing which exists at the boundary between CS and EIS. Professor Cerpa's research interests include computer networking and distributed systems, which also lie at the boundary between CS and EIS. The educational backgrounds of both professors include computer science and electrical engineering degrees, or hybrids thereof.

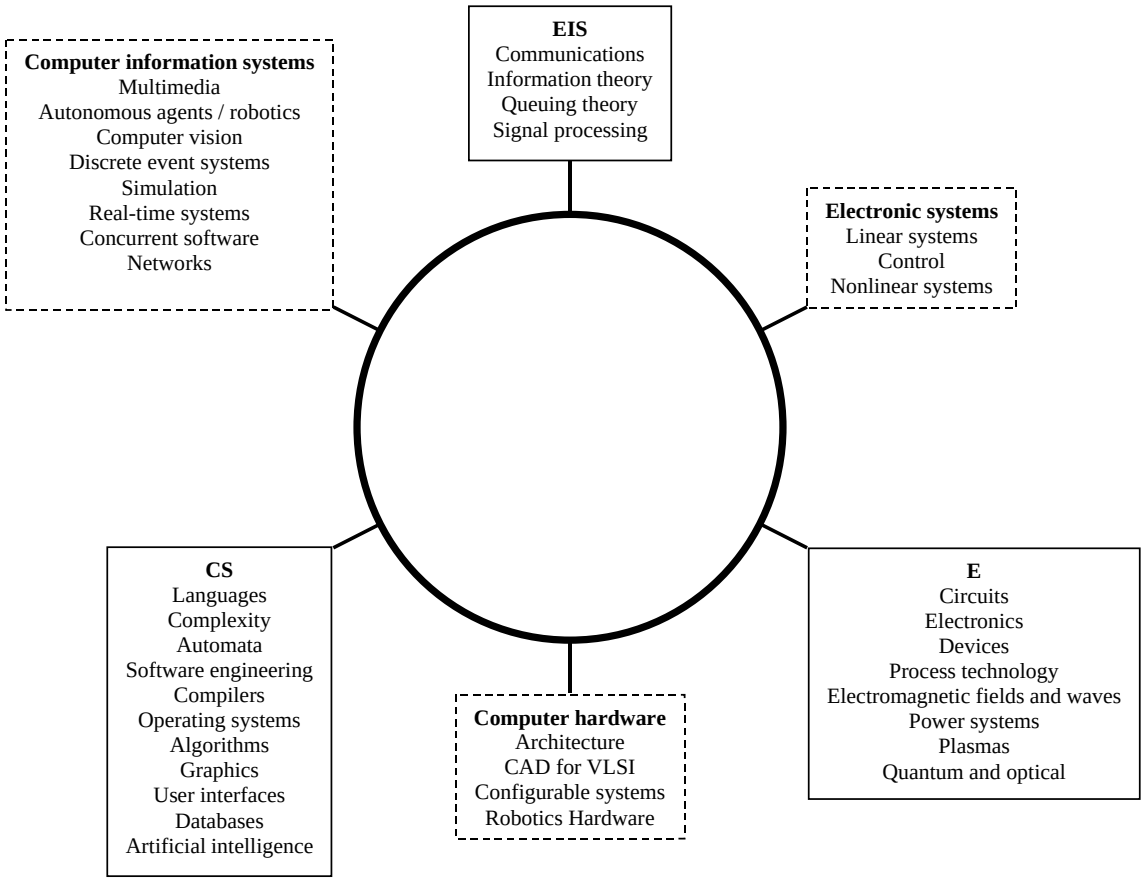


Figure 5 – A circular continuum along with sample topics. The core areas are shown in solid boxes and the overlap areas in dashed boxes.

The differences between disciplines in the EECS continuum is often confusing, especially to students seeing the topics for the first time. Just as it is unrealistic to expect graduating high school seniors to make a knowledgeable choice on undergraduate major, so too is it unrealistic to expect freshman or even sophomore college students to decide between CS, CSE, ECE, or EE. Having a joint EECS program with common freshman and sophomore years allows students to be exposed to a variety of topics from the continuum. This will prepare them to make a more knowledgeable decision about which emphasis or track to follow during their junior and sophomore years. We will likely consider a set of initial courses modeled on the recently revised EECS curriculum at UC Berkeley. Students in the EECS program would be required to take the following courses by the end of their sophomore year:

- CSE 30 – Introduction to object oriented programming and data structures
- CSE 31 – Systems programming and C.
- ENGR XX – Introduction to microelectronic circuits
- ENGR XX – Structure and interpretation of signals and systems

The ENGR course on microelectronic circuits is a modern, more digital version of a traditional circuits course. The ENGR course on signals and systems is modeled on a course

recently introduced at UC Berkeley that complements the circuits course to provide a better introduction to the EECS continuum.[v]

Additional arguments for a comprehensive consideration of merging these programs include:

1. Many of the top engineering schools at US institutions have joint EECS programs, including UC Berkeley, MIT, and the University of Michigan at Ann Arbor. Prior to a formal proposal to merge our programs, a comprehensive review of these programs will be made;
2. In addition to the pedagogical motivation, forming a joint EECS program at UC Merced probably makes sense from a resource perspective. Rather than struggling to hire the minimum number of faculty to support both CSE and EE degrees, the EECS program can spread to fill out the continuum as resources permit. The current CSE faculty lie on the CS to EIS arc of the continuum so this is a natural starting place for this growth; and
3. It would be significantly easier and more cost effective to form a joint EECS program initially that is later split, than vice versa.

Certainly many questions remain, such as what it means to have a joint EECS program at UC Merced where there are no departments. At larger, established schools, EECS is typically a department that offers either a single undergraduate degree (Berkeley offers only an EECS degree) or multiple degrees (MIT offers three degrees: Electrical Science and Engineering, EECS and CSE; and Michigan also offers three: EE, CE and CS). Offering only an EECS degree with several tracks (the Berkeley approach) would be the most straightforward way to achieve the objectives described above. However, other approaches might be possible. Another question concerns the relation of a joint EECS program to the yet to be formed graduate group that includes the current CSE faculty. Further consideration of a restructuring of our programs in CSE and EE will remain a major topic for discussion during the coming year.

2.3.2 Chemical Engineering

Our previous strategic plan reflected our intent to hire our first faculty member in chemical engineering in academic year 08-09, for roll-out of the major in 09-10. At the current rate of faculty hiring, bringing this major on this soon will come at the risk of having insufficient faculty personnel support for our current majors. Therefore, we propose postponing the roll out of this major until 10-11. Since chemical engineering is expensive in terms of both infrastructure and space, resource needs will have to be carefully considered. The chemical engineering curriculum requires sufficient support in space and personnel, especially in its required “unit operation lab” class.

Nonetheless, chemical engineering is an important component in the engineering portfolio of a mature campus. The motivation to plan *now* for UC Merced’s offering in this area is spurred by several factors:

4. Traditional ChE programs are converting away from the traditional areas of petroleum and bulk chemical processing to the scale up of biotechnological processes and specialized materials manufacture. UC Merced is in the unique position of being able to *start* a program in these strategic areas without having to dismantle an existing, unproductive, program or appease a “dead-wood” faculty;
5. UC Merced’s existing and planned engineering faculty already have a focus in the areas of biotechnology, materials, and nanoscale science that are mutually

complementary with strategic directions in ChE. The costs of bringing on a focused ChE degree program that complements the others would be less than that of restructuring an established program or starting a new one in a traditional, departmentalized environment;

6. Two of our existing faculty (Professors McCloskey and Chin) have undergraduate and graduate degrees in ChE that give them and us insights into the development of a cutting-edge program; and
7. We anticipate that existing synergies between Engineering and NS with respect to the chemical, biological and materials sciences will be able to grow to accommodate the teaching and research needs of a non-traditional ChE program.

2.3.3 Engineering Economics and Management

The undergraduate major in Engineering Economics and Management (EEM) is still under consideration. However, introduction of the major has been delayed due to budget uncertainties, as well as lack of clear information about the future development and growth of the management school.

2.3.4 Development of a Management Program and School

The School of Engineering (SOE) wishes to provide input into the planning of the School of Management (SOM). To help expedite success of SOM, we can leverage the research successes and strengths of SOE. Positions readily synergistic with the research thrusts of SOE and anticipated to be of particular benefit to both schools are: Technology Management, Entrepreneurship, and Natural Resource Management.

Below we provide a working definition of each of these research areas from the SOE perspective as well as a description of the type of faculty candidate most appropriate to head such areas.

2.3.4.1 Natural Resource Management

Natural Resource Management encompasses ecosystem management, habitat conservation, sustainable land management and water resources, with the goal of protecting, conserving, and rationally using natural resources. We proposed a Natural Resource Management focus within the SOM to advance our knowledge and understanding of our environment in order to develop innovative solutions to complex environmental challenges. Natural resources management employs a systems approach that combines and uses knowledge from natural science, engineering and social science to manage natural resources as an integrated system.

UC Merced's Sierra Nevada Research Institute provides the faculty expertise and unparalleled real-world research opportunities, including field work, in Natural Resource Management. Our location in the San Joaquin Valley near the Sierra Nevada offers an excellent and diverse real-world laboratory for studying the natural environment and how it is affected by human activity. It is envisioned that UCM would develop both undergraduate and graduate degrees in Natural Resource Management. The SoM would initiate the B.S.; initially, the graduate degrees could be offered under the Environmental Systems graduate group. At the graduate level, a number of discussions have taken place around starting a program in National Parks or Public Lands Management.

The Natural Resources Management program will be designed for students who are interested in pursing a career in both private and public sectors that engage in natural

resources management. The students who graduate from the program are expected to equip with necessary managing skills and solid understandings of how natural systems interact with human activities. We will focus on ecosystem stewardship, environmental governance, climate applications, policy and science, technology and its effects on the environment. While various foci should be considered, the following areas take advantage of capacity within UCM's existing schools: watershed, water resources, land, forest, public lands and wildlife management.

The demand for a workforce to carry out management of natural resources, including sustainable management, is always high as most resources used by human beings are depletable. Graduates of the program will be poised to pursue employment in a variety of federal, state agencies, non-profit organizations and the private sector. We expect the curriculum and aforementioned areas to qualify graduates for many state and federal jobs. Employment opportunities in California at the federal level include the, National Park Service, Fish and Wildlife Service, Forest Service, Geological Survey, Bureau of Reclamation, and Army Corps of Engineers. State and local level opportunities include various departments within the Resources Agency, water management agencies, parks and recreation departments, health departments, planning departments, and secondary school education. Non-profit and private sector employment opportunities include consulting firms, mining and lumber companies, and non-governmental organizations (e.g., Environmental Defense, Nature Conservancy, land trusts).

Natural Resource Management Position

This founding and leadership position requires a tenured faculty member at the full or associate professor level. Areas including global environmental issues (climate change, loss of biodiversity), critical natural resources (freshwater systems, forests), and health (air and water quality) are particularly encouraged. A research emphasis on water, forest, or range would compliment existing faculty and help fill an important niche in the UC system. The ideal candidate would have a proven track record in connecting their research with its social sciences and policy aspects and implications.

2.3.4.2 Entrepreneurship

Society depends on the advance of knowledge generated by scientists, engineers and researchers. However, entrepreneurs materialize this knowledge by undertaking innovative business plans. As an example, society's dependence on increasingly advanced materials, from lightweight yet strong composites for aeronautics to fiber optics for communications to bio-compatible materials for medical implants and drug delivery to silicon microchips for information storage and sensors, demands ever evolving new materials and the associated engineering processes for manufacturing them. Nanotechnology, the production of devices and machines at the molecular level, is heralded to drive the next technological revolution. This includes advances to enable: quantum information processing, orders of magnitude increase in strength of materials, and new strategies to address critical biomedical challenges.

As such, we feel it imperative to teach our students how to leverage the science and engineering fundamentals they learn by simultaneously providing them the real-world tools to do so. Entrepreneurship will draw on the research conducted by Materials Science and Bioengineering faculty and other disciplines in SOE. This position will be in the SOE. We will provide a framework for students to invent, develop new technologies, and recognize opportunities. As such, students will learn about intellectual property and patents, technology

and product development, discovery pipelines, the dynamics of innovation and technology management, risk management and regulatory compliance, and technology and start-up strategy.

Entrepreneurship Technology Position

This founding and leadership position requires a significant background in Materials Science, with also a demonstrated track-record in entrepreneurship. This will be the first Entrepreneurship position. The candidate should be well versed in topics including: advanced materials, biomaterials and bio-compatibility, nanotechnology, opportunity recognition, cost analysis, and manufacturing engineering. The ideal candidate would be a start-up veteran with a proven academic track-record.

The ideal hire for this position would have a background in MSE, allowing him/her to contribute to the teaching of engineering fundamentals and/or MSE core subjects. Their research area would have to be consistent with the goals of the BEST graduate group. This person would additionally have significant experience in the corporate world, of taking intellectual property past the concept stage to material or device fabrication. At UC Merced, the successful applicant would develop strong links with our economics and management programs, helping to create a degree pathway that emulates the successful MEM program at Oxford. Because it is likely that the candidate will have had limited teaching experience, an appointment to the assistant or associate professor ranks would be anticipated.

While detailed laboratory needs will emerge when strong candidates are interviewed, we again expect that considerable space use efficiency will derive from our ongoing efforts to develop shared facilities for nanofabrication and characterization.

2.3.4.3 Management of Technology

Management of Technology involves the operational and organizational issues associated with managing: innovations of the 21st century, information technology, environmental issues, and entrepreneurship in high and bio-technology. UCM's proposed *Management of Technology Joint Management & Engineering Program* seeks to employ rigorous research methods, including optimization, simulation, and empirical approaches, in a comprehensive and multidisciplinary framework to teach our students how to develop, plan, implement, and assess the technological capabilities which shape the strategic and operational objectives of organizations.

To help launch the Management School, we feel that one initial, effective focus would be on Management of Information Technology, to leverage the expertise of strengths of the Computer Science Faculty within the SOE. Information Systems Management focuses on the collection, processing, storage, distribution and utilization of an organization's information resources. According to the US Department of Labor, Bureau of Labor Statistics, employment of computer and information systems managers is expected to grow faster than the average for all occupations through the year 2016. Because Information Systems Managers must possess a solid mix of business and technical knowledge to understand organizational structures, objectives, operations and the resulting financial implications, we must have a comprehensive and rigorous program in which our students will be equally trained in the math and science fundamentals of computer science as well as in understanding

the environment in which their solutions will be applied, through economics and business courses.

Only by understanding both these facets can our students communicate effectively with users to design systems that support their needs.

Management of Technology Position

This founding and leadership position requires a broad and significant background in engineering and also in business/economics or related field, a demonstrated record of successful teaching, plus extensive research experience in academia and industry, with strong ties to industry. The ideal candidate should be well versed in topics including: systems development tools and techniques, information architecture, network configurations, databases structures, systems integration, knowledge management, technology development and process improvement, and performance measurements and technology drivers. This person could initially contribute to graduate education through the EECS graduate area.

2.3.4.4 Energy, Climate, and Sustainability

Our state, nation and world face unprecedented challenges in developing sustainable solutions to the global environmental problems associated with the production and consumption patterns that have developed in our industrial societies. Climate change is perhaps the most difficult problem that today's society and nations must solve. The knowledge base for finding solutions is particularly weak and effective policy resolution remains unknown. Thus, significant research is needed. In summer 2007, the UC campuses together submitted a $600 million proposal to the California Public Utilities Commission for a Climate Solutions Institute, intended to be the focal point for research on energy, policy, climate applications and related research to help California meet the goals of AB32, which commits the state to major reductions in carbon emissions. Research and education at the intersection of energy, climate applications, environmental sustainability and technology management will be a strong growth area for coming years and decades, and represents an opportunity for UC Merced. Other UC campuses are not far ahead of UCM in this area, and we can develop visible, well-respected programs in a relatively short time.

Universities across the nation are either considering or developing academic programs in sustainability, with energy and climate being the central themes. An SoM focus in this area can help faculty and students who develop technical solutions to put these in a business context. Entrepreneurship will be a key ingredient of a focus area in energy, climate, and sustainability at UCM. It is expected that sustainability could be an undergraduate focus area in the SoM, as well as a graduate degree track.

Energy, climate, and sustainability management position

This founding and leadership position requires a tenured faculty member at the full or associate professor level. Preference should be given to someone with a strong foundation in engineering or science, but with a track record of research in management or policy. Areas of interest for the founding faculty member include energy management, carbon management, sustainable infrastructure or climate applications. The person could initially attract graduate students through the Environmental Systems graduate group; though in the longer term, a more management-oriented graduate group should be formed.

2.3.4.5 Biotechnology Management

According to the National Science Foundation, the need for biotechnology workers is out-pacing the rate at which US universities are producing graduates. Biotechnology, loosely defined, incorporates techniques that leverage the characteristics of living systems for products or services. Because universities cannot satisfy industry's demand for new PhD graduates, attracting and retaining trained employees is increasingly a serious challenge. This problem specifically impedes, for example, the drug development process. In shortest supply are trained biologists to make discoveries, research engineers to develop the discoveries, and managers to plan and execute clinical trials.

Management programs designed to teach the requisite knowledge and skills for life science commercialization are therefore needed. Instead of creating another generic program in which students learn broadly about marketing, we can specifically train our students in growth areas to ensure their own marketability upon graduation. In particular, we have a unique opportunity because of Prop 71, a California statewide ballot measure passed in 2005, providing $3 billion in funding for stem cell research at California universities and research institutions (other states are considering similar legislation). Because we have this jump-start to address this burgeoning and rapidly growing field, we can develop a unique certificate program to specifically train our students in the requisite skills to help realize the long-heralded potential of stem cell research. We can develop a unique Biotechnology Management Track and an eventual major by piggy-backing on the research strengths of our biomedical scientists and engineers.

Biotechnology Management Position

This hire would be able to fit into several graduate groups, including BEST and QSB and bring unique and industry relevant research to UC Merced. This faculty member will not only teach our students the basic science and lab skills, but also the ethical, legal, and financial ramifications of their decisions. They will be taught about strategies and can attain real world practice through commercialization of existing research projects here.

2.3.4.6 Center for Entrepreneurship

Whether under a School of Management, engineering or jointly administered, a Center for Entrepreneurship would have a number of core features. We have already implemented an entrepreneurial aspect to Service Learning, by encouraging students to develop innovations to address the needs of their clients. The scope of the projects includes not only the engineering aspects, but also issues associated with a real nascent venture, including: opportunity recognition, intellectual property issues, competitive analyses, team formation and management, and fund-raising/financial management. This semester we are also introducing our first entrepreneurship course, BioEntrepreneurship (Eng 108, Eng 208). Other areas to pursue under an Entrepreneurship Center include:

- provide courses on product design and development
- educate students about intellectual property /enable ease of tech transfer
- build and support cross-disciplinary teams for technology and product development
- offer internship and fellowship opportunities with start-up companies, industry leaders, and venture capital firms
- offer students consulting opportunities
- provide real-world entrepreneurs as mentors (we are assembling a board of high-profile mentors)

- train our engineering and life science students in the business aspect of innovation and management
- promote industry connections and involvement with this campus
- offer incubation of companies that are developed from this campus
- stimulate and promote new industry in the San Joaquin Valley area

By teaching both the technical and entrepreneurial skills in parallel, we will uniquely arm our students to be competitive in today's workforce. By offering the opportunity to implement these skills in a real-world environment, we are providing the experience critical to become successful or "seasoned" entrepreneurs. Finally, by developing an interdisciplinary, nurturing, and entrepreneurial-promoting environment, we will offer our students and faculty the greatest probability of success with respect to their ventures.

2.4 Request for School of Engineering Faculty Positions for 2008-09

The 13 faculty FTEs being requested by the School of Engineering for the next faculty hiring cycle are shown in Table 8 as pink shaded cells corresponding to AY 08-09. They are ranked in order of priority within the major, and ranked by order of priority within the School of Engineering in Table 9. The faculty of the School of Engineering as a whole ranked the FTE requests shown in Table 9 and approved the ranking and adoption of this Strategic Plan in a vote taken at the January 15, 2008, SOE faculty meeting. Of 23 faculty eligble to vote, 18 voted YES, 0 No, with 5 absent. FTE requests were triaged into 3 categories - critical hires required for existing large enrollment majors to deliver the curriculum; high priority additional hires necessary to sufficiently staff majors, focused on UC Merced research pillars; and regular priority additional hires necessary to sufficiently staff majors. Within each category, FTE lines are listed with equal priority. The faculty of the School of Engineering recognizes that under the present fiscal conditions, we are unlikely to be allocated all the requested hires. However, we feel it imperative to articulate the reality of our hiring needs. Descriptions of major specific positions are presented in Sections 2.4.1 through 2.4.5, Cross-engineering positions (shared by more than one engineering major) are presented in Section 2.5 and cross-school positions are presented in Section 2.6. Filling our current positions and these 13 new positions would bring our total engineering faculty FTE to 55.5.

Bioengineering

To deliver the BIOE major in its currently proposed, we need to cover 26 specialist credits. These credits do not include engineering fundamentals courses, service learning, freshman seminars, or graduate courses. They also do not allow for multiple offerings of any course in an academic year.

BIOE major includes 4 existing and 2 approved FTEs who are realistically available to deliver the above mentioned 26 specialist BIOE credits (lecture and laboratory courses) in the foreseeable future. Using a model in which a faculty member would typically offer one fundamental/core course, one specialist/upper division course or one graduate course in a year (plus a freshman seminar and/or mentor a service learning team), it is clear we do not have the minimum number of faculty FTEs to deliver the major. In addition, we have initiated BEST (Biological Engineering and Small-scale Technology) graduate group in the fall semester of 2007. We also need to provide two required graduate courses and sufficient advanced elective classes (3-5) for BEST students.

Three future FTE directions have been identified by the faculty in BIOE (listed in the priority order).

1. Tissue Engineering

2. Physiological Modeling

3. Single Cell Quantitative Measurements

2.4.1 Bioengineering: Tissue Engineering

The field of tissue engineering is an emerging and ambitious area of research in which scientists seek to build devices that would replace diseased tissues/organs with their biological equivalents, thus completely restoring tissue/organ functionality. This area has been termed Tissue Engineering and/or Regenerative Medicine. The area of tissue engineering is, by nature, cross disciplinary in that it employs cell culture methods combined with appropriate materials, scaffolding architecture, technologies for cell delivery, and nutrient transport strategies while also synergizing with nanobioengineering by employing the use of small nanoparticles or nonocomposite scaffolding materials. For this reason, the tissue engineer would also be expected to contribute significantly to our undergraduate program in Materials Science.

The Tissue Engineering position could also compliment and synergize with the research of a number of faculty in the areas of Stem Cells, Vascular Tissue Engineering, Biomaterials, Nanotechnology, and Microfluidics/Microchip design. We expect that this faculty hire would contribute to our growing graduate program in BEST and Quantitative and Systems Biology Depending the particular area of research, this faculty position could possibly contribute to helping build a Stem Cell Program at UCM.

2.4.2 Bioengineering: Physiological Modeling

We have been experiencing unprecedented advances into the complex nature of biological systems in recent years. Current advances in biology, genomics, proteomics, cellular level modeling methods, simulation capabilities, new technologies for imaging and measuring biological phenomena and molecular level interfacial characterization tools present the engineering community with unique opportunities to advance the understanding of these biological or even ecological systems to deliver desired functions. Currently the lack of involvement of engineering has hindered the complete understanding of the complex biological systems. Furthermore, there is a need to understand how the desired or additional functionality can eventually be accomplished and integrated over larger scales and complexities from cellular, organism to human level. Systematic modeling incorporating various engineering concepts such as optimalization, database management, control and network formation based on large body of experimental results would lead to complete understanding of the non-linear nature of biological systems. Being a interdisciplinary field between engineering and biology, BioE has a strategic advantage in engineering to address this unique challenge and opportunity.

Current most faculty members in bioengineering at UCM are in experimental-oriented researchers. Modeling expertise at multiple levels is needed to tackle more complex biological projects. This requested multiple-scale modeling position will be at junior level. This faculty member is expected to collaborate with the current faculty members to link

various research areas to study specific biological/physiological problems from system point of view. This position will develop quantitative modeling and simulation methods that faithfully represent the complexity of biological/ physiological systems based on experimental data and deal creatively with the hierarchical and nonlinear nature of living systems. This position will integrative knowledge from various research fields to serve a focal point for faculty members from NS, ME and BIOE to collaborate on projects that can not be addressed from the view point of a single discipline.

The space need for this position is expected to be dry lab space around 400 sq ft. This faculty member is expected to teach undergraduate classes in bioengineering and graduate classes in BEST graduate group.

2.4.3 Bioengineering: Single Cell Quantitative Measurements

Recent developments in optical techniques (particularly laser manipulation, quantitative fluorescence microscopy, ultra-small volume sampling and analysis, incorporation of optically useful probes, and optical approaches to determining the rates and equilibria of intracellular processes) clearly indicate the enormous potential of in vivo single cell studies for our understanding of cell physiology. Single-cell detection technology should allow researchers to target individual molecules within the cell, track where they are going, and record changes--all without significantly interfering with cellular physiology. Due to its highly multidisciplinary nature, single-cell detection technology presents a unique opportunity for Engineering at UCM. Our unique campus environment is an ideal location to cultivate single-cell detection technology. This research area will apply tools in optics, microfabrication, microelectronics, nanotechnology and analytical chemistry to small volume detection inside an individual cell. The development of such technology enables many research and industrial applications such as single-cell manipulation, high throughput screening, improved diagnosis tools, single-cell genomics and proteomics. This research area represents an outstanding opportunity to involve faculty members in natural sciences, optical physics, bioengineering, materials science and engineering, mechanical and electrical engineering in a cross-disciplinary project. It is proposed that this position will be designated at the rank of full professor.

This position would compliment and synergize with the research of a number of faculty in many areas of research. We also expect that this faculty hire would contribute to our growing needs in developing assays or tools for analyzing single cells. Single cell analysis is a much needed tool for the advancement of many fields including Systems Biology. Therefore, this cross-school position compliments the growing needs for graduate programs such as BEST or Quantitative and Systems Biology.

Computer Science Engineering

We request a minimum of 3.5 full FTE positions to be assigned to CSE. After ample internal discussions the CSE faculty unanimously agreed on the following prioritized list for the 2008-2009 strategic plan.

2.4.4 Computer Science Engineering: Instructor with security of employment.

We request one instructor to permanently teach the undergraduate courses CSE5, CSE20 and CSE21. These introductory courses attract large number of students and are time consuming to teach and prepare for research faculty. A dedicated experienced instructor is the best option in order to optimize the resources needed to offer these classes. An additional duty of

the instructor will be to coordinate and supervise the content of the other lower division CSE courses, i.e. CSE30 and CSE31. In recent semesters lower division CSE courses have been offered by temporary instructors, often hired under time pressure. The persistence of this situation hinders the development of a strong undergraduate CSE program, due to the fluctuations in content and possible lack of coordination deriving from this situation. The role of the instructor will be therefore critical to improve our existing curriculum. Considering that the three aforementioned courses are not specific to the CSE major, but are rather taken by all engineering students (CSE 20 & 21), or from the other schools (CSE 5), we propose that this position will be counted as a 0.5 FTE against CSE.

2.4.5 Computer Science Engineering: Senior position complementary to existing CSE faculty with research emphasis in CS.

This position is needed to broaden the CSE program both for teaching and research. We recently successfully hired two junior faculty members in the areas of machine learning and intelligent systems. With the goal of creating a very strong research group within a few selected domains instead of growing in all directions, this position will aim to the same domains targeted in the past, i.e. AI/Graphics, Systems, and Data Analysis/Data management. The current searches are still somewhat broad, and there is a possibility that not all of the target domains of the current searches will be covered successfully or sufficiently by the candidate hired. If there is sufficient coverage, however, the new core research areas that will be targeted include languages, compilers, operating systems, computer networks, embedded systems, and algorithms. Considering the current composition of the CSE faculty, i.e. 6.5 assistant professors, it is imperative to hire a senior faculty member in the CSE program. Two searches for senior faculty members are open at the moment. With this additional senior position the CSE group will reach a viable distribution of ranks. The space needs for this new position are expected to be similar to those of the current CSE faculty; a modest level of dry lab space for several computer and/or experimental research workstations. The exact space needs will depend on the rank of the position.

2.4.6 Computer Science Engineering: Senior position complementary to existing CSE faculty with research emphasis in EE.

This position is needed to build the Electrical Engineering undergraduate major under planning. Moreover the graduate study area formerly called Computer and Information Systems has been recently renamed Electrical Engineering and Computer Science. This new position will therefore be instrumental not only to jumpstart the undergraduate program in Electrical Engineering, but also to strengthen the graduate program being developed at the moment. Considering the current situation in Electrical Engineering, i.e. one open search with broad scope, we feel the new search should be broad as well. Targeted areas should include the following: systems,communication, signal processing, wireless technology and networking, RF hardware, control, circuits and sensors The space needs for this new position will depend both on the rank and on the research area of the selected candidate.

2.4.7 Computer Science Engineering: Senior position complementary to existing CSE faculty with research emphasis in EECS.

This position will be instrumental to bridge possible research and teaching gaps between Electrical Engineering and Computer Science. Possible research topics include, but are not limited to, embedded systems, robotics, sensor networks and the alike. The space needs for

this new position will depend both on the rank and on the research area of the selected candidate.

2.4.8 Computer Science Engineering: Media Arts and Technology (MAT) (Cross-school)

Media Arts and Technology (MAT) is an interdisciplinary area that fuses emergent computer science and engineering, and digital art research, practice, production, and theory. MAT offers the opportunity for working at the frontiers of art, science, and technology, where new art forms are born and new expressive media are invented. The highly crossdisciplinary nature of this exciting field, and the direction being taken at UC Merced with key faculty hires within the School of Engineering and the School of Hunamities, Social Sciences, and Arts, suggest that this is an excellent opportunity for innovation at UC Merced.

Environmental Engineering

2.4.9 Environmental Engineering: Junior or Senior Hire Environmental Microbiology.

We recommend an open-rank search in, with a research focus on any of several areas, e.g. environmental remediation, environmental contributions to infectious disease or characterization of microbial communities in natural and engineered systems. Last year both the SoNS and SoE strategic plans identified environmental microbiology as a critical hire in order for UCM to achieve national competitiveness in a number of research areas. Leading environmental research programs in the nation include a strong core subgroup of environmental microbiology and microbial ecology, typically 2-3 investigators. Environmental microbiology was deemed critical for emerging research strengths in global change ecology, in biocomplexity, bioremediation, and in climate and watershed science. This position would provide critical synergy with the successful candidates in ecology currently being searched in SoNS, particularly in the microbial ecology area. This individual is necessary for creating the kind of modern undergraduate environmental engineering program that will attract the best and brightest students to this field, for undergraduate teaching in environmental engineering and for accreditation of the degree. The ES graduate group also identified the position as important for recruiting graduate students and offering appropriate courses. CAPRA recommended the position.

2.4.10 Environmental Engineering: Junior or Senior Hire in Ecohydrology and Ecological Engineering.

We recommend an assistant or associate level search for a faculty member who uses engineering principles to design sustainable systems that integrate human activities with the natural environment**,** with particular emphasis on the linkage between hydrologic and ecological systems. Possible areas of research emphasis include interactions among hydrologic, biogeochemical, physiological, and soil processes; hydrologic ecosystem services, integrating water quality, water cycling; spatial analysis and scaling. Use of remote sensing, field-based measurements, laboratory experiments and modeling are all of interest. As a discipline, ecohydrology addresses the bi-directional regulation of hydrologic and ecological processes, e.g. the flow regime and pollutant levels of water in wetlands regulate the species and the populations that live in the ecosystem, while ecological processes in the wetland regulate the timing and magnitude of water and nutrient fluxes through the system. Ecological engineering involves the design, construction, restoration and management of aquatic and terrestrial ecosystems that have value to both humans and the environment, using

principles from engineering, ecology, economics, and natural sciences. The extensive and large-scale ecosystem restoration efforts planned in the Central Valley provide excellent opportunities for both natural laboratories, and research support through applications partnerships with local landowners and conservation entities. Similar efforts are being carried out and across the Western U.S.

Materials Science Engineering

"Materials Sciences" has been identified previously as a cross-School priority, and "Materials Technologies" as a priority within Engineering. A nanoscale trend is also emerging as an area of interest that intersects MSE, BIOE, ME, ChE, Life Sciences, Physics and Chemistry, as well as SNRI (forest fire generated nanoparticulates) and the Energy Program (quantum dot photovoltaics and nanostructured fuel cells/batteries). MSE and BIOE, in particular, are building a strong research program in bionanotechnology, as evidenced by the continued development of the Biological Engineering and Small-scale Technologies graduate group. Bionanotechnology is a research area of great current interest that encompasses fields such as tissue engineering, nanoscale/microscale electromechanical systems, biosensing, and bio-inspired nanoscale materials synthesis and processing. Funding for it by granting agencies ranging from the National Science Foundation to the Department of Defense, and private industry, is rapidly growing; and it strongly contributes to the strength in biomedicine that UC Merced is building.

Faculty in MSE are also contributing to the proposed research theme in free radical biology. Reactive oxygen and nitrogen species (which includes free radicals, such as superoxide and nitric oxide) play essential and ubiquitous roles in biology. An interdisciplinary group composed of faculty and students in QSB and ES has formed a center that focuses on the role of oxidants and other electrophiles in both damage to organisms and in normal physiology. The present and proposed work includes studies of redox cycling in the environment, environmental and health hazards of nanotechnology, photobleaching of coral, how Hepatitis C infection is modulated through redox signaling, how elephant seals avoid oxidative stress that results from extreme environments, how growth factors act through redox signaling, and understanding the recognition of oxidants important to inflammation with the goal of designing anti-inflammatory pharmaceuticals. In particular, since MSE has a research concentration in nanoscale materials, its faculty contribute important nanoscale materials characterization and chemistry expertise to this effort.

MSE as a discipline intersects many areas of environmental interest. These include: (a) new, energy-efficient, cost-effective routes to raw material extraction and recovery (the FFC Cambridge process for material production, http://www.msm.cam.ac.uk/djf/FFC_Process.htm, demonstrates the revolutionary impact that MSE can have in this regard); (b) the effect of changing ozone levels and climate on the durability of construction materials; (c) materials use in energy conversion, distribution and storage; (d) materials for communication and transportation infrastructure; (e) whole life-cycle design with recyclable materials. Given its existing "green" credentials and continuing aspirations, UC Merced can (should!) become an international leader in sustainable materials technologies.

Faculty in MSE are developing innovative experiences in undergraduate education, a key component of our goals to put UC Merced at the forefront of 21st century materials technology. A recent grant awarded by the National Science Foundation will enable us to offer undergraduates the opportunity to learn microfabrication techniques and practical

nanotechnology, and to extend the experience to students (= potential recruits) from Merced College.

Undergraduate students at UC Merced have expressed considerable interest in MSE. Freshman seminars have been oversubscribed and, consistently, very well attended. Numerous conversations with students suggest a chicken-and-egg situation in which students are drawn to the subject, but are reluctant to declare MSE because they perceive that there are not yet sufficient FTEs to deliver the major. We also anticipate that some students (those who find themselves less mathematically inclined but who have strong conceptual and spatial skills) will migrate from ME and also EE to MSE. This has been the experience at many established universities; ME or EE recruits the students to campus, and MSE helps to keep them there. In this way, an active MSE program strengthens the ME/EE programs and boosts retention.

From the point of view of delivering the approved major in MSE, which has been designed to meet ABET accreditation standards, a "core" of 26 specialist credits needs to be covered, and there are also some technical electives that MSE should contribute to the "pool" of courses that are presented to students in MSE, BIOE, ME and Chemistry. A bare minimum of 5 FTEs is needed to run the major based on these teaching and accreditation requirements. The proposal for a minimum of 5 FTEs allocated to this major is also consistent with the original plans that formed the basis for approving the major. There are currently up to 4 approved FTEs (Professors Viney, Leppert and Lu, and a fourth hire currently open) associated directly with this major. Two are at the senior level and two at the junior level. However, Viney and Leppert continue to be very heavily involved in other programs that are essential to the success of the School, including the Engineering Fundamentals course ENGR45 (Introduction to Materials), General Education, Engineering Service Learning, the Center Of Integrated Nanomechanical Systems (COINS), and the Imaging and Microscopy Facility. Therefore, we are requesting an FTE (emphasis: complex materials) at the Senior level.

We are also keen to capitalize on the unique opportunities afforded by the already strong economics program and the nascent School of Management at UC Merced. Specifically, we would like to emulate the successful program at Oxford which allows the very top students in Materials (as assessed after the freshman year) to major in Materials, Economics and Management (MEM). The approximate coursework composition is 60% Materials, 20% Economics and 20% Management. The Oxford program recognizes that captains of industry in Europe's and Asia's more successful economies are not lawyers or accountants, but PhD engineers or scientists. Graduates of the program are highly sought after. We envisage that such technical representation in the highest levels of industry will become increasingly necessary as manufacturing based on – and producing – complex technologies increases. It will be especially relevant in the context of UC Merced, which is expected to perform the dual roles of inventing technologies and encouraging local entrepreneurship to implement the inventions. Accordingly, we propose hiring an FTE (at the level of assistant or associate professor) who can thrive at the intersection of engineering and entrepreneurship.

2.4.11 Materials Science Engineering: MSE-6: Complex Materials

An FTE in complex materials will contribute strongly to both our teaching and research missions. The person hired will have an accreditable background in materials and be able to deliver essential courses that are core to the discipline, plus technical electives. On the research side, Merced would benefit from enhanced expertise in new materials that meet

nanodevice fabrication, or high temperature material for use in energy conversion, or nanomaterials with novel physical, chemical and mechanical properties. A hire in any one of these areas will considerably strengthen at least two of the research focus areas targeted for strategic development by the School of Engineering: Energy and Materials Technologies, and Nanoscale Systems. A hire who (our preferred choice) *combines* experiment and modeling could enhance the collaborative opportunities for an additional two of the areas targeted by SOE: Computational Sciences and Engineering, and Modeling Sciences. The term "Complex Materials" reflects the fact that simultaneous control of multiple properties requires molecular order to be controlled simultaneously at multiple length scales. Depending on the area of expertise of the person hired, it is likely that he or she may also contribute to strategic research efforts in Environmental Science and Engineering or Biological Engineering.

We propose a hire at the Senior level for this position. Laboratory needs will be unexceptional, and will depend on the area of the strongest candidate who emerges from the search. Space use efficiency will benefit from our ongoing efforts to develop shared facilities for nanofabrication and characterization.

Mechanical Engineering

The mechanical engineering (ME) undergraduate major was launched during Fall 2006 accepting only freshman students. The plan is to start accepting transfer students for Fall 2008. However, a large number of current upper division students at UC Merced have approached ME faculty or the engineering student counselors to explore the possibility of transferring to this major before they complete their degree. There is increasing evidence that ME will become one of the most popular engineering majors at UC Merced. For instance, out of 300 freshman students accepted in engineering for fall 2007, 53 students (17.7%) chose ME. Last year, a significant fraction of the undeclared students decided to enroll in ME, so we expect a similar trend for this year.

Although there are some fundamental topics that relate to mechanical engineering, such as mechanics, design, manufacturing, strength of materials, transport phenomena, controls, etc., we emphasize that this discipline adapts and grows as new technologies emerge. Cutting-edge research in biological systems, nano- and micro-scale devices, sustainable energy systems, intelligent systems and controls, complex systems, supercomputing, mechatronics, and national defense issues is currently being done at top mechanical engineering departments around the world.

In order to evolve into a top ME program, it is absolutely necessary to develop a strong and comprehensive foundation in key areas, with a sufficient number of faculty to build a modern program with state-of-the-art research infrastructure. In addition, because ME is a key component of any modern engineering academic program in serving key and foundational needs for many engineering sub-disciplines. Delaying the hiring of ME faculty will dramatically constrain the growth of our engineering program and could significantly impair the image and reputation of the ME program and the university.

Currently, ME provides service to other majors by teaching a number of engineering fundamentals courses that include: ENGR 50 (Statics), ENGR 57 (Dynamics), ENGR 151 (Strength of Materials), ENGR 130 (Thermodynamics), ENGR 120 (Fluid Mechanics), and ENGR 135 (Heat Transfer). This year, ME will also be teaching ENGR 155 (Engineering Economic Analysis). This situation increases dramatically the teaching load of ME faculty.

Concerning graduate studies, the Mechanical Engineering and Applied Mechanics graduate group was approved in May of 2007. This multidisciplinary research group offers research opportunities for students interested in projects at the interface between Complex Analysis, Mechanics, Manufacturing, Bio-Inspired Engineering, Applied Computational Sciences, Mechatronics, Advanced Materials, Energy Conversion, and Controls. Due to the variety of research topics, a number of graduate courses taught by MEAM faculty serve graduate students from different disciplines. This also increases the teaching load of ME faculty. For instance, the following courses, offered by ME faculty, have been taken by graduate students from MEAM and/or other programs: ES 235 (Heat Transfer), MEAM 201 (Advanced Dynamics), ME 210 (Linear Controls), and MEAM 251/ES 237 Viscous Flows.

There are currently three FTE positions filled in mechanical engineering, Professor Diaz, Professor Sun, and Professor Coimbra, denoted ME-1, ME-2, and ME-3, respectively. The excerpts of the CAPRA report to the EVC dated May 20, 2006 indicated "*two additional FTEs for ME are highly recommended, one at the senior Level.*" Out of these two recommended positions, only one was authorized as a result of the AY 2005-06 academic strategic plan, denoted ME-4 in Table 8. A senior faculty has been selected out of an outstanding pool of candidates and his case has been recently approved by CAP.

The memorandum date July 20, 2007 from Keith Alley authorized one additional FTE for ME, denoted ME-5. A search is already underway to fill out this position at the senior level in the area of complexity and energy systems. This position will expand the current areas of research available in the program, help with teaching courses at the undergraduate and graduate level, and help with the starting of the Energy Institute at UC Merced. One more Cross-Engineering FTE was authorized, denoted BIOE-7/ME-8, in the area of multi-scale modeling. The job description has already been posted on UCM website.

A total of seven desired positions have been identified and described below in descending level of priority for the major.

1. Bio control
2. Computational Engineering
3. Bio-Inspired Mechanics
4. Nonlinear Analysis
5. Energy (with emphasis in Fuel Cells or Hybrid Systems)
6. CFD
7. Mechatronics

The requested positions can be described as:

- ME-6: Senior/junior position complementing existing ME faculty
- ME-7: Senior/junior position complementing existing ME faculty

The program is also requesting ***two security-of-employment instructors***. One will concentrate on the engineering fundamentals courses and the other on ME electives.
The description of the requested FTE positions is as follows:

2.4.12 Mechanical Engineering: ME-6: Bio-Control

Mechanical Engineering sees a need for an FTE working on research in one or more areas of the emerging domain of Bio-Control. This senior/junior position will add an important and strategic area of research in ME to broaden and strengthen its actual capabilities. This position will cover, but will not be limited to, the design and construction of self-assembled structures, bio-mimetic surfaces, sensors and actuators that will allow external control of

biological and bio-technology systems. Mechanical Engineering and the MEAM Graduate Group see such a hire as necessary to position the campus competitively in this promising area of research. The undergraduate program in Mechanical Engineering will benefit with courses such as mechatronics (ME 142), vibration and controls (ME-140), and the capstone design (ME-170). The graduate program will benefit with courses in the particular areas of research of this FTE. Natural synergies with other programs include Bio-Engineering, Computer Science and Engineering, and Applied Mathematics. The space needs are expected to be adequate for a senior/junior level position in the wet lab area.

2.4.13 Mechanical Engineering: ME-7: Computational Engineering

This senior/junior position is an important and strategic area of research in ME and it is intended to strengthen the actual capabilities of ME faculty. It will cover, but will not be limited to, the development of numerical schemes to treat problems in structural, fluids, and/or thermal/fluids systems. It can relate to parallel computing and high performance algorithm development applied to engineering problems. The undergraduate program in Mechanical Engineering will benefit with courses such as FEA (ME 135) and CAE (ME 137). The graduate program will benefit with courses in the particular areas of research of this FTE. Natural synergies with other programs include Computer Science and Engineering, and Applied Mathematics. The space needs are expected to be adequate for a senior/junior level position in the dry lab area.

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Table 8 School of Engineering Faculty 5-year Hiring Plan.

Academic Year	ENVE		CSE		BIOE		ME		MSE		EE		ChE		EEM		CE		Cumulaive Faculty FTEs
	Name	FTE	Name	FTE	Name	FTE	Name	FTE	Name	FTE	Name	FTE	Name	FTE	Name	FTE	Name	FTE	
	Bales	1.0	Newsam	1.0	Chin	1.0	Diaz	1.0	**Viney**	1.0	**Chiao**	0.5							
	Conklin	1.0	Kallmann	1.0	McCloskey	1.0	**Sun**	1.0	**Leppert**	1.0	**EE-2**	1.0							
	Harmon	1.0	Cerpa	1.0	Khine	1.0	Coimbra	1.0	Lu	1.0	**EE 3**	1.0							
	Winston	0.5	Carpin	1.0	**(Escobar)**	1.0	**ME-4 (Fried)**	1.0	MSE-4	1.0									
	Guo	1.0	Carreira	1.0	**BIOE-5**	1.0	**(Modest)**		(Davila)	1.0									
	Rogge	1.0	Oh	1.0	BIOE-6	1.0	lex Systems	1.0	**MSE 6**	1.0									
	Ervans(x)	*0.5*	Noelle	0.5	*Multi Scale*	0.5	*Multi Scale*	0.5											
	Westerling	0.5	CSE-8*	1.0	BIOE 8	1.0	*(TBD)*												
	Chen	0.5	**CSE-9***	1.0	BIOE 10	1.0	*(TBD)*												
	Sustain	1.0	CSE-10(x)	0.5	**BIOE 11**	1.0	ME 6	1.0											
	ENVE 11	1.0	***CSE 11***	**1.0**			ME 7	1.0											
	ENVE 12	1.0	**CSE 12**	**1.0**															
			CSE 13	1.0															
AY 05-06	5.5		6.0		4.0		2.0		2.0		0.5		0.0		0.0		0.0		20.0
AY 06-07	7.0		6.5		4.0		3.0		4.0		1.5		0.0		0.0		0.0		26.0
AY 07-08	7.0		7.5		5.0		4.0		4.0		1.5		0.0		0.0		0.0		29.0
AY 08-09	10.0		12.0		9.5		7.5		5.0		2.5								46.5
AY 09-10	12.0		15.0		12.5		9.5		6.0		3.5								58.5
AY 10-11																			0.0
AY 11-12																			0.0

Underlined (x) denotes cross-School hire - *Italics* denote cross-engineering hires - (Paranthetical) entries denote individuals under consideration - **Bold** denotes senior FTE

	Future FTE
FTE	**Current searches**

Table 9 Prioritized FTE Request List for AY2007-2008 SOE Strategic Plan

Priority	Name of Position	Level (Lecturer/Assistant/Associate/Full)	Primary Major Conribution (Current or Planned)	Secondary Major Contribution (Optional)	Primary Graduate Group	Secondary Graduate Group (Optional)	Estimated Start-up cost	Estimated Space Needs	Special needs and strategic considerations, if any
Critical	Bio-control	junior/senior	ME	BioE	MEAM	BEST	$ 500,000.00	750	Wet Lab
Critical	Computer Science	senior	CSE		EECS		$ 450,000.00	500	Dry Lab
Critical	Complex Material	senior	MSE	BioE	BEST	MEAM	$ 400,000.00	750	Dry Lab
Critical	Computational Eng	junior/senior	ME	CSE	MEAM	EECS	$ 550,000.00	500	Dry Lab
Critical	Tissue Eng	junior	BioE	MSE	BEST	QSB	$ 550,000.00	750	Wet lab
High	Environmental Microbiology	junior/senior	Enviorn Eng	BioE	ES	QSB	$ 450,000.00	500	Wet Lab
High	EE	senior	CSE	ME	EECS	MEAM	$ 450,000.00	500	Dry Lab
High	CS/EE position	senior	CSE	ME	EECS	MEAM	$ 450,000.00	500	Dry Lab
High	Bio-Inspired Mech	junior/senior	ME	MSE	MEAM	BEST	$ 550,000.00	750	Dry Lab
High	Physiological modeling	junior	BioE	ME	BEST	QSB	$ 550,000.00	400	Wet lab
High	Ecohydrology & Ecological Eng	junior/senior	Enviorn Eng	BioE	ES	BEST	$ 400,000.00	500	Wet Lab
Regular	Single cell measurement	senior	BioE	ME	BEST	QSB			
Regular	Media art	senior	CSE		EECS				cross-school
Potential Security of Employment Positions (SOE)									
1	CSE	potential SOE	CSE						
2	ME	potential SOE	ME						
3	ME	potential SOE	ME						
Management School Related Positions									
1	Natural Resource Management	senior							
2	Entrepreneurship	junior/senior			BEST				
3	Technology Management	senior							
4	energy, climatic & sustainability	junior/senior							
5	biotech Management	junior/senior			BEST				

2.4.14 Cross-School Hire

Last year, SOE proposed several cross-school positions. Some of these positions were endorsed by CAPRA and recommended as cross-school positions. However, SOE did not receive some of these FTE allocations from the Provost. The faculty of SOE was not able to identify the rationale for these irregularities. Without a transparent policy for cross-school FTE allocations, SOE faculty has decided to request only one cross-school FTEs this year.

3 Strategic Planning Framework

Section 2 of this plan began with a justification for the request for 13.5 faculty FTEs to be hired into the School of Engineering during the AY 2008-09 academic year, bringing our total faculty to 42.5 Engineering faculty FTEs as shown in Table 6. The discussion then shifted to the impact that this increment in faculty resource would have on the further development of our academic programs, and most importantly, to a listing of the specific faculty FTEs by research area and cross-School synergies that would result—presented in Section 2.4. Similarly, Section 2.5 presented a list of 2 Cross-Engineering hires that would further enhance the programs of the School of Engineering, but more important, would further provide opportunities for strategic multidisciplinary research opportunities across UC Merced. To the extent possible, these proposed positions have been discussed to various degrees, with our colleagues in our sister schools.

3.1 Revisiting the Strategic Faculty Hiring Framework

The strategic value of the faculty hires proposed in Section 2—both intra-School and cross-Schools hires—are presented in Table 10, which is an expanded and updated version of the hiring framework proposed last year. The columns of Table 10 represent the emphasis areas within Engineering sub-disciplines being developed at UC Merced, with each column corresponding to a strategic research opportunity shaping specific faculty hires; present, current, and future. The rows of Table 10 list more comprehensive cross-Schools research areas that have been discussed, and than have emerged as a result of the faculty hiring process over the years. These columns are deliberate in their inclusion of priority cross-School strategic research areas, but are themselves grouped within the six priority research areas set forth in Section 1: (1) Energy and Materials Technologies, (2) Biological Engineering, (3) Nanoscale Systems, (4) Environmental Science and Engineering, and (5) Computational Science and Engineering, and (6) Modeling Sciences.

3.1.1 Energy and Materials Technologies

The early energy emphasis at UC Merced focuses on solar energy. Both **optics and materials** play a key role. The use of advanced optics techniques, and nonimaging optics in particular enable the generation of high temperature for power and heat, as well as efficient photovoltaic power through concentration. Advanced materials are critical across all solar energy technology. These areas of optical design and material science span a range of disciplines from applied mathematics (optical design) to condensed matter physics (photovoltaic materials) to engineering (thermal and electrical components and systems).

Mechanical and electromechanical systems are integral to virtually any kind of engineering system, with rapid growth now being observed at the micro and nano levels. Examples of such systems include transportation systems, energy production and control systems, environmental management systems, and an increasingly important area of bioengineered systems. Not only will it be essential for the School of Engineering to have a very strong research and education foundation in these key engineering areas, but this foundation will also be invaluable for the cross-disciplinary framework that we seek to establish across our university. As we develop a program in medical research and technological development, bio and electro-mechanical research innovation will be extremely important.

Table 10 Revised strategic cross-School hiring strategy for AY 2007-08 from the School of Engineering.

Strategic Faculty Hiring Planning Matrix--This matrix is intended as a framework for displaying the structure of faculty hiring within the School of Enigneering at UC Merced. The left column presents the strategic research priorities within Engineerring. Each area is further categorized by potential cross-School priority areas. The columns to the right reflect research emphasis areas grouped by disciplinary categories, also reflecting our current and future undergraduate majors. Entries in the table correspond to current, pending, and desired future faculty hires.

Current and Planned Undergraduate Majors witin the School of Engineering

Strategic Research Priorities within the School of Engineering	Strategic Cross-School Research Opportunities	ENVE						CSE					BIOE					ME					MSE						EE							
		Hydrology	Microbiology	Water Quality	Air Pollution	Environmental Sustainability	Energy water & resource management	Networking	Data Base Mining/Informatics	Robotics/Autonomous Agents/AI	Graphics/Multimedia	Architecture/Systems	Bioelectronics	Biomaterials Engineering	Cellular Bioengineering	Tissue Bioengineering	Bioprocess Eng	Energy and Environment	Computational Mechanics	Complex and Intelligent Systems	Multiscale Phycics and Modeling	Bioengineering	Nanomaterials	Composite materials	Materials Synthesis	Materials characterization	Environmental Aspects Materials	Materials Processing	Microelectronics and Nano Technology	Communication Networks	Bioelectronics	Optics and Photonics	MicroElectroMechanical Systems	Signal Processing	Circuits	Linear/Nonlinear Systems, Control
Energy and Materials Technologies	Energy; including optics, material sciences					☒																	☒														
	Mechanical and electromechanical systems												▢		▢		☒			▢					☒							☒					
Biological Engineering	Human biology, health and enviroment, including management and policy														☒					▢																	
	Regenerative medicine													▢		☒																					
Nanoscale Systems	Nanotechnology												☒			▢								▢		☒		▢									
	Human dimesions of engineering and science																										▢										
Environmental Science and Engineering	Atmospheric & climate sciences, air resources			☒	☒		▢																														
	Energy, Water & Environmental sustainability, including policy	☒		☒		▢	☒																														
	Remediation		▢																																		
	Ecological Engineering	▢																																			
	Geography and spatial analysis and global change						☒	☒	☒			▢																									
Computational Science and Engineering	Cognitive and computational sciences								☒	▢	☒																										
	Media arts and Technology										▢																										
	Cyberinfrastructure and system							☒	▢	☒	▢	▢							▢															▢			
Modeling Sciences	Management and decision sciences					▢	☒																														
	Mathematical sciences, applied mathematics, and applied statistics								☒						▢		▢	☒	▢	☒	▢	☒															
		10						12					9.5					8					6						2.5							

- Engineering faculty (first 20)
- ☒ Engineering faculty already hired
- ▢ Joint (cross-school) faculty hires or joint hires requested
- ▢ Joint (cross-engineering) faculty hires or joint hires requested
- ▢ Current faculty searches
- ▢ To be requested; need to be distributed into the matrix

3.1.2 Biological Engineering

Human biology, health and environment—including management and policy focuses on improving human health through an understanding of physical, chemical and biological processes, interpreted through the design-based and problem-solving skill set of engineering. The influences of physical and social environment on health, and strategies for influencing these environments positively, are included. Objectives include significant health-care cost reduction, development of methods for earlier and more accurate diagnosis, possible therapeutic interventions, and effective preventive measures for patients at high risk.

Regenerative medicine refers to technologies that repair or replace diseased, damaged or defective tissues or organs. This focus area represents an emerging multidisciplinary field involving biology, medicine, chemistry, physics, materials engineering and bioengineering. It is expected to revolutionize the current therapeutic measures by restoring tissue and organ function that are affected by the natural aging process or diseases.

3.1.3 Nanoscale Systems

At nanometer length scales, the physical and chemical properties of matter are dictated by quantum phenomena. **Nanotechnology** aims to exploit these material properties directly, as well as in the context of novel machines and electronic devices that operate on a very small scale, comparable to or smaller than the scale of functional devices found in nature. Also included, is the design and exploitation of self-assembling molecular systems and nanoscale devices to produce macroscopic objects with precisely controlled specifications. The effects of nanoparticles on human health and the environment will require careful, extensive attention.

The **human and ethical dimensions of science and engineering innovation** will be increasingly important in the future for new areas of social concerns such as bioengineered systems, environmental and energy systems, and virtually all biomedical and medical technology areas.

3.1.4 Environmental Science and Engineering

This strategic research priority builds on existing faculty strengths to gain a competitive edge in the areas of (1) **atmospheric sciences, climatology and air resources**, (2) e**nergy, water, and environmental sustainability**, and (3) **geospatial analysis and global change.** Research opportunities associated with this research priority are abundant from both a regional and global perspective. Specific research topics for the first area may encompass air pollution chemistry, air quality characterization and management, and other topics critical to human and environmental health. The second area encompasses the science, technology and management of these resources that are critical to global economy and life itself. The third area encompasses the analysis of large spatial data sets, such as those generated through remote sensing technologies, to observe changes in land use, vegetative canopy and other environmental properties in response to drivers such as climate change.

3.1.5 Computer Science and Engineering

Cognitive science and engineering is the interdisciplinary study of mind and intelligence, embracing philosophy, psychology, artificial intelligence, neuroscience, linguistics, and anthropology. Cognitive and Computation Sciences refers to all the computational aspects of

these domains and ultimately aims to create computer models and algorithms able to reproduce intelligent behavior in intelligent systems. Example of covered domains include: image processing, computer vision, artificial intelligence, statistical and machine learning, neural networks, computational neuroscience, nonlinear dynamics, nonlinear control theory, robotics, behavioral animation, virtual reality, human-computer interaction, etc.

Media Arts and Technology (MAT) is an interdisciplinary area that fuses emergent computer science and engineering, and digital art research, practice, production, and theory. MAT offers the opportunity for working at the frontiers of art, science, and technology, where new art forms are born and new expressive media are invented. The highly cross-disciplinary nature of this exciting field, and the direction being taken at UC Merced with key faculty hires within the School of Engineering and the School of Hunamities, Social Sciences, and Arts, suggest that this is an excellent opportunity for innovation at UC Merced.

Recent trends suggest that inexpensive networked video sensing elements will be pervasively deployed in our environment. Already, they are embedded in devices such as computers and mobile phones and they are mounted in public spaces such as malls and airports. In many ways, this trend could prove beneficial to society, in that information collected by sensors could be shared for the better good. Harnessing the power of these emergent sensory environments will hinge on our ability to build applications capable of gathering, interpreting and storing data from distributed sensors and to provide scalable mechanisms for managing the networks and systems resources that these applications consume. We anticipate the design, implementation, and testing of a state-of-the-art signature facility for this purposes—the UC Merced Sensorium.

The UC Merced Sensorium would catalyze fundamental advances in image and video computing, network protocols, and resource management to deal with unique spatio-temporal constraints of sensor networks in general and of video sensor networks in particular. It will also contain hardware and software for image, audio, and video capture and processing; motion capture; visualization; interactive display; digital preservation; and innovative internet interaction. When fully developed, the Sensorium educational and research infrastructure will be composed of a sensor network of video cameras spanning several areas, networked processing units, and a terabyte database, managed together to satisfy queries using those generated by mobile users within this environment. It will support a number of undergraduate and graduate courses, including

- Multimedia Systems (undergraduate)
- Arts and Technology (undergraduate)
- Computer Networks (undergraduate)
- Operating Systems (undergraduate)
- Digital Image Processing (undergraduate)
- Digital Audio Processing (undergraduate)
- Digital Video Processing (undergraduate)
- Databases (undergraduate)
- Computer Vision (undergraduate)
- Computer Graphics (undergraduate)
- Programming Languages (undergraduate)
- Embedded Systems (undergraduate)
- Real Time Systems (graduate)

- Advanced Computer Networks (graduate)
- Sensor Networks (graduate)
- Distributed Systems (graduate)
- Computer Animation and Simulation (graduate)
- Advanced Digital Image Processing (graduate)
- Advanced Computer Vision (graduate)
- Advanced Databases (graduate)
- Data Mining (graduate)
- Motion Planning and Cognition (graduate)
- Security and Privacy (graduate)
- Visualization (graduate)

The Sensorium will serve a variety of constituents including faculty in computer science, electrical engineering, art and cognitive science. It will be a core facility for the proposed interdisciplinary program in Multimedia Arts and Technology. Through hosting classes, seminars, and performances, it may also provide opportunities for synergies between the campus and local community.

The term "**cyberinfrastructure**" was coined by a National Science Foundation (NSF) blue-ribbon committee. In general, the term refers to systems that facilitates the development of new applications, allows applications to interoperate across institutions and disciplines, insures that data and software acquired at great expense are preserved and easily available and empowers enhanced collaboration over distance, time and disciplines. It also includes effective management of distributed resources (data and facilities). Some other names in use for such systems are co-laboratory, grid community/network, virtual science community and e-science community.

3.1.6 Modeling Sciences

Modeling sciences refers to the broad array of disciplines used throughout math and science disciplines, including **mathematical modeling** and **operations research**, **applied mathematics and statistics**, **decision sciences**, and **quantitative analysis and reasoning**. From the initial discussions of building at UC Merced a culture of multidisciplinary research and education, there has been considerable interest in establishing a broad foundation of modeling and modeling technologies as a framework for this synergy across the current and future Schools. This framework would encompass and promote strong synergy among a broad spectrum of academic disciplines, including simulation modeling, optimization modeling, statistical and inferential modeling, and perhaps physical modeling. It was argued early on in our development that an emphasis on modeling and modeling technologies could be valuable at all levels and across virtually all domains. Even our initial discussions about general education considered a strong component of modeling as a means to improve personal decision makinge and proeuctivity. Indeed, the *Decision-making* guiding principle of General Education at UC Merced was an artifact of that early discussion.

While the emphasis on this as an area of synergy between and among Schools has not remained central in discussions of cross-Schools priorities, it remains a priority within the School of Engineering, and will very likely re-emerge as a top priority because of the successful development of programs across Schools, including Cognitive Science, Economics, and Management within the School of Social Sciences, Humanities, and Arts; Quantitative Biology and Ecology within the School of Natural Sciences, and virtually all

disciplines within the School of Engineering. This is an ideal focus area for attracting cross-School multidisciplinary faculty hires, and while it will certainly remain a cross-cutting area for research and scholarship—rather than an area "owned" predominantly by one School—it is very consistent with the foundational vision behind UC Merced.

3.2 Strategic Faculty Hiring

The entries in Table 10 each correspond to a faculty FTE, either one already filled, one currently being recruited, or one being proposed within this strategic plan. Blue cells in the table correspond to the initial allocation of 20 faculty for the school of Engineering—those blue cells marked with X indicate positions already filled. Cells shaded yellow ☐ indicate positions that have been authorized for recruitment currently in process. Cross-School hires are denoted by cells having a bold border ☐ regardless of color, while cross-Engineering hires are denoted by cells having a double border regardless of color, either current faculty or anticipated hires. And cells shaded orange ☐ denote FTEs requested for AY 2007-2008.

The table thus reflects, for each faculty hire or potential faculty hire, the synergies that will result within and among Engineering disciplines, as well as between and among Schools having shared strategic research areas.

4 Space Planning and Management

4.1 Space Challenges at UC Merced

The growth of academic programs within the School of Engineering at UC Merced depends in part on the availability of space in the form of research facilities, faculty, student, and "professionals" office space; teaching labs; essential support facilities such as conference and meeting rooms; and other support space such as administrative offices and other space for scholarly activities. The space in the Science and Engineering Building is of course finite, and the second Science and Engineering Building (SE2) will not be available for the space inventory until fall of 2012. Table 2 suggests that with 20% of the student body—which will number approximately 4558 at that time—and faculty FTEs based on student numbers and student faculty ratios, the size of the Engineering faculty may be expected to be about 51 FTE at the beginning of AY 2012-13. Assuming that the School of Natural Sciences will comprise conservatively 30% of the student body[vi], and with similar assumptions about faculty numbers, NS could have as many as 70 faculty by the time SE2 is available. This means that at the time SE2 comes on line, the total faculty FTE within the combined Schools of Natural Sciences and Engineering may be as high as 121, or more than 40 - 50 FTE more than the total office space available in SE1based on the original campus planning space numbers. With the size of SE2 already set at less than 52,000 ft^2 assignable, it may be more than half full upon opening.[vii] As the original per-faculty space numbers used in planning SE1 failed to provide office space for research groups (e.g. grad students and post docs), the true demand for SE1 and SE2 space is much higher. From another perspective, this level of growth may mean that SE1 reaches capacity by 2008; four years before SE2 comes on line.

As a result, it will be imperative that space at the Castle facility be used efficiently and effectively in support of campus space needs. Future space planning and management for SE1 should be aligned with campus space planning objectives.

4.2 Space Allocation, Utilization Monitoring, and Reallocation

The School of Engineering currently occupies space in the Science and Engineering Building (SE1). In the discussion below, *allotment* refers to the designation of specific space for management and use by the School of Engineering, and *assignment* refers to the designation of space by the Dean of Engineering to individual faculty, programs, projects, etc.

4.2.1 Initial campus space allotment

The initial allotment of space by the Provost to the School of Engineering consisted of:

1. The use of 25 faculty offices;
2. A total of 32.4% of research space to support the inaugural faculty; and
3. The Deans suite of offices on the second floor of SE2.

The initial allocation of space to the School of Natural Sciences was identical, and the total area was divided up between the two schools. This initial allocation was thus intended to house the first 40 faculty, with the initial 5 faculty offices made available to each school to support other space needs with the understanding that when the building is "full," all faculty offices will be occupied by faculty only. The 5-office "buffer" controlled by each school will be correspondingly reduced to zero as the building reaches capacity.

Beyond the initial allotment of space in SE1 for faculty offices and research space, the Deans of both Schools have agreed on an additional allotment for housing all faculty and their anticipated research activities up through those faculty expected to be hired by fall 2007. This second and third rounds of allotment divided all faculty offices and research space between the two schools resulting in 33 faculty offices and 21,535 sq. ft. of research space allocated to the School of Engineering.

Following the final allocation of space, the School of Engineering is short in 6 offices and research space for 6 junior and 2 senior authorized FTEs, space will have to be assigned at Castle.

4.2.2 Initial engineering research space allocation

The allocation of space allotted to the School of Engineering has been (is being) made by the Dean of Engineering as follows:

1. Each faculty member has been assigned a standard faculty office in general proximity to their assigned lab space, and to other faculty within the School of Engineering and the School of Natural Sciences having similar or related research programs.
2. Four groups of faculty were initially identified based on disciplinary areas of research and teaching responsibilities, and corresponding research space areas were identified by the Dean and designated for ach group. The groups developed recommendations for the specific allocation of each area among members of the group, as well as common areas to be shared within the group--which may also include faculty members from outside the group. Initial faculty research space assignments were based on these recommendations.
3. Requests for use of buffer office space was considered by the Dean following issuance of priorities for the use of that space, and temporary office space assignments were made.
4. Office and research space needs for future faculty will be assigned by the Dean until all faculty offices are assigned (NOTE: at this time SE1 will have insufficient space for postdocs, instructors, lecturers, and other research staff.)

Table 11—Space assignment factors.

	PROPOSED FORMULAS		
	Research (ft^2)	PD office (75 ft^2/FTE)	GS Office (50ft^2/FTE)
Assistant	250	0.5	3
Associate	500	0.75	6
Full	750	1	9

Specific faculty space allocations were made using the general guidelines reflected by the factors contained in Table 11. For example, associate professors in the School of Engineering will be assigned an ***average***[viii] of 500 ft^2 of lab space, with an additional allocation of space for post doctoral researchers of 75 ft^2 per person, and 50 ft^2 per graduate student. It is assumed that as our program grows, associate professors will have an average of .75 post doctoral scholars per person, and an average of 6 graduate students including both Masters and Ph.D. students. Similarly, faculty at the rank of full professor will be provided an average of 750 ft2 of lab space, and additional space for an average of 1 postdoctoral associate, and 9 graduate students.

The research space allocation factors were obtained from the initial planning documents for the Science and Engineering building, and the researcher (post doc and grad student) space factors were obtained from the CPEC guidelines. While it can be argued that these space

allotments are less than what might be available anecdotally at other UC campuses, the averages will likely include faculty who have very modest or no lab space allocations.

NOTE: These estimates do not include space allocations for shared core research facilities.

The estimates for the average numbers of post doctoral scholars and graduate students anticipated for School of Engineering faculty as shown in Table 13 were estimated from numbers obtained from several UC Engineering Schools as presented in Table 12. While these data were not yet obtainable for all campuses, nor broken down by faculty rank—we will be pursuing this more detailed breakdown of data in the future—they show that the factors proposed in Table 11 are generally realistic and defensible. For example UC Davis, with a total of 176 regular faculty FTE reports 80 postdocs, or approximately 0.5 postdoc per faculty member (averaged across all ranks). These data suggest that our estimates for the numbers of graduate students at UC Merced may be a bit high in comparison with other campuses, but not excessively so, and may be modified after we receive complete data from all sister campuses.

Table 12 Reported numbers of graduate students, and other academic personnel in UC Engineering Schools.

Campus	Faculty	Graduate Students[1]				Other Academic Personnel[2]					
		Masters		Doctoral		Post Docs		Instructors		Researchers	
	Count	Count	Fac Avg	Count	Fac Avg	Count	Fac Avg	Count	Fac Avg	Count	Fac Avg
Santa Cruz	66	81	1.2	193	2.9						
Santa Barbara	125	110	0.9	584	4.7						
San Diego	166	346	2.1	801	4.8						
Riverside	73	53	0.7	238	3.3	24.0	0.3	14.0	0.2	14.0	0.2
Merced	14	9	0.6	8	0.6						
Los Angeles	150	474	3.2	782	5.2						
Irvine	154	59	0.4	249	1.6	58.0	0.4	10.0	0.1		
Davis	176	334	1.9	782	4.4	80.0	0.5	20.0	0.1	16.0	0.1
Berkeley	218	235	1.1	1354	6.2			45.0	0.2		
Total	1163	1880	1.6	5448	4.7						

[1] Report to the University Wide Council on Engineering Education UCEE Fall, 2005
[2] Direct consultation with Schools

The anticipated need for additional space prior to the availability of the second Science and Engineering (SE2) building becomes evident when considering that (1) the total available space in SE1 totals slightly more than 100,000 ft^2, (2) the School of Science—having space requirements similar to those of Engineering—is likely to be on the order of 20% larger than Engineering in terms of students and faculty, and (3) this does not include the entire 1st floor of SE1, which is exclusively allocated for teaching labs: approximately 1/3 of the total assignable square footage.

Table 13 – Space Needs Planning.

Name	Offices on campus (number)	Labs Space on Campus (sq. ft.)	Total campus Space	Space at Castle (sq. ft.)	Space at other location
Current total (7/2007)	33	21,535	21535	0	0
	New FTSs space needs				
	Faculty Offices	Research Space (sq. ft.)	Sitting stations Graduate Students	Sitting stations Post Docs	Instructors offices
New space for AY08-09 hires	11	6650	28	17	3
Total for AY08-09	11	6650	28	17	3

[1] **SoE is short I 6 offices for the current authorized FTEs and research space for 6 junior and 2 senior authorized FTEs**

It should be emphasized that the estimates presented in Table 13 do not consider adequately the CPEC guidelines. Not only did the original planning for SE1 fail to account properly for the resulting size of graduate research groups, but they also failed to account for the resulting number of instructors, and other multidisciplinary research infrastructure. Using the same projections for faculty recruitment and size of graduate research groups, the use of CPEC factors would result in a much greater space requirement as reflected in Table 13. It is important for future planning activities that realistic assumptions be used during the request for, and justification of, new space.

4.2.3 Core research facilities

In any consideration of research space allocation, it is vitally important to plan for the presence of shared research core facilities on campus. Not only do these facilities contribute to the research missions of multiple faculty (typically 10-20), but they are also actively utilized in teaching and need to be placed on campus so that graduate and undergraduate students have the benefit of training on commonly-used instrumentation. This integration of teaching and research makes efficient use of space, and is pedagogically desirable and strongly encouraged by the National Science Foundation, as evidenced by the over $1M in grants received by UC Merced faculty to develop two core facilities, the Environmental Analytical Facility and Imaging and Microscopy Facility. Core facilities are generally operated on a recharge basis in order to minimize cost to the university, and for them to generate the income necessary for operation they must be on campus where they will be utilized by researchers and for teaching. Sufficient space allocation for core facilities is essential to the development of UC Merced as a research university.

4.2.4 Teaching laboratory space allotment

Recommendations for the allotment of space for teaching in the SE1 will be made to the deans of both schools by a newly formed teaching laboratory planning committee. This committee will be lead by the assistant deans of both schools, with participation from lab managers from both schools, Steve Rabedeaux, Nancy Tanaka, and, as appropriate, from the Office of the Registrar.

4.2.5 Space utilization monitoring and reallocation planning

Monitoring and assessment of the use of assigned space will be the responsibility of the office of the dean of the School of Engineering, working closely with the newly formed SoE Academic Resources Committee. Assignments of additional space to individual faculty, groups, projects, etc. will be made following careful justification and consideration. Similarly, reduction in space allocations will be made as appropriate such that the space resource serves the best interest of the School and the university.

ENDNOTES

[i] The original target was 1,000 student FTEs upon opening, which was not achieved. The actual student FTE of 875 students (total undergraduate and graduate students) is reported in Table 1.

[ii] The 10-year planning horizon was selected in part because this represents the time over which the second phase of campus construction—specifically, the second Science and Engineering building—will be complete and [probably] fully occupied. This should represent a time in the future at which a reasonably steady-state rate of student recruiting and faculty hiring will be achieved, and in particular, the time after which few if any additional undergraduate majors are likely to be added to the program.

[iii] STEM stands for Science, Technology, Engineering, and Math, and is increasing used to describe institutions of learning that emphasize these technical areas as a major mechanism for increasing participation of women and minorities in professional technical areas.

[iv] E. A. Lee and D. G. Messerschmitt, "Engineering an Education for the Future," *IEEE Computer Magazine*, Vol. 31, No. 1, January 1998, pp. 77—85.

[v] See, for example E. A. Lee and P Varaiya, "Introducing Signals and Systems—The Berkeley Approach," *The First IEEE Signal Processing Education Workshop*, Hunt, Texas, October 15-18, 2000. or E. A. Lee, "Designing a Relevant Lab for Introductory Signals and Systems," *The First IEEE Signal Processing Education Workshop*, Hunt, Texas, October 15-18, 2000.

[vi] Some estimates suggest that this number may be closer to 40% of the student body at UCM.

[vii] This depends, of course, on the space required for research labs and auxiliary uses. Planning will soon begin pursuant to the PPG for SE2, which should be complete by late spring 2006.

[viii] While actual assignments will of course depend on individual research programs, it is expected that these will represent an average over all faculty, at least until we get better projects/information.

STRATEGIC PLAN

School of Natural Sciences

AY 2007-2012

(2008 update)

January 29th, 2008

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APPENDICES
Appendix 1: Comparative Data, Faculty Workload, Majors, Enrollments and Projections

A. SNAPSHOT OF THE SCHOOL OF NATURAL SCIENCES

Table A1: Faculty, Students, Space

Resources	2005-06 Actual	2007-08	2010-11 *Projected*[c]
Faculty Positions (total)[a]	27	39	77
Lecturer FTE	2	5.5	7
Undergraduate Majors[b]	312	594	1,348
Graduate Students (in graduate groups, shared across schools)	26	45	180
Space (assignable square feet)	24,200	~38,000	70,000

[a] Filled and unfilled positions allocated to Natural Sciences
[b] Undeclared and declared majors and undeclared students in Natural Sciences
[c] Faculty projections

Table A2: Student Enrollments in Natural Science Courses

Course Enrollments	AY 2005-2006[a]	AY 2006-2007[b]	AY 2007-2008 *Projected*[c]
Mathematics	925	1,230	1,962
Physics	344	510	569
Biology	510	860	1,758
General Ed	274	255	65
Chemistry	462	855	1,235
ESS	28	74	116
NSED			195
Total (% campus enrollments)	2,543 (34%)	3,784 (42%)	5,900 (43%)

[a] Actual enrollments at the 3rd week in Fall 2005 and Spring 2006
[b] Actual enrollments at the 3rd week Fall 2006 and Spring 2007
[c] Actual enrollments Fall 2007 and projected at the 3rd week Spring 2008

B. FACULTY AY 2007-2008

Andres Aguilar, Assistant Professor
Keith Alley, Professor, EVC/Provost
David Ardell, Assistant Professor
Miriam Barlow, Assistant Professor
Francois Blanchette, Assistant Professor
Raymond Chiao, Professor
Jinah Choi, Assistant Professor
Michael Cleary, Assistant Professor
Michael Colvin, Professor
Michael Dawson, Assistant Professor
Benoit Dayrat, Assistant Professor
Phillip Duffy, Adjunct Associate Professor
Henry Forman, Professor
Carolin Frank, Assistant Professor
Marcos Garcia-Ojeda, Assistant Professor
Sayantani Ghosh, Assistant Professor
Ajay Gopinathan, Assistant Professor
Boaz Ilan, Assistant Professor
Anne Kelley, Professor
David Kelley, Professor
Arnold Kim, Associate Professor
Lara Kueppers, Assistant Professor
Andy LiWang, Associate Professor
Patti LiWang, Professor
Jennifer Manilay, Assistant Professor
Monica Medina, Assistant Professor
Matthew Meyer, Assistant Professor
Kevin Mitchell, Assistant Professor
Alexsandr Noy, Adj Associate Professor
Rudy Ortiz, Assistant Professor
David Ojcius, Professor
Peggy O'Day, Professor
Maria Pallavicini, Professor, Dean
Jason Raymond, Assistant Professor
Jay Sharping, Assistant Professor
Michael Sprague, Assistant Professor
Samuel Traina, Professor, Vice Chancellor Research/Graduate Dean
Meng Ling Tsao, Assistant Professor
Mayya Tokman, Assistant Professor
Anthony van Buuren, Adjunct Associate Professor
Wil Van Breugel, Adjunct Professor
Roland Winston, Professor
Tao Ye, Assistant Professor

C. INTRODUCTION

VISION AND MISSION

The University of California has a tripartite mission of research, teaching and public service. Research excellence forms the foundation upon which academic programs flourish in all of the campuses of the University of California system. Research excellence translates to excellence in graduate education and undergraduate experiences. The School of Natural Sciences is developing stellar academic programs for discoveries and applications in science and technology and for graduate and under-graduate education. The research and teaching programs will serve as an economic engine for the region and the state of California and contribute to development of a college-going culture in the San Joaquin Valley.

The vision of the School of Natural Sciences is to develop multidisciplinary and inter-disciplinary research programs and innovative undergraduate and graduate curricula, to distinguish itself among established science programs, to provide the best possible preparation for its students as they address the many scientific challenges of the 21st century, and to address the needs of its stakeholders in the region and the state of California.

- ***Multidisciplinary and inter-disciplinary research programs***

  The programs in the School of Natural Sciences are thematically categorized into Applied Mathematical Sciences, Environmental and Evolutionary Sciences, Health and the Environment, Biomedical Sciences, Biological Chemistry and Physics, Atomic, Molecular and Optical Physics and Condensed Matter Physics and Chemistry. Thematic groupings emphasize the commitment of the faculty and School administration to research programs that encourage cooperation and collaboration across disciplines. Thematic groupings acknowledge that finding solutions to complex problems often requires multi-disciplinary expertise and the growth of research programs should not be hampered by disciplinary boundaries.

- ***Innovative undergraduate and graduate curricula***

  Curricular innovations in degree programs and foundational courses for science and engineering students are highly valued by the School. The faculty and school administration are committed to innovative pedagogies that increase the recruitment and retention of students in mathematics, the sciences and engineering. The faculty of the School of Natural Sciences has the wonderful opportunity to create and shape curricular programs and offerings to provide both the scientific breadth and the depth required for graduates in the 21rst century.

- ***Provide the best possible preparation for its students as they address the many scientific challenges of the 21st century***

  UC Merced has the most ethnically and culturally diverse student body amongst the UC campuses. In AY 2006-2008, more than 40% of the students on campus declared majors in the School of Natural Sciences, providing enormous opportunities to

develop a diverse workforce with a strong science and mathematics preparation. An appreciation and commitment to diversity at all levels (students, staff and faculty) in the School and across multiple activities are essential for success of our students, the School of Natural Sciences and UC Merced.

- ***Contribute to addressing the needs of stakeholders and constituents in the San Joaquin Valley and the state of California***

The School of Natural Sciences recognizes its responsibility and value to the public and is committed to addressing the needs of its stakeholders in the State and in the San Joaquin Valley region. The San Joaquin Valley has been underserved in access to higher education and in reaping the economic and intellectual benefits of a research university. Graduates of degree programs in mathematics and sciences will be well-prepared to contribute to solving complex problems that face our region, state, nation and the world. Access is the key to personal success in modern society and an important goal is opening doors to higher education to groups that have not traditionally had opportunities in higher education. The research programs of faculty in the School of Natural Sciences have far reaching implications to advance the health and well-being of humans and the environment, while making fundamental discoveries about the world in which we all live.

VALUES

Excellence in Scholarship

A top priority of the School of Natural Sciences is scientific excellence. Programs of scientific excellence form the foundation for continued success in recruiting the best faculty, encouraging students, and providing multiple pathways to improve higher education and economic opportunities. The School recognizes the value of disciplinary depth, as well as interdisciplinary and multidisciplinary academics and research.

Academic excellence in training scientists and citizens

The School of Natural Sciences places a high priority on increasing the scientific literacy of all students and increasing the pool of students in UC Merced's academic programs in math, science and engineering. There is an increasing need for well-trained scientists, for scientifically trained decision makers and for a scientifically literate public to meet the global and technological challenges of the 21st century. Academic programs that encourage recruitment and retention of students into math and sciences, while maintaining the highest academic standards are a high priority. Innovative curricula and commitment to teaching excellence in Natural Science courses are essential for student success.

Recognition of the special responsibilities incumbent on a new school of sciences

The School of Natural Sciences recognizes that as the first new school of sciences in the 21st century it has a special responsibility to be innovative in its research, teaching and relationships with its partners and communities. The School is committed to developing unique multi- and inter-disciplinary research and academic programs and recognizes that

partnerships with higher educational institutions and communities leverage resources across the region, state and nation, enabling new synergies and promoting progress.

GOALS

The overall goal of the recommendations described in this strategic plan for the School of Natural Sciences is the development of outstanding research and academic programs, spanning the full range of scientific disciplines. Achieving this goal is dependent on success in a number of more specific objectives including intertwined objectives are:

- Success of junior faculty in establishing excellent research programs -- requires sufficient space and facilities, a pool of high-quality graduate students, reasonable teaching loads, and effective mentoring.
- Continued recruitment of excellent faculty -- requires sufficient space and facilities, competitive start-up packages, reasonable teaching loads and strong graduate programs.
- Recruitment and retention of top quality graduate students -- requires strong research programs, sufficient faculty to form effective graduate groups, and a diversity of graduate courses.
- Successful implementation of a broad range of innovative undergraduate programs in science and mathematics that attracts and graduates excellent students – requires sufficient faculty to teach a breadth of subject matter, reasonable class sizes, an adequate number of qualified teaching assistants, and access to undergraduate research opportunities.
- Continued commitment to diversity among faculty and staff to opening doors to higher education for all students, including those that traditionally have not had opportunities in science and math careers.

SPECIAL OPPORTUNITIES AND CHALLENGES

A new university faces many challenges, but also has numerous advantages compared to established universities. The ability of the School of Natural Sciences to leverage opportunities is essential for our success in rapidly building world-class research and academic programs. These opportunities include:

- ***Lack of disciplinary barriers:*** At established campuses, the departmental organization imposes serious barriers to developing multidisciplinary research and academic programs. These barriers are evident in the hiring and promotion of faculty who do not fit into traditional academic categories and in space commitments for inter-disciplinary projects. These barriers limit development of programs that link multiple disciplines to address complex problems. The absence of barriers at UC Merced allows facilitates cross-school graduate groups and multidisciplinary research programs.

- ***Long-term sustained faculty growth:*** The small number of faculty spread across many disciplines in the School of Natural Sciences is one of our most conspicuous

opportunities and challenges as a new program. Even with modest growth projections, workload and unique opportunities will continue to bring 6-8 new faculty lines to the School each year, offering ongoing opportunities to build new research programs. This capability is much more constrained in existing campuses, where faculty lines are usually distributed into narrow discipline-based departments and are not available for building strategically in new research areas.

- ***New research facilities:*** The Science and Engineering Building at UC Merced is home to science and engineering faculty in all disciplines. The co-location of science and engineering faculty and students in one building offers multiple opportunities for synergies and collaborations. The inter-disciplinary research efforts that are underway would be strengthened by improvements in the amount and configuration of the laboratory space available to support the mix of faculty research programs that the campus is developing.

- ***Diverse faculty and student body:*** There continues to be disparity between the diversity of university faculty, particularly in the sciences and engineering, and the demographics of the state and the country. This mismatch is implicated as one cause of the decline in science and engineering enrollments which is predicted to be a significant problem in US economic competitiveness. (see for example, *The Quiet Crisis: Falling Short in Producing American Scientific and Technical Talent* (www.bestworkforce.org)). UC Merced and the School of Natural Sciences are successful in attracting a highly diverse student body. Our ability as a research university to continue to recruit and retain such a student body would be widely recognized; this capability will position the campus to be competitive in attracting the top students from historically underrepresented groups who are rapidly growing fraction of the college-bound population. Key to this success will be continued efforts to develop a highly diverse faculty.

- ***A small public research university:*** Although the small size of UC Merced creates many challenges, it should be noted that a major problem at most of the existing UC campuses is the very large size of the faculty and student body. This large size makes significant changes to existing programs nearly impossible and creates complex bureaucracies that stifle new initiatives. For many years, UC Merced and the School of Natural Sciences will have the opportunity to combine the resources of a public research university with the flexibility of a small private university. UC Merced can provide excellent opportunities for faculty and students who value this potential to start new programs. Moreover, this potential is recognized by a number of private foundations and federal agencies who see the campus as an ideal test-bed for new models of research and academic programs.

The challenges for the School and campus include:

- ***Insufficient research space and resources:*** Development and expansion of research programs, recruitment of top quality faculty, and academic success is constrained by research space and resources. This is particularly problematic in the start-up phase of

the School of Natural Sciences (and for the campus as a whole), and will be particularly severe in AY 2008-2012), precluding recruitment of sufficient faculty to keep pace with projected student enrollments for the School and the campus. Limitations in state-funded space to create the research environment (i.e., shared facilities and infrastructure) essential for stellar research programs mandates that the administration and the faculty develop creative solutions to leverage opportunities to create research cultures that promote outstanding collaborative science.

- ***Low ratio of senior to junior faculty***: Senior faculty members are essential to provide leadership in research, shared governance and mentoring of tenure track faculty. The low numbers of senior faculty during early stages of campus developing are being addressed by faculty and administration by more senior recruitments. The administration and the faculty are working together to recognize and proactively address these issues so that the opportunities presented by the newest campus of the UC system can be realized.

D. SUMMARY OF FIVE-YEAR PROGRAMMATIC GROWTH PLAN

The faculty of the School of Natural Sciences is creating innovative, cross-cutting, multi/inter-disciplinary research and educational programs, and innovative undergraduate curricula. The current status of research themes, graduate groups, and undergraduate programs is summarized in Table D1.

Table D1: Research Areas, Graduate and Undergraduate Programs

Strategic Research Area	Graduate Group	Undergraduate Program
Applied Mathematical Sciences	AM	Applied Mathematical Sciences
Evolution and Environmental Sciences	ES, QSB	Earth Systems Science, Biological Sciences
Health and Environment	ES, QSB	Earth Systems Science, Biological Sciences
Biomedical Sciences	QSB	Biological Sciences
Biological Chemistry and Physics	CP, QSB	Biological Sciences, Chemical Sciences, Physics
Atomic, Molecular, and Optical Physics	CP	Physics
Condensed Matter Physics & Chemistry	CP	Chemical Sciences, Physics

QSB - Quantitative and Systems Biology; CP - Chemistry and Physics, ES - Environmental Systems; AM - Applied Mathematics

E. PROGRAMMATIC RESEARCH AREAS AND TEACHING

It is increasingly recognized that discoveries and solutions to complex problems will occur at the interface of disciplines in science, engineering, social sciences and the humanities. Research themes that cross disciplines and forge novel linkages will have the most impact in finding solutions to complex problems such as improving the health of the environment and human well being, developing new materials, and making discoveries about fundamental processes in our universe. Strategic planning groups included Applied Mathematics, Biomedical/biological sciences, Chemistry, Environmental Sciences, Integrative and Evolutionary Biology, and Environmental Health Sciences and Physics.

1. APPLIED MATHEMATICAL SCIENCES

Faculty providing input to the this portion of the School Strategic Plan included Francois Blanchette, Boaz Ilan, Arnold Kim, Michael Sprague, Mayya Tokman.

Overview - Mathematics is a subject of great depth and beauty. Mathematics is also crucial for developing new theories in natural sciences, engineering and social sciences. The application of mathematics to other disciplines is a particularly rich area for research and education.

Applied mathematical science involves the use of analytical and computational mathematics to solve real-world problems. Its core is comprised of modeling, analysis and scientific computing. Using these tools, applied mathematical scientists study a broad spectrum of problems across a number of disciplines. In fact, applied mathematicians are connected more closely through their shared approach and attitude toward interdisciplinary research rather than a shared interest in any particular set of problems. An explicit goal of applied mathematical sciences is to contribute significantly to other disciplines and foster interdisciplinary and multidisciplinary research and education. The absence of disciplinary barriers at UC Merced is an ideal environment for multidisciplinary research and education. Hence, UC Merced has an excellent opportunity to develop top-notch academic programs in applied mathematical science. Because applied mathematical scientists contribute to other disciplines through their research, the development of applied mathematical sciences contributes to the growth of other programs.

Research - Applied mathematicians are inherently interdisciplinary. They must be well trained in fundamentals of mathematics to model, analyze and compute solutions to real-world problems. Applied mathematics research is usually assessed through two criteria: (1) sophistication of the mathematics used and (2) novelty and importance of the application. A strong group of applied mathematicians can be a great asset to any number of scientific and engineering programs within the university where they can provide the theoretical/quantitative support or foundation.

We do not seek to build a program comprised of a specific set of sub-fields. Instead, we seek to build a strong program comprised of world-class researchers, who contribute to

the applied mathematical sciences program and a number of different programs at UC Merced. Hence, the over-arching theme encompassing the research of the founding faculty is mathematics applied to real-world phenomena. This brings applied mathematicians together with the intent to contribute to other programs of study on campus. There are many opportunities at UC Merced for interdisciplinary research under this research theme. There are several large funding sources for applied mathematics research and education. Federal sources provide funding for both education and research programs. The current faculty members (6 + 3 in progress) are well are on their way toward developing a strong research program including undergraduates, graduate students and postdoctoral researchers.

Although the founding faculty has deep expertise in the applied mathematical sciences and breadth across several disciplines, new faculty hires are needed to deepen the base of expertise and broaden the range of application areas. For example, we are seeking new hires in stochastic modeling, mathematical biology, mathematical economics and atmospheric science, among others, to forge new links with economics and management, environmental systems, the Sierra Nevada Research Institute and the developing Systems Biology Institute and Energy Institute.

Teaching - All applied mathematics faculty contribute to delivering undergraduate and graduate curricula. New faculty hires are needed to deliver and support the curricula as the demand due to our growing student population increases (see academic programs section). At present, 23 students have declared Applied Mathematical Sciences as their major. In addition, Applied Mathematics courses account for a total 238 credit hours in 2007-2008. This includes approximately 60% of *all* UC Merced undergraduates, who are taking lower division mathematics courses. This large number of enrollments requires a sufficient number of faculty members to maintain a low student-to-faculty ratio in these classes. This situation is not limited to lower division courses alone. Upper division courses and graduate courses serve a number of other programs such as physics and engineering. We may be able to depend on faculty from other programs to help contribute to the teaching needs, but mathematics courses are absolutely critical to nearly all of the majors at UC Merced. Furthermore, the effective teaching of mathematics courses is best achieved by individuals, who have both rigorous training in the subject and use the methods being taught in their research. Being an active user is an invaluable asset in conveying the "why one should care" when discussing seemingly abstract mathematical concepts. Therefore, the delivery of the mathematics curricula requires dedicated faculty support.

Cross-disciplinary and Cross-School Linkages - The applied mathematics faculty is dedicated to interdisciplinary applied mathematical science, which seeks to build linkages across disciplines and schools. The founding faculty is already involved with other programs on campus. Graduate Studies in Applied Mathematics is highly interdisciplinary; the Core faculty is comprised of 5.5 Natural Sciences faculty, and its Affiliate faculty is comprised of four members from School of Engineering, two from Social Sciences Humanities and Arts faculty, and two from Natural Sciences. We seek to strengthen current linkages and to form new ties with other programs. In particular, we are interested in forming new linkages with colleagues in electrical engineering,

mechanical engineering, computer science and engineering, life sciences, environmental systems, economics and management.

Historically, applied mathematicians have worked closely with researchers in physical sciences and engineering. Physical sciences and engineering have long adopted mathematical analysis and methods in their topics. At UC Merced we anticipate strong ties with physical sciences and engineering. Moreover, we anticipate more collaboration with researchers and students in the Energy Institute as it develops.

In addition to physical sciences and engineering, we anticipate that applied mathematical sciences will have an important role in the life-sciences program at UC Merced. Both the undergraduate major in Biological Sciences and the graduate program in Quantitative Systems Biology involve more quantitative reasoning and mathematical modeling than traditional biology programs. The applied mathematics faculty is working in collaboration with biology faculty to ensure the success of these objectives. In addition, we anticipate collaboration and look forward to involvement in the evolving Systems Biology Institute.

The area of collaboration between applied mathematics and environmental systems is rich with opportunities. In fact, several collaborations between applied math faculty and environmental systems have already begun. There are several top-notch applied mathematicians working in areas such as atmospheric science, geophysical fluid dynamics, porous media, geophysical remote sensing, and bio-statistics of ecological and environmental health. Hence, we will continue to foster collaborations and seek opportunities with future hires, who could participate actively in the Environmental Systems program and the Sierra Nevada Research Institute (SNRI). Particularly, we are supportive of a hire of an applied mathematician in the area of Atmospheric Science, who could interface between Applied Mathematical Sciences and SNRI.

There also exists potential to form collaborations with social science programs at UC Merced, most notably econometrics, management and public policy. These collaborations represent relatively new areas for applied mathematic science research. Nonetheless, the "open door" organizational structure at UC Merced facilitates exploring connections among colleagues that may become substantial collaborations in the future.

Resources – Faculty, lecturers/visiting assistant professors, space/facilities and computational administrative support are needed for academic success.

> ***Faculty:*** At a bare minimum, 20 FTEs will be needed for the applied mathematical sciences program including the undergraduate and graduate academic programs. We propose a growth rate of hiring two applied mathematics faculty per year until that number is reached. Below is a table that shows this proposed growth beyond our current faculty and assuming that our current searches are successful.

Table E1: Applied Math FTEs

	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
FTE	**6***	**9****	**11**	**13**	**15**	**17**

* Included is Prof. Kevin Mitchell, who is a Core Member of Graduate Studies in Applied Mathematics

** Included is current search for a Lecturer with Potential for Security of Employment (LPSOE), an Assistant Professor, and an Associate or Full Professor

Lecturers and Visiting Assistant Professors: Currently, and in future years, the number of mathematics courses, in particular, the number of undergraduate service courses offered to students not majoring in applied mathematics, exceeds the teaching capacity of our FTEs. To fill this gap, we currently rely on 8 full-time Lecturers to teach lower-division courses. Lecturers are highly qualified teachers who take on a heavy teaching load and thus help ensure that our students are provided with the best possible education. We project that at least two Lecturers will be needed for the next five years to allow us to offer all of the required service courses.

In keeping with the research mission of the university, we propose the establishment of a Visiting Assistant Professor (VAP) position. The hired individual would help us provide high quality education, while contributing to our research program. The VAP position will also provide the means for other applied mathematics programs to recognize UC Merced as a place to nurture young applied mathematicians. Moreover, it provides UC Merced a means to attach its name onto young researchers going out to the academic job market.

Space and Facilities: Applied mathematicians do theoretical and computational research. Hence, new applied mathematics hires typically only need office space for their group. However, it should be noted that for applied mathematicians office space also doubles as "lab space": the office is where applied mathematicians spend nearly 100% of their research time. It is also where office hours are conducted. Therefore, it is essential for Applied Mathematical Sciences to have offices that are conducive for doing research, computing, and office hours. This includes office space for summer undergraduates, graduate students and postdoctoral fellows. Currently, our nine graduate students are occupying temporarily lab-designated space that is available through Fall 2007. Over the next five years, we plan to admit 20-30 graduate students, of which approximately 15 will be Teaching Assistants. Both Teaching Assistants and Graduate Research Students in Applied Mathematics will need access to a secure office or common space that is conducive for doing their research and holding office hours. The ability to offer adequate space is extremely important when recruiting both graduate students and faculty.

Because high-performance computing is a rich area for applied mathematical sciences research, planning is required for space, hardware-acquisition, and administration. Our faculty together with Professor Lara Kueppers has purchased a 66-node/264-processor parallel-computer cluster. This cluster will become an integral part of our graduate course MATH 233 "Scientific Computing." Sufficient space has been allocated for the cluster in the Science & Engineering building.

Undergraduate and graduate studies in applied mathematics also require open access to a computer lab for course work and research. Currently, our students have open access to the instructional computer lab in the Science and Engineering building. In the future, an open access workstation-based computer lab for graduate studies would best accommodate the computing needs of our graduate students, other students enrolled in our computational courses, and potentially other courses as well.

Computational Administrative Support: While faculty start-up funds have been used for building a modern parallel-computation cluster, long-term financial support for its administration is required. Having an Information Technology person on-site to support the computational administration of the Applied Mathematics cluster, and potentially others, will ensure an optimal use of our resources and will benefit both our educational and research missions. The School of Natural Sciences has hired a full-time system administrator to set up databases and infrastructure for all academic programs. It is expected that faculty research grants and start-up funds will be used to help pay for around 10% of the system administrator's time for administration of the applied mathematics cluster.

2. BIOMEDICAL/BIOLOGICAL SCIENCES

This portion of the School of Natural Sciences Strategic Plan covers the life sciences related to Biochemistry, Molecular and Cell Biology, and Biomedicine and was developed by the following faculty: Miriam Barlow, Jinah Choi, Michael Cleary, Michael Colvin, Marcos Garcia-Ojeda, Andy LiWang, Patti LiWang, Jennifer Manilay, Monica Medina, Matt Meyer, David Ojcius, Rudy Ortiz.

Overview - Biology is on the brink of a fundamental transformation from a primarily "descriptive" study of individual components of biological systems, to a science based on creating a comprehensive and ultimately predictive understanding of biological systems. This so-called "systems" approach to biology is already dramatically changing how biological research is done, leading to new connections with the physical, mathematical, and computational sciences. This new biology offers the promise of a much more complete understanding of living systems and ultimately new treatments for complex diseases such as asthma, diabetes, and cancer.

This new biology is built on several themes: 1) acquisition of comprehensive, quantitative data sets on living systems, such as whole genome sequences, protein expression rates, and complete maps of metabolic and regulatory pathways, 2)

development of mathematical models for integrating and evaluating such data, with the goal of building models that can predict novel or unexpected properties of biological systems and 3) recognition of the central role of evolution in studying and understanding organisms, pathways, genes, and disease. Finally, this "new biology" requires very close partnerships with the physical and mathematical sciences. This need for a highly multidisciplinary approach constitutes an important barrier to progress in quantitative systems biology; many universities have highly compartmentalized research programs and few undergraduate or graduate programs provide truly multidisciplinary training.

UC Merced has an excellent opportunity to develop biological and biomedical sciences research and academic programs at the forefront of this field. The small size and lack of disciplinary barriers at UC Merced have already been fostering a number of multidisciplinary research programs (see below). Furthermore, this new biology will be greatly enabled by many of the other initial academic programs and research efforts at UC Merced, such as the applied mathematics, earth systems science and bioengineering programs, the Biomedical Sciences Research Institute, the Sierra Nevada Research Institute, and the Center for Computational Biology.

Research - The biological and biomedical sciences at UC Merced encompass several research themes described below. Linking all of these themes is the strategy of using methods that integrate large data sets, such as genomic or proteomic data, or produce quantitative data at the single cell or even single molecule level. Another linking theme is the goal of quantitative characterization of biological processes with ultimate aim of predictive models.

1. Predictive Understanding of Cellular Interactions and Cell Fate Decisions

An ultimate goal of cell biology is to achieve a complete understanding of the biochemical pathways underlying cellular decisions, including developmental choices and response to outside stimuli. Research in cell biology at UC Merced spans a wide range of specific research topics, from the development of immune system cells, to the evolution of bacterial antibiotic resistance to symbiosis in marine systems. New research questions are being made accessible by technologies that allow comprehensive genomic, proteomic, and metabolomic characterization, in some cases down to the single cell level. A combination of experimental investigation using these new tools and computational modeling of the interacting pathways will provide data to determine the mechanisms of cellular responses to exogenous factors such as infection, oxidative stress, growth factors, as well as internal factors such as epigenetic state or cell age. This knowledge will allow the development of new therapies to treat diseases, including the potential of chemoprotective agents against inflammation and aging.

The understanding of cell signaling and cell fate decisions also has important biomedical applications because the ontogeny and maintenance of multicellular life depends on exquisitely complex developmental process in which undifferentiated stem cells give rise to specialized cell types. Understanding this process promises to provide new treatments for many complex disease states related to developmental

failures. Moreover, because of their ability to generate new specialized cells, stem cells hold the potential to treat a vast array of health problems, including spinal cord injuries, Parkinson's disease, diabetes, and many others. Elucidating the complex mechanisms by which extrinsic and intrinsic signals determine the proliferation or differentiation of stem cells is inherently a systems-level challenge, and will require new technologies for collecting data on cell populations and individual cells, and new methods to build models of cell decision processes.

2. Complex Diseases

Complex diseases are defined as diseases that are influenced by the actions of multiple genes, their interactions with each other and with the environment. Examples include metabolic disease, cardiovascular disease, Alzheimer's disease, Crohn's disease, persistent infection, cancer, diabetes and asthma. These diseases can only be fully understood in multidisciplinary approaches that include: identifying communities with increased risk due to their genetic backgrounds, determining the environmental factors that increase disease risk and understanding the cellular and molecular mechanisms underlying the increased susceptibility that can offer possible treatments.

The Central Valley has a high rate of such diseases and provides a microcosm of the health challenges of the entire state and nation. A strong research program on complex disease would foster collaborations with healthcare providers in the Central Valley. Conversely, the local community would provide unique cohorts for studying strategies for treating or reducing the incidence of these diseases. This program would have strong synergies with emerging UCM Merced programs in environmental science, psychology, sociology, and economics and would have many links to future health professional programs.

3. Biochemistry and Chemical Biology

Central to biology's transition from a descriptive to predictive science has been the growing understanding of biological processes in terms of the underlying chemical mechanisms. This transformation has been made possible through cross-fertilization with the chemical sciences. Advances in determining the structural and functional properties of macromolecules have largely come from the application of physical techniques such as spectroscopy and crystallography to biological systems. Furthermore, many of the most exciting recent advances in the biological sciences, including the ability to image and analyze processes occurring in single cells and/or single macromolecules or assemblies, have become possible only through the development of new ultra-sensitive analytical techniques. Therefore the development of a vibrant, cutting-edge research program in biochemistry must draw on individuals trained in the classic chemical disciplines of organic, physical, and analytical chemistry as well as biochemistry, a fundamentally interdisciplinary field concerned with the structure, function, regulation, reaction mechanisms, and energetics of biologically relevant molecules.

Research at the interface between chemistry and biology at UC Merced falls into two categories: Biochemistry and Chemical Biology. Biochemists seek to understand the chemical structures and reactions underlying biological processes. Chemical biologists seek to harness the complex synthetic machinery of the cell to accomplish chemistry that is impossible to achieve in vitro. While chemical biology is a new and developing field, it holds promise as a means of developing new pharmaceuticals, novel biological technologies from biosensors, new molecular biology techniques, and means of dissecting cell signaling pathways. Chemical biology is a field that is truly cross-disciplinary between biology and chemistry, and offers one of the best avenues by which UC Merced can craft truly interdisciplinary research.

4. Cross-disciplinary and cross-school linkages Multidisciplinary research is a founding principle of UC Merced and the biological/biomedical sciences offer many opportunities for cross-disciplinary and cross-school collaborations. The fields of chemistry and biology have had a long and fruitful partnership, leading to a detailed understanding of many of the chemical processes underlying life. Recently, there has started to be a reciprocal flow of information from biology to chemistry with biology providing "metaphors" for new chemical strategies, such as self-replicating chemicals. Ultimately, biological examples could provide more detailed designs and design principles for practical chemical applications such as catalysts or detectors. Likewise, chemistry informs the biological sciences by providing accurate chemical means of monitoring biological systems. Chemical biology could also have strong synergies with the bioengineering program in the School of Engineering. Similarly, large-scale, inexpensive DNA sequencing have placed evolutionary approaches at the center of modern biological research. The genomes of hundreds of eukaryotic and prokaryotic organisms are being sequenced at a very fast pace and experimental and analytical evolutionary methods are being used to asses the functions and potential of genes and genomes. Those technological advances have caused evolutionary biology to advance from studies that are merely interesting to those that have important applications such as engineering proteins, developing improved strategies for treating diseases, and identifying the underlying causes of genetic disorders. The UC Merced faculty is using evolutionary biology to understand a range of problems ranging from the origins of disease to the emergence of antibiotic-resistant microbes. This research program also has the potential for strong linkages to programs in Integrative Biology and Earth Systems Science, and Environmental Engineering.

Nearly all aspects of biomedical research have repercussions in the humanities and social sciences: ethics, economics, psychology, philosophy, and cultural studies. These components are strongly emphasized in the Human Biology degree, but there are good prospects for more broad synergies between SSHA and the biomedical sciences.

There are large funding sources for biomedical research. Federal agencies such as the National Institutes of Health provide approximately $30 billion per year and research funding is also available from many foundations and private companies. Nevertheless, these funding sources are all highly competitive and success requires a strong research

program. The previously described research themes, cell signaling, cell fate decisions, and complex diseases, are well aligned with the newest academic and research priorities of the funding agencies and foundations. Most major research universities are also creating research programs in quantitative and systems biology, but their natural advantages in having already established research programs and facilities may be somewhat offset by having larger institutional barriers to building multidisciplinary research efforts.

Teaching – The faculty in Life Science**s** contribute to undergraduate programs in biological sciences and the QSB graduate program.

Undergraduate - Biological Sciences: The Biological Sciences is the largest undergraduate major at UC Merced. By AY07-08, there were 480 declared Biological Sciences majors. Biological Sciences is currently organized into three emphasis tracks: Molecular and Cell Biology, Human Biology and Integrative Biology. For AY08-09, we plan to add three additional emphasis: Biochemistry (study of the molecular basis for life), Cell & Developmental Biology (study of the fundamental components of multicellular life), and Microbiology & Immunology (study of the diversity, structure, evolution, method of transmission, replication, epidemiology, and mechanism of pathogenesis of microorganisms and their interplay with the host immune system.). Biochemistry may develop rapidly into a separate major. Based on enrollments at other universities and UC campuses, we expect high enrollments all three of areas. Since these new emphasis and potential majors are almost entirely built from courses already offered for the original Biological Sciences major, they require minimal new resources.

Courses developed for the life sciences majors and graduate groups are also relevant to a number of majors outside biology. A number of the bioscience core courses, such as Molecular Biology and Biochemistry will be necessary for other majors such as the Chemical Biology emphasis area in the Chemical Sciences major and the Bioengineering degree offered by the School of Engineering. Earth System Science majors with an ecosystems and conservation biology emphasis will take lower division and core biology classes, and upper division IB and ESS courses in this emphasis area will often be cross-listed. Additionally, the biological sciences program offers a number of lower division general educations courses in biology and health that will be of interest to students from any major or school.

***Graduate Emphases*:** The faculty associated with the Biological/Biomedical Sciences participate primarily in two graduate emphases: Quantitative and Systems Biology (QSB) and Bioengineering and Small-scale Technologies (BEST). These are both rapidly growing graduate groups that have been successful in attracting academically strong students. The research priorities for these groups are described in their separate research plans.

Most graduate programs in the biomedical sciences are very discipline-oriented, e.g. biochemistry, cell biology, etc. This restricts the type of students entering the program and limits the training opportunities for students in the program. In contrast, the Quantitative and Systems Biology graduate group at UC Merced brings together faculty from a wide range of disciplines with broad expertise to investigate the complex systems and networks responsible for the biological functions of cells, tissues, organisms, populations, and ecosystems. The current QSB faculty is drawn from both the Schools of Natural Sciences (17 members) and Engineering (5 members) covering disciplines including molecular and cell biology, evolutionary biology, genomics, proteomics, signal transduction, experimental technologies, and computational biology. QSB students are involved in a wide range of biomedical sciences research projects, and this will continue to grow as new faculty join the graduate group. The doctoral program emphasizes quantitative analyses at multiple levels of biological systems, development and use of novel model systems, and computational and analytical approaches for the study of biological processes.

Resources – Resource needs to build excellence in this program include faculty, core facilities and experimental research laboratories.

Faculty: The first 12 faculty in biomedical/biological sciences initiated planning and development of the research programs described above; additional faculty are needed to broaden the base of expertise into new areas not currently covered and to deepen the base in selected research areas. The following table lists specific high priority biological/biomedical sciences hires for the next five years.

Table E2: Summary of Proposed Biomedical Sciences Hires for the Next Five Years

	Cell Fate	Complex Diseases	Biochemistry/ Chemical Biology
Current Faculty[a]	6	7	4
UCM collabs.	BioEngineering	BioEngineering	Chem, BioEng, ESS
Institutes	BMRI[c]	BMRI	WCI, BMRI, SNRI
2007-2008	Developmental Biology[b]	Complex Disease Develop. Biology[b]	--
2008-2009	Neurobiology	Infectious diseases Physiology	Molecular Biology
2009-2010	Cell Biology[b] Microbiology[b]	Cell Biology[b] Microbiology[b]	Biochemistry Chemical Biology
2010-2011	Immunology[b] Cancer Biology[b] Computational Biology[b]	Immunology[b] Cancer Biology[b] Mol. Bio/Genetics[b]	Computational Biology[b] Mol. Bio./Genetics[b]

2011-2012	Systems Biology[b] Neurobiology	Systems Biology[b] Epidemiology	Chemical Biology
2012-2013	Cell Biology[b] Develop. Biology[b]	Cell Biology[b] Disease Biology	Biochemistry

[a] Current Faculty includes individual faculty counted in more than one category; and the numbers are based on only the 12 faculty included in the biological/biomedical sciences planning group. For anticipated hires the "[b]" indicates that position appears in more than one research theme. [c] BMRI: Biomedical Research Institute

Core Facilities: The research programs described above will require continued development of research facilities. Good progress has been made over the past year in developing life sciences research resources; however, the facilities require continued development, and several facilities are needed that have yet to be developed. The vivarium opened for animals in Summer 2007 and groups of faculty several types of have purchased shared instrumentation that are intended to be part of the cores, including the Genomic Center of Excellence and Quantitative Cytometry Core Facility. Formal procedures for recommendation of these facilities as official University research cores are under review. As current core equipment has been purchased and is now maintained by current faculty start-up funds, new faculty start-up packages could include funds for salary support for core managers and maintenance agreements. University financial support for the salary of core managers, and improved administration, such as recharge set up for UC and non-UC affiliates is key for the success of any research core. The full establishment of core facilities is crucial for the success of research progress, recruitment and retention of faculty and should be a high priority for the School and the Office of Research, under the direction of the Vice Chancellor for Research.

Table E3: Facilities Required for Biological/Biomedical Sciences Research

Core	Cell Fate	Complex Diseases	Biochemistry/ Chemical Biology
Genomics	√√	√	
Quantitative Cytology and Imaging	√	√	√
Proteomics (Mass Spec.)	√√	√	√
Proteomics (Microarray)	√	√√	√
Animal (Vivarium)	√	√	
Animal (Transgenic)	√√	√	
Computational support	√√	√	√

Facilities shown in bold are under development. Two checkmarks, very strong need; single check mark, some need.

Laboratories: Space for biomedical/biological laboratory research is a challenge. Core facilities required dedicated shared space that should not come at the expense of laboratory space of individual faculty. Each of the new faculty will require a bare minimum per CPEC average of ~700 square ft (assuming about 50% senior faculty). The reality is that it will be necessary to offer, on average, twice that amount to be competitive and to be able to recruit stellar faculty at all levels. Faculty recruitment and programmatic success requires resources in the form of start-up packages, laboratory and office space, and institutional investment for equipment and staff. Finally, each of the cores described above will require at least a 0.5 time staff member. Typical start-up packages in the life sciences are in the range of $500K - $1M, even for junior faculty.

Overall, the proposed life science hiring plan will require 10,000-15,000 square feet of new office and laboratory space over the next 5 years. The seven proposed core facilities will require approximately 4,000 sq. ft. of additional laboratory space. There are several options for acquiring this further space. These include acceleration of the timetable for SE II, use of space at Castle, and the use of temporary buildings on campus. The exact mix of these alternatives involves decisions by the UC Merced administration, and is therefore beyond the scope this strategic plan.

3. CHEMISTRY

Natural Science faculty providing input to this portion of the School's Strategic plan included Anne Kelley, David Kelley, Matt Meyer, Meng-Lin Tsao, and Tao Ye.

Overview - Chemistry is often known as "the central science" because of the key position it occupies in modern science and engineering. Most phenomena in the biological and earth sciences can be described in terms of the chemical and physical behavior of atoms and molecules, and chemical principles also underlie much progress in medicine and engineering. In addition, chemical systems are fascinating and often beautiful in their own right. George Whitesides, in his 2007 Priestley Medal address, states that "Chemistry is now the natural home of many of the most engaging problems in fundamental science and of the problems in applied science about which society cares the most." Herein we give a few examples of how chemistry has had a profound impact on other fields of science and technology. Just several years after the inception of UC Irvine, Sherwood Rowland and Mario Molina (Nobel Prize, 1995) used physical chemistry approaches to unravel the chemical mechanisms of ozone depletion. This discovery, which helped to pull us back from the brink of an environmental catastrophe, played no small part in catapulting Irvine to research powerhouse status. Chemistry plays an essential role in the development of nanoscience and technology due to chemists' expertise in understanding and controlling matter at the atomic and molecular scale. It is no coincidence that almost all the exciting nanomaterials, from quantum dots to carbon nanotubes to semiconductor nanowires, have been pioneered by chemists. The intimate connections between life sciences and chemistry result from the prowess of chemists at manipulating and measuring molecules, the building blocks of life. A recent example is

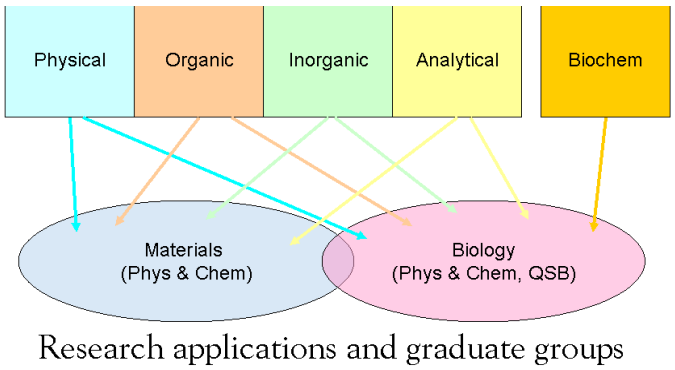
Bertozzi's chemical manipulation of oligosaccharides in biological systems, which opens up new avenues to understanding and regulating complex cell surfaces. Analytical chemists such as John Fenn (Nobel Prize, 2002), were responsible for developing mass spectrometric analyses of biological macromolecules, a cornerstone in proteomics. The advancement of single molecule spectroscopy by Sunney Xie, a molecular spectroscopist by training, has stirred much excitement in biophysics as it affords access to unprecedented details of life processes at the single molecule level.

Because of the indispensible role of chemistry as a core discipline in science, one would be hard-pressed to think of any highly respected comprehensive research university that does not have a strong chemistry program that grants both bachelor's and Ph.D. degrees. Chemists may be classified according to their subdiscipline and/or by the nature of the problems on which they work. The four traditional subdisciplines of chemistry are organic, inorganic, physical, and analytical:

- Organic chemistry is the chemistry of carbon-based compounds. Organic chemists are concerned with synthesizing useful chemical compounds, developing new reactions to better achieve challenging syntheses, and determining the physical principles that are responsible for chemical behavior. Organic chemists are actively engaged in the synthesis of new materials for energy harvesting and storage, the manipulation and understanding of biological processes, and the development of efficient and ecologically benign catalysts and reactions.
- Inorganic chemistry is the chemistry of chemical compounds that are not primarily carbon-based. Inorganic chemists determine the structures of inorganic molecules, study their reactions, and develop procedures for their synthesis. The fundamental principles are applied to problems in environmental chemistry, bioinorganic chemistry, and solid-state materials chemistry.
- Physical chemistry applies the fundamental laws of physics to understand the properties of chemical compounds and the basis of chemical reactivity. Physical chemists study the energetics of molecular and macroscopic processes, the dynamics of chemical reactions, quantum chemistry, and interactions of molecules with light (spectroscopy, photochemistry, and photophysics) using techniques that are experimental, theoretical, and/or computational.
- Analytical chemistry concerns the chemical analysis of substances. Analytical chemists develop instrumentation and methodologies to determine what chemical compounds are present in a sample and/or how much is present. Modern analytical chemistry is particularly concerned with very small systems, down to the single-molecule level, as well as applications to biology (proteomics, genomics) and environmental monitoring.

At UC Merced, we have the unique opportunity to build a modern chemistry program that combines disciplinary rigor and interdisciplinary reach. Chemical sciences require systematic training. All four subdisciplines should be represented to some extent in order to have an externally recognized chemistry program that incorporates all of the course work required for an American Chemical Society-accreditable major, although the four areas need not be equally weighted. Reflecting the expansive nature of chemical research and the interdisciplinary emphasis at UC Merced, the faculty has decided to focus on recruiting chemists working on problems in two broadly defined areas, biology and materials (Figure E1). The representation of traditional disciplines should not be viewed as an impediment to interdisciplinary research as we intend to recruit chemists who can bring novel chemical solutions and perspectives to materials and biology, just as the aforementioned prominent chemists have done.

Figure E1. Chemistry: Disciplinary and Inter-Disciplinary Synergies



Biochemistry is a discipline closely allied with both chemistry and biology but distinct from both. Some universities have a combined department of chemistry and biochemistry while in others biochemistry is a separate department or is associated with another department. For the purposes of this year's planning exercise, biochemistry has been associated with molecular and cell biology rather than with chemistry. Two searches are currently underway for faculty working in the area of materials chemistry, which may belong to any of the four sub-disciplines.

Research - Materials Chemistry is defined by the American Chemical Society journal in this field, *Chemistry of Materials*, as "Solid-state chemistry, both inorganic and organic, and polymer chemistry, especially as directed to the development of materials with novel and/or useful optical, electrical, magnetic, catalytic, and mechanical properties." Materials chemists may be focused predominantly on synthesis (organic or inorganic chemistry) or characterization (analytical or physical chemistry). These areas offer the possibility of many different types of collaborations, both within UC Merced between Natural Sciences and Engineering and at other nearby institutions including Hewlett-Packard, LLNL, and possibly NASA/Ames in the near future. This type of research is very well funded and we expect it will continue to be well funded in the foreseeable future. The Bush administration's American Competitiveness Initiative (ACI) commits to doubling, over 10 years, funding for research at key federal agencies that support physical science and engineering: NSF, DOE's Office of Science, and NIST. Part of the ACI is the Advanced Energy Initiative, which provides for a 22% increase in funding for clean-energy research at the DOE. Materials chemistry will be key to advances in new energy sources. Potential research areas for future Materials Chemistry hires include:

- *Organic Electronics*: Design, synthesis, and physical properties of materials for organic light-emitting diodes (OLEDs), thin film transistors, and liquid crystal displays
- *Solar Photovoltaics*: Design, synthesis, and physical properties of materials for organic, inorganic, or hybrid solid-state devices and/or electrochemical cells
- *Photonic Materials*: Design, fabrication, and properties of materials for frequency conversion of lasers, optical limiting materials, contrast agents in nonlinear optical imaging technologies, electro-optic modulation, and photonic bandgap crystals
- *Batteries:* New materials to enable lightweight, high capacity, multiply rechargeable battery technology
- *Heterogeneous Catalysts*: Solid-state materials that catalyze a variety of desired chemical reactions
- *Structural Materials:* Design, synthesis, and characterization of new materials having desirable properties (light weight, high strength, environmentally benign, biocompatible, *etc*.)
- *"Smart" Materials*: Synthesis, characterization, and engineering of materials that can respond adaptively and autonomously to changes in their condition or the environment
- *Plasmonics*: Materials for, and study of, phenomena based on the coupling of light to the plasma oscillations of conduction electrons in small metallic nanostructures, and their coupling to other materials

The ACS Division of Biological Chemistry defines this subfield as "using the principals [*sic*] of chemistry to assist in the development of a deeper understanding of biological processes ". Much of the recent dramatic progress in the life sciences has been driven by quantitative approaches and a molecular-level understanding of complex biological systems. Experimental, computational and theoretical methods and techniques from chemistry have played a significant role in these advances. In addition, the flow of knowledge and inspiration runs both ways: challenges posed by specific biological problems are driving the development of new analytical tools, prompting advances in the physical and chemical sciences. Biological chemistry has undergone explosive growth in recent years as experimental and computational tools from the physical sciences have become widely applied to biological problems. Biological chemistry is explicitly interdisciplinary between the physical and life sciences, and there should be extensive opportunities for collaboration across these groups. In addition, at least some of the biological chemistry faculty is expected to have research interests that overlap engineering, particularly Bioengineering. The development of a strong presence in biological chemistry would position our school for center grants and other translational research initiatives. Biologically related chemistry is a large area of chemistry research that is well funded, largely by NIH but also through other agencies. Potential areas for future Biological Chemistry hires include:

- *Nucleic acid replication, damage and repair*
- *Novel modes for drug delivery*

- *Development of ultrasensitive bioanalytical techniques, particularly for single molecule/single assembly measurements and/or high throughput screening*
- *Single molecule studies of molecular motors, DNA/RNA dynamics, transcription factor binding/functioning, viral genome packaging, ion channel transport etc.*
- *Organized chemical systems that imitate the functioning of biological cells*
- *DNA and/or other biological macromolecules as scaffolds for fabrication of organized structures*
- *Protein folding*
- *Molecular recognition*
- *Novel uses of combinatorial techniques at the interface of chemistry and biology: aptamers, phage display, novel approaches to screening and combinatorial synthesis*
- *Atomistic modeling of biological systems (channels, membranes, receptors)*
- *Membranes and associated phenomena including fusion, exo/endocytosis, pore formation and functioning, lipid rafts*

Teaching – The Chemistry faculty have broad teaching responsibilities, including graduate students in the Chemistry and Physics Graduate Program and undergraduates majoring in chemical sciences. In addition, the chemistry faculty teaches preparatory lower division courses in chemistry for science and engineering majors, constituting a large service load for the campus.

Undergraduate - Chemical Sciences Major: In AY 2006**,** UC Merced began accepting majors into the B.S. degree program in the Chemical Sciences. All of the programs meet the requirements for approval by the American Chemical Society. Students who complete an approved curriculum may obtain a certified degree, a valuable credential which serves as national-level recognition for successfully completing a rigorous academic chemistry curriculum in an ACS-approved department. ACS accreditation may be sought upon graduation of the first majors and we anticipate accreditation in 2010. The curriculum is designed to meet the needs of students who plan to end their formal education with a bachelor's degree as well as those who wish to go on for an advanced degree. The UC Merced chemistry B.S. graduate will be well prepared to pursue a career in chemistry or an allied field.

Students pursuing a B.S. degree in Chemical Sciences have the opportunity to pursue interdisciplinary areas within a degree program that is still focused on chemistry. Our B.S. degree in Chemical Sciences offers four emphasis tracks: Biological Chemistry, Environmental Chemistry, Materials Chemistry, and "pure" Chemistry. All four tracks share the same lower-division courses and some of the core upper-division courses. While some of the required and elective courses for the Biological, Environmental, and Materials tracks are offered by faculty in other disciplines in the Natural Sciences and Engineering, there are four lower-division and approximately eight upper-division courses that must be taught by the chemistry group. The lower-division courses are each offered every semester in order to meet the needs of not only the chemistry majors but also the other Natural Sciences and Engineering

students for whom these courses are required. The upper-division courses each need to be offered once each year. Therefore, a total of 16 undergraduate chemistry courses must be taught each year, requiring eight faculty FTE. While instructors can cover a few of the lower-division courses, the chemistry faculty feel strongly that instructors should only teach in Chem 1 and Chem 2, leaving a bare minimum of 5.5 tenure-track faculty FTE to cover undergraduate teaching needs alone. In addition, all of our emphasis tracks require at least two units of research, and undergraduate research supervision is highly intensive of faculty time.

Graduate Programs: At present, Ph.D. programs in chemistry are administered under the umbrella "Interim Individual Graduate Program" that was put in place at UCM's inception. A combined "Physics and Chemistry" emphasis area currently involves 14 faculty (five chemistry, six physics, and three engineering) and 12 graduate students (five chemistry and seven physics). Separate courses of study are offered in Physics, Physical Chemistry, and Organic Chemistry. Physics programs normally require more extensive graduate course work than chemistry programs, and we are currently taking advantage of this by having our physical chemistry students take some of the physics graduate courses, particularly quantum mechanics. However, this combined graduate group is certainly not an ideal situation from the standpoint of either graduate student recruiting or graduate education, and we expect that when we apply for stand-alone graduate program status, it will be as separate physics and chemistry Ph.D. programs. Even if we limit our course offerings to a bare minimum of three to four advanced courses in each of the four core subdisciplines, a few of which can overlap, and offer some of these courses only once every two years, eight to ten graduate chemistry courses would have to be offered each year, requiring four to five faculty FTE. This, combined with the undergraduate teaching requirements outlined above, leads to the conclusion that a faculty size of ten to eleven is the minimum required to offer undergraduate and graduate programs in chemistry. This conclusion is in keeping with data from the American Chemical Society showing that the smallest Ph.D.-granting chemistry departments in the U.S. have at least ten full-time faculty. Thus, much of this strategic plan is based on the facts that Merced's current IIGP is an interim program that will soon expire, and we need to be able to propose a graduate program in Chemistry at that time. This will involve broader coverage of the discipline and require at least ten to eleven faculty.

Resources - Development of a stellar academic and research program in chemistry requires faculty, laboratory space for faculty, and shared core facilities.

Faculty: A five year growth plan for faculty recruitment has been developed. As described above, the chemistry group needs to grow to a minimum of ten to eleven faculty by AY 09-10 in order to offer both the undergraduate major and a viable graduate program. The current faculty plus the two currently open positions give us a total of seven; therefore we request three high priority hires, plus one lower priority, for AY 09-10. Thereafter, approximately one new faculty member per year for the next four years will allow us to diversify our research programs and undergraduate and graduate course offerings. At the undergraduate level, we would like to introduce

some more specialized upper-division elective courses as well as versions of organic chemistry and/or physical chemistry geared toward students with biological interests, as are commonly offered at most other research universities. At the graduate level, we would also like to offer more specialized courses and be able to offer all core graduate courses on an annual basis. The new hires should be distributed among the four subdisciplines (organic, inorganic, physical, and analytical) and between the two application areas (biological and materials) as summarized below:

Table E4: Summary of Proposed Chemistry Hires for the Next Five Years

Faculty	Research areas	Subdiscipline
Current	Kelley, A: materials	Physical/analytical
	Kelley, D: materials	Physical
	Ye, T: materials/bio	Physical/analytical
	Meyer, M: bio	Organic
	Tsao, ML: bio	Organic
2007-2008	Materials (2)	Organic or inorganic preferred
2008-2009	Bio or materials	Inorganic or organometallic
	Bio	Analytical
	Bio	Organic
	Bio or materials	Theoretical (physical)
2009-2010	Materials or bio	Theoretical (physical)
2010-2011	Bio or materials	Theoretical (physical)
2011-2012	Materials	Organic
2012-2013	Bio (single molecule)	Physical

Whenever possible, all positions should be searched at open rank. We have no tenured faculty in any of the sub-disciplines except physical, and senior leadership in these areas is much needed. However, recruiting top-notch tenured faculty will be very challenging, particularly in experimental fields that are highly resource-intensive. We feel that the most profitable strategy is to attempt to recruit tenured faculty but accept that many of our new hires will have to be made at the Assistant Professor level.

Facilities and space: Laboratory research space poses a huge challenge. Competitive offers will require allocation of significant amounts of laboratory space. This is particularly true for senior-level candidates. Most new experimental hires will require 500-1500 sq ft. of laboratory space which will generally be some mixture of "wet" (i.e. with sinks and fume hoods) and "dry" space. SE I will likely fill up with the current year's faculty hires. Following this year, further space will be needed. There are several options for acquiring this further space. These include acceleration

of the timetable for SE II, use of space at Castle, and the use of temporary buildings on campus. The exact mix of these alternatives involves decisions by the UC Merced administration, and is therefore beyond the scope this strategic plan.

Core Facilities: Many new chemistry hires will require the services of core facilities. Any organic chemist will require NMR, which we already have, although only at Castle. Many materials chemists will make use of our existing excellent electron microscopy facilities, the recently acquired powder x-ray diffractometer, and the clean room being built in SEI. Major core facilities that potential hires are likely to need, and that we do not currently have or do not have in working order, include high quality mass spectrometry, single crystal and thin-film x-ray diffraction, and circular dichroism. Other instruments that are currently in the laboratories of individual faculty members, but would be widely used and should be reproduced as core facilities develop include a high quality UV-VIS-NIR and a fluorimeter.

4. Environmental Sciences, Integrative and Evolutionary Biology, and Environmental Health Sciences

Overview - Environmental Sciences and Integrative and Evolutionary Biology were established as initial areas of research and education excellence at UC Merced. Earth Systems Science (ESS) was designated as one of the first undergraduate majors in Natural Sciences (SNS), Environmental Engineering (ENVE) as a first major in the School of Engineering (SE), and the Environmental Systems (ES) graduate group as a joint SNS and SE graduate program awarding M.S. and Ph.D. degrees. In 2006, the Integrative Biology (IB) track within the Biological Sciences (BIS) was approved for study of comparative and evolutionary biology. A revision of the ESS undergraduate major is underway, with the goal of strengthening the interdisciplinary nature of the major through cross-school faculty support to reflect the broad and diverse nature of environmental sciences. The Sierra Nevada Research Institute (SNRI) is a cross-school institute through which faculty, researchers, and students conduct basic and applied research on environmental issues, using the San Joaquin Valley and the Sierra Nevada as their outdoor laboratory. Existing research collaborations and coordinated teaching efforts between SNS and SE in this area, as well as recent successes in faculty recruitment in the School of Social Sciences, Humanities and Arts (SSHA) in the areas of environmental policy and economics emphasize our cross-school, interdisciplinary nature. Environmental Health Sciences, focusing on research at the intersection of environment and health, is an emerging area at UC Merced. Given the breadth of research and education encompassed in this area, a major challenge for program development is to identify and build strategic areas in which UC Merced can excel while providing sufficient program breath and depth to support undergraduate majors and graduate education. The following plan was developed based on previous years' plans and consideration of strategic plans from graduate groups, SNRI, and faculty from other schools with interests in environmental research.

Research - A central philosophy of the environmental program area is an integrated approach to the study of physical, chemical, and biological processes in natural and engineered environments. Research and education components focus on the quantitative understanding of the Earth as coupled systems of atmosphere, hydrosphere, lithosphere, and biosphere, and of biological systems as shaped by evolution and the environment. These themes intersect with human and ecosystem health. Such integrated studies require a balance of disciplinary expertise and interdisciplinary connections. This requirement translates to a need for a large and diverse faculty assemblage -- one that can support the multifaceted components of priority research themes and whose members will contribute to multiple majors and programs. Current SNS research areas include *Global Change Science*, *Climate and Watershed Resources*, *Biocomplexity and Evolution*, *Atmospheric Pollution and Health*, and the *Ecology of Infectious Disease*. Continued expansion of complementary faculty in SSHA and the future School of Management is viewed as an integral component of program development to address the human dimension of environmental systems, along with continued synergy with SE. The research themes are described in more detail below:

a. Environmental Sciences

Global Change Science - Ecosystems encompass living organisms and the abiotic environment they inhabit. The science of global change employs a genome- to ecosystem-level perspective to understand interactions among organisms and the environment with an emphasis on discovering the effects of climate change, land use, pollution, biodiversity loss and other environmental pressures on ecosystems. Research in this area examines both past environmental changes and their impact on evolution as well as modeling future global change scenarios. Global change science examines how these alterations influence the interactions among organisms, ecosystem processes, and other Earth System components such as oceans, the atmosphere, and soils. Both significant needs for new knowledge in stressed regional and global ecosystems and new research initiatives in this region make this a compelling opportunity for UC Merced. For example, the California Ecological Observing Network (CALEON) planning group has proposed the San Joaquin Valley and Southern Sierra as a focus for new research infrastructure. Extramural funding in global change research initiatives and environmental biology from NSF, EPA, DOE, NASA, USDA, and other agencies are currently on the order of $3 billion. We have begun to develop expertise in the area of global change science, with faculty in evolutionary and conservation genetics, ecosystem and fire ecology, and macroecology. In AY 2007-2008, we are searching for three positions in ecology, with up to two senior faculty appointments (Table E6). We anticipate that these new faculty may contribute to this area and that some fraction of the new senior faculty will provide leadership and direction. Forefront advances in this field are occurring at the interface between biological systems and physical sciences. The addition of new faculty in the area of ecology strengthens expertise in environmental life sciences. In order to continue to develop a nationally and internationally competitive program grounded in both life and physical sciences, we need to continue to build complementary expertise in the area physical surface

processes/ecohydrology (Table E6). Future positions in soil biogeochemist, conservation biology, and others listed in Table E6 would further strengthen the global change science research area.

Climate and Watershed Resources - Water is a critical resource on our planet and an essential component of planetary function where it serves as a solvent, a transporter, and a reactant, as well as a basic requirement for life. From an anthropogenic perspective, water is a critical resource, for drinking water, agricultural and industrial use, energy production, and recreation, thus making it an important commodity. There is growing awareness that the combination of impending climate changes and increased human demand for water will soon collide, particularly in California and the western U.S. where high quality water is already a limited resource in many areas. UC Merced is well poised to have a signature impact on integrated science, engineering, and management issues related to water as a critical resource including relationships between climate change and the regional hydrologic and carbon cycles, fundamental understanding of molecular, chemical, and biochemical processes the impact water quality, and integration of basic research into water resource management, sustainable agricultural activities, and economic development in the Central Valley. This thematic area already has a strong component in SE and formed the initial core of the ES graduate group programs. We envision that a faculty group in SSHA with interests in economics, policy, law and social science related to the environment would strengthen cross-discipline research and education. Faculty in the School of Management would also play an important role in the development of interdisciplinary links in areas of natural resource management, particularly related to water and biological resources. We support a proposed cross-school position in resource conservation and management (Table E5). Growth in this thematic area requires additional faculty strength in SNS in surface processes/ecohydrology noted above, and in plant biology/ecology and environmental microbiology (Table E6). Future recruitments in conservation biology and other areas in Table E6 would further strengthen research and teaching in this area.

Table E5: Current Environmental Science and Integrative and Evolutionary Biology Faculty FTE's Across Graduate Groups and Schools

Current Faculty	School			Research Themes: SNS Faculty		
	SNS	**SoE**	**SSHA**	**Global Change**	**Bio-complexity Evolution**	**Climate, Water-sheds**
ES	7	9	1	AA, MD, LK	AA, MD, BD, MM	LK, PO, ST
QSB	17	5		AA, MD	AA, MB, MD, BD, MM, JR	

* SNS Faculty: AA: Andres Aguilar; MB: Miriam Barlow; MD: Michael Dawson; BD: Benoît Dayrat; LK: Lara Kueppers MM: Monica Medina; PO: Peggy O'Day[†]; JR: Jason Raymond; ST: Sam Traina[†] (0% FTE); [†]denotes tenured faculty. Faculty contributing from SE and SSHA not listed.

b. Integrative and Evolutionary Biology

Biocomplexity and Evolution **-** Biocomplexity research explores the emergence of self-organized, complex behaviors or structures from the interaction of many simple agents in the environment. Such emergent complexity is a hallmark of life, from the organization of molecules into cellular machinery, through the organization of cells into tissues, to the organization of individuals into communities. The study of biocomplexity in the environment requires novel approaches to understanding pattern and process across multiple temporal and spatial scales, and draws upon interdisciplinary efforts at the interface of biology, physics, chemistry, and mathematics. Biocomplexity in the Environment research is a Priority Area at the National Science Foundation, with over $35,000,000 currently allocated in grant funds for 2007. Additional potential funding sources in biocomplexity research include the National Institute of Health, the Department of Energy, NASA, the James S. McDonnell Foundation, and the Moore Foundation. Biocomplexity research at UC Merced addresses a diverse range of questions relevant to integrative biology such as: What are the forces that shape the magnitude and diversity of life across multiple temporal and spatial scales? How do systems with living components respond and adapt to stress? Are adaptation and change predictable? How do organisms within and between populations interact and evolve? A core group of faculty in this research theme is developing at UC Merced (see Table E5) that is represented strongly in the QSB graduate group, and priorities in this area overlap with the other research themes in ES and QSB. To adequately develop strength in this theme and to fulfill undergraduate and graduate teaching will require further expertise in plant biology and ecology. Future positions in evolution of development, comparative evolutionary physiology, and paleoecology would solidify research in this area (Table E6).

Table E6: Proposed SNS and Cross-Unit Faculty in Environmental Sciences and Integrative and Evolutionary Biology

Faculty	Research Themes			
	Climate, Water-sheds	Global Change	Bio-complexity Evolution	Fills coursework gaps*
AY 2007-2008				
Ecology† (3 positions: microbial, biodiversity, general)	x	x	x	BIS, ESS, ES, QSB
AY 2008-2009				
Earth surface processes/ecohydrology	x	x		ESS, ENVE, MGMT, ES
Plant biology/ecology	x		x	BIS, ESS, ES, QSB
Environmental microbiology¶	x	x	x	BIS, ESS, ENVE, ES, QSB
Resource conservation and management++	x	x		MGMT, ESS, ES
AY 2009 and beyond				
Soil biogeochemist	x	x		ESS, ENVE, ES
Conservation biology	x	x		ESS, ES, MGMT
Paleobiology/ecology		x	x	BIS, ESS, ES, QSB
Comparative evolutionary physiology			x	BIS, QSB
Evolution of development			x	BIS, QSB
Deep ocean sediments			x	BIS, ESS, ENVE, ES
Physical/chemical oceanographer		x	x	ESS, ES

†Search in progress, up to two senior positions may be appointed.
¶May be cross-unit position with Engineering; may also contribute to Environmental Health Sciences.
++Cross-unit position in Management in this area is supported by EES faculty.
*BIS: Biological sciences; ESS: Earth systems science; ENVE: Environmental engineering; ES: Environmental systems; MGMT: Management; QSB: Quantitative systems biology.

c. Environmental Health Sciences

Earth is an ecosystem that houses more than one million different species whose complex interactions with each other and the environment shape the life and fate of its individual constituents and their progeny. These interactions are frequently manifest in symbiotic, parasitic and, pathogenic relationships between species. Humans frequently degrade the environment, and this in turn affects their health and safety. The cost burden for health care associated with environmental toxins and infectious agents, the emergence of drug resistant pathogens, the economic impacts of pathogens on agriculture, the threat of bioterrorism, and the increasing need to ensure clean and safe air and water are some of the compelling examples of how fundamental research in *Environmental Health Sciences* directly connects to social, economic, and political impacts both locally and globally. UC Merced is uniquely positioned to develop a strong and interdisciplinary research program in *Environmental Health Sciences*, initially focused in two highly complementary areas: *Atmospheric Pollution and Health*, and the *Ecology of Infectious Disease*. UCM Faculty who are interested in this research focus or already engaged in this research, are listed in Table E7. Potential partners outside of UCM include biologists, geochemists, and biodefense researchers at LLNL, LBNL, and Los Alamos National Laboratory and UC-wide programs in toxicology.

Table E7: Current faculty FTEs who would contribute to the development of research in Environmental Health Sciences.

Current Faculty	School			Research Themes	
	SNS	**SoE**	**SSHA**	**Atmospheric Aerosols & Health**	**Ecology of Infectious Disease**
ES	4	3	1	TW, YC, LK, VL, PO, WR	YC, AA, MD
QSB	7			HF, RO	AA, MB, MD, JC, DO

Faculty: AA: Andres Aguilar; MB: Miriam Barlow; YC: Yihsu Chen; JC: Jinah Choi; MD: Michael Dawson; HF: Henry Forman[†]; QG: Qinghua Guo; LK: Lara Kueppers; VL: Valerie Leppert[†]; PO: Peggy O'Day[†]; DO: David Ojcius[†]; RO: Rudy Ortiz; WR: Wolfgang Rogge[†]; TW: Tony Westerling. [†]denotes tenured faculty.

The Environmental Health Sciences program is unique in that it steps beyond a traditional biomedical and public health focus to examine fundamental, mechanistic questions from multiple angles, fully integrating genomic, biological, geochemical, physical, computational, and ecological tools into studies of toxins and pathogens that involve humans as well as other organisms. This initiative encompasses both research and education that intersects all three schools in a compelling interdisciplinary area and is expected to support new and existing undergraduate and graduate programs. It also complements existing and future SNS research areas in addition to the environmental research described above, including areas of Applied Math, Complex Disease States, and Microbiology and Immunology. The addition of faculty in relevant aspects of health management and policy through SSHA and/or the School of Management will

contribute to the future development of a community-health-focused medical school. Recommendations for FTE's are given in Table E8

Atmospheric Pollution and Health - Air pollution in the Central Valley is a daily burden on human and ecosystem health and well-being. Organic and inorganic particulates, persistent organic pollutants, and precursor gases for ozone formation are produced during routine agricultural practices and weekday commutes. These pollutants are lofted into the atmosphere to interact with other chemicals or microbes and are eventually deposited in the respiratory systems of humans and animals, as well as on plant leaves. The resulting effects on human and ecosystem health are devastating. A significant air pollution-related research effort aimed at the understanding and mitigating the escalating air quality problems in the Central Valley, Sierra Nevada, and elsewhere has already been initiated in the Environmental Systems graduate group. Two new air pollution hires (Wolfgang Rogge and a junior position in progress, both in SE) have added strength in measurement and analysis of atmospheric pollutants, and will contribute to research on human and ecological exposure. Strength in this research area can be built through the addition of FTE's in environmental toxicology, environmental epidemiology, and environmental microbiology, which will add to current expertise in pathophysiology (HF, RO), particle and surface chemistry (VL, PO), and land use-atmosphere interactions (LK) (Table E7). UC Merced is well poised to conduct critically needed basic research in this area, as well as to developing solutions to these complex environmental and public health problems. This area would benefit from the addition of faculty in atmospheric chemistry and environmental/ecological biostatistics.

Ecology of Infectious Disease - Infectious disease agents affect all living organisms, can have complex life histories involving multiple species, and can be specialists or generalists in terms of host preference. A better understanding of the ecological and socio-ecological determinants of transmission by vectors (e.g., insects, rodents, birds) or abiotic agents (e.g., dust, water, weather systems), the population dynamics of reservoir species, the transmission to humans or other hosts, or the cultural, social, behavioral, and economic dimensions of disease communication is needed. The interface between humans and both domestic and wild animals is a region rife with opportunity for emerging diseases – those that were not pathogenic in the original host, but are in the new host (e.g., Hantavirus, SARS). Evolution of infectious agents and their plant and animal hosts is also a critical component of research for understanding the ecology of infectious disease. UC Merced is uniquely positioned for research in this area, literally located in the transition zone between suburban, agricultural and natural ecosystems. Migratory birds use Central Valley agricultural fields as stopover points, and human migration supports the agricultural industry. Air pollution can make stressed organisms more susceptible to infection. Building strength in this research area requires the addition of FTE's in environmental toxicology, environmental microbiology, emerging zoonoses/immunology, and environmental/ecological biostatistics (Table E4) to complement initial expertise in evolution (MB, MD), cell level host-pathogen

interactions (JC, DO), environmental epidemiology (YC), and population genetics (AA).

Table E8: Proposed SNS and cross-unit faculty in Environmental Health Sciences

Faculty	Research Themes		
	Atmospheric Aerosols & Health	Ecology of Infectious Disease	Fills coursework gaps*
AY 2007-2008			
Mechanisms of Complex Disease†	x	x	BIS, QSB
Air Pollution (SE)††	x		ENVE, ES
AY 2008-2009			
Environmental Toxicology	x	x	BIS, BIOCHEM, ESS, ES
Environmental Epidemiology	x	x	BIS, ESS, ES
Environmental Health Policy++	x		BIS, ESS, MGMT, ES
AY 2009 and beyond			
Atmospheric Chemistry	x		CHEM, ESS, ENVE, ES
Environmental/Ecological Biostatistician	x	x	ESS, MATH, BIS, ES
Emerging Zoonoses/Immunology		x	BIS, QSB
Eukaryotic Microbiology		x	BIS, ESS, ES, QSB

† Senior searches underway – outcomes may support research in this program area
†† Junior position in negotiation stage – may support research in this program area
++Cross-unit position in SSHA and/or Management in this area is supported by EES faculty.
* BIS: Biological sciences; CHEM: Chemistry; ESS: Earth systems science; ENVE: Environmental engineering; ES: Environmental systems; MATH: Mathematics; QSB: Quantitative systems biology.

Teaching - Faculty in Environmental Sciences, Integrative and Evolutionary Biology, and Environmental Health Sciences Contributions to Undergraduate and Graduate Programs.

Undergraduate Programs: SNS faculty members with interests in environmentally related research contribute primarily to undergraduate Biological Sciences (BIS) and Earth Systems Science (ESS) majors. A number of SNS faculty with interests in *Biocomplexity and Evolution* form the core of the Integrative Biology (IB) emphasis in

BIS, whereas SNS faculty shown in table E8 (previous page), together with faculty from other schools, contribute to the ESS major. SNS Faculty indicated above contribute to other tracks in the current BIS major and to the Chemical Sciences major, particularly Biochemistry and Environmental Chemistry. Faculty contributions to multiple undergraduate majors is a strength for the school and valued by the faculty involved. However, faculty should be vested in the undergraduate majors to which they contribute.

Discussions are in progress regarding the feasibility of changing the ESS major to a cross-school major to enable faculty who teach the courses to have full participation in programmatic direction and student mentoring. This change would also enable the formulation of undergraduate tracks, minors, or new majors that intersect with Social Sciences and Management, with potential increases in student participation. Plans are in development for a separate Integrative Biology major, to be implemented when sufficient faculty are on-board to support the major. We foresee the diverse faculty who contribute to environmental research as those who will continue to contribute to a number of undergraduate majors in the future, rather than aligning strictly with a single major. From a student viewpoint, however, it is advantageous to clearly define the differences between majors such as ESS and IB when the programs share courses and faculty. Evolution of these majors will include discussion and revisions to distinguish program content and educational objectives for the student. The faculty lines proposed above will contribute to existing undergraduate programs by filling programmatic course needs and assembling a critical mass of faculty to deliver the curriculum. Furthermore, additional of faculty in the *Environmental Health Sciences* will contribute to proposed development of undergraduate programs in Biochemistry and Microbiology and Immunology, as well as supporting current majors.

Graduate Programs: At the graduate level, the environmental faculty contribute primarily to the Environmental Systems (ES) and Quantitative and Systems Biology (QSB) graduate programs, currently the two largest and most successful graduate groups. For example, current extramural grants by members of the ES graduate group/SNRI faculty have brought more than $15M in research funds and equipment to UCM between 2003 and 2010. The proposed FTE's will contribute to strategic areas within the current graduate groups, as well as contribute to development of programmatic areas that may eventually spin-off to form new graduate groups.

Resources - Development of a stellar program in Environmental Sciences, Integrative and Evolutionary Biology, and Environmental Health Sciences requires resources in faculty, space and centralized core research facilities.

Faculty: A description of the types and proposed sequencing of faculty hires for each emphasis area is described above**.** The faculty hiring plan is derived from the need for balanced growth among the thematic areas described above, graduate and undergraduate teaching demands, and identification of cross-school and cross-discipline hires that support multiple degree programs and research areas. As noted above, the interdisciplinary nature of environmental programmatic areas requires

support from a breadth of faculty within SNS and among all of UCM's schools. The research initiatives we are pursuing and the graduate and undergraduate degree programs associated with them span from "Natural Sciences-centric" to truly cross-school. Thus, long-range planning requires a university-wide view of programmatic development and needs. An immediate goal is to insure balance between SNS, SE, and SSHA/Management in thematic areas where complementary or cross-school hires can be made. We note, however, the difficulties associated with formal joint appointments for Assistant-level faculty. Given the likelihood of future junior faculty with cross-school research and teaching affinities, an explicit policy for evaluating and promoting interdisciplinary scholars should be established at UCM. Additional research support comes from the affiliation of adjunct researchers. There are presently two adjunct faculty (Duffy, Quinn) affiliated with the ES graduate group. Four additional government scientists have expressed interest in being involved with supervising graduate students, teaching, or being Co-PI's on grants. We expect to affiliate at least two more government scientists with the ES graduate group in the near future.

***Space and centralized facilities*:** The research encompassed within three broad environmental areas described above has prime opportunities for funding from a variety of government and foundation sources that span across physical, chemical, and biological sciences and engineering. Our strategic development is targeted to interdisciplinary areas where funding opportunities exist or are anticipated to increase. Programmatic growth relies on the availability of adequate space for research, graduate students, post-doctoral associates, and technical support staff for new and existing faculty as their individual research portfolios grow.

- Centralized instrumentation and computing facilities are critical to the success of the interdisciplinary research carried out in the area. Space and technical personnel support must be provided for these facilities to enable cutting edge research in a cost-effective way. Continued support for courses with field labs (which incur comparable or lower per student costs than courses with indoor labs) is critical for providing students with quality hands on research and educational opportunities.

  Several established centralized facilities figure prominently in the environmental program areas. The SNRI Wawona Field Station provides support for field-based research and learning across all research themes by housing field researchers, and by hosting field classes and workshops. SNRI is helping spearhead UCM's flagship Yosemite Leadership Program -- a partnership between the University of California, the National Park, and the largest privately owned business to develop tomorrow's thoughtful, ethical, and innovative leaders. The Environmental Analytical Laboratory (EAL, administered under SNRI) provides core analytical support for all research themes, including instrumentation for lab courses required in several majors (ESS, ENVE, CHEM). Likewise, the Imaging and Microscopy Facility (IMF) is a key support laboratory for multiple research themes and is used in several lab-based courses. The Genomic Core Facility (GCF) is the first

centralized facility with genomics instrumentation to fulfill multiple needs of faculty in SNS and SE, with a foundation based on sequencing and microarray analysis equipment already available through faculty start-up funds. The GCF is essential for the success of research themes in Global Change, Biocomplexity and Evolution, and Ecology of Infectious Diseases. A collaborative scientific supercomputing cluster is under development using start-up funds, to be co-administered by Applied Mathematical Sciences and Environmental Systems faculty with support from the School of Natural Sciences. This computing facility will support research in the Climate and Watershed Resources and Global Change research themes. Core facilities in other program areas such as those supporting chemical sciences would also be used by environmental faculty. A critical need for strengthening the Global Change and Biocomplexity and Evolution themes is a modern greenhouse facility and freshwater and seawater aquaria.

There is an immediate need to address on-campus space needs of the EAL and the IMF, or they will not be utilized to their full potential and will fail to garner sufficient recharge funds to partially support their operation. The existing centralized facilities rely on a combination of NSF-funded grants and University support to deliver cost-effective services enabling research and graduate and undergraduate instruction. University technical staff support for existing and new facilities is an essential feature of centralized facility success.

- Space and Facilities - Environmentally related faculty require a range of resources to support research that may encompass laboratory, field, and/or computational methods. Both junior and senior faculty will need adequate start-up packages, laboratory and office space, and institutional investment for equipment, both shared as noted above and individual. Each of the new faculty will require at least the CPEC average of ~700 square ft (assuming about 50% senior faculty), in addition to adequate space for centralized facilities that these faculty might use. With the possible exception of an epidemiologist or ecological biostatistician, new Environmental Health Sciences faculty require standard wet lab space with fume hoods, analytical instrumentation, and/or field equipment. New faculty in atmospheric chemistry and toxicology would likely take advantage of the Environmental Analytical Facility, and also the Imaging and Microscopy Facility or the Genomics Core lab, depending on their particular research. Depending on their research emphases, the Environmental Toxicologist, Emerging Zoonoses, and/or Animal Responses to Air Pollution researchers may need access to the vivarium or a biosafety level three (BSL3) facility (unless certain agents are avoided). Environmental Health Sciences faculty could also make use of core facilities under development by current QSB, ES, Applied Math, and Chemistry faculty.

5. PHYSICS

Overview - Physics is the study of the properties of nature at their most fundamental. It ranges from the study of the very tiniest pieces of matter and energy, including molecules, atoms, photons, and subatomic particles, to the study of the entire universe. Insights in physics have revolutionized our society. It is hard to imagine an area of science or engineering that has not been profoundly affected by fundamental developments in physics. One need only think of the harnessing of electricity, the invention of the transistor, and the discovery of the laser. The present strength in physics at Merced is centered on three broad areas of research, detailed below.

Research -

a. Atomic, Molecular, and Optical Physics

UC Merced is building a strong research emphasis in atomic, molecular, and optical (AMO) physics. Interest and developments in this field have surged in the last ten to fifteen years, primarily due to advanced experimental techniques. These developments have been recognized by several recent Nobel prizes: for ion trapping and atomic clocks (1989; Ramsey, Dehmelt, Paul), for atomic cooling and trapping techniques (1997; Chu, Cohen-Tannoudji, Phillips), for the creation of Bose-Einstein condensates (2001; Cornell, Ketterle, Wieman), and most recently for advances in quantum optics (2005; Glauber, Hall, Haensch).

The modern trend in AMO science is toward greater control over quantum systems such that quantum coherence is maintained and quantum processes can be resolved. This includes working at very low temperatures, at ultrashort time scales, and with very high spectroscopic precision. Modern techniques can now routinely address single atoms, single photons, and single qubits (the quantum analog of a bit).The technological implications for such precise control over the fundamental building blocks of ordinary matter are as yet unimagined, but the promise is great. By analogy, the laser, which in some sense is a “Bose-Einstein” condensate of photons, has impacted almost every area of technology and medicine. The program in AMO physics complements the research programs in condensed matter physics and chemistry.

At present UC Merced has hired five faculty whose research supports the general AMO theme: Roland Winston and Ray Chiao (both split between Natural Science and Engineering), Kevin Mitchell, Jay Sharping, and Sayantani Ghosh. A search is currently being conducted this year for one additional junior faculty position in AMO physics. Potential areas for subsequent AMO hires, include, but are not limited to:

- *Ultrafast Optics*: pico-, femto-, and attosecond pulses, time-domain studies, wavepacket dynamics, high harmonic generation, photonic crystals and nanostructures for plasmonics and terahertz dynamics
- *Attosecond Physics*: fourth generation synchrotron sources, attosecond pulse generation, characterization, and applications
- *Fundamental Quantum Processes and Engineering*: quantum control, quantum computing and information theory

- *Atomic Cooling and Trapping*: ultracold gases and plasmas, Bose-Einstein condensates, degenerate Fermi gases, superfluidity
- *Precision Measurement*: atomic clocks, ultrasensitive detectors, high precision spectroscopy, multi-photon microscopy
- *Novel Imaging Techniques*: sub-diffraction fluorescence imaging, near-field imaging, etc.

Funding potential: Various government funding agencies support physics research, and AMO research in particular, with NSF being the largest sponsor of table-top AMO research. Furthermore, DOE funds several large national user facilities, including three that are strategically located with respect to UC Merced: Lawrence Livermore National Lab, Lawrence Berkeley National Lab, and the Stanford Linear Accelerator Center. In addition, optics research has historically benefited financially from its close connection to industry and industrial applications.

Cross-Disciplinary and Cross-School Linkages Expertise in AMO science has a natural connection to other present and potential University research programs. This is reflected in the fact that two of the AMO faculty have joint appointments between natural science and engineering. Specific connections include, but are not limited to:

1. The energy sciences program: Optics is of fundamental importance to solar energy collection.
2. Chemical physics/ physical chemistry: Current faculty rely heavily on lasers and other optical techniques. They could be well supported by additional expertise in optics and atomic physics.
3. The materials or nanoscience programs would benefit from advanced optical techniques. Also, many of the issues of quantum control, manipulation, computing, etc. are relevant to nanoscience just as they are to AMO science.
4. Computer science: Quantum computation and information processing synergizes naturally with computer science.
5. Biology and Earth systems science: Synergy could potentially arise in the areas of microscopy, advanced detector design, and optics.

b. Condensed Matter Physics

The Condensed Matter Physics program in Natural Science is a broad, interdisciplinary program focusing on "condensed" phases of matter. These phases range from simple solids and liquids to metallic and semiconductor nanomaterials to exotic condensed phases such as the superconducting phase exhibited by conduction electrons in certain materials, and the ferromagnetic and antiferromagnetic phases of spins on atomic lattices. The intellectual scope of this program is vast, and includes an understanding of the optical, electrical, mechanical, and transport properties of materials, encompassing the nano- to the macro-scale. Research in condensed matter can be harnessed to design new materials such as magnets, semiconductors, ferroelectrics, superconductors, polymers, and liquid crystals, used for applications in a wide variety

of disciplines including efficient energy conversion, ultra-fast optics, quantum information processing, and structural materials, to name a few.

The faculty participating in this program spans the disciplines of solid state physics, nanoscale physics, soft matter physics, physical chemistry, surface science and materials characterization. Several specific areas that are at the forefront of modern condensed matter science are targeted. These include photonic materials, nano-scale electronics, quantum information and "smart" materials.

Photonic materials - "Photonics" may be broadly defined as the technology of generating and harnessing light and other forms of radiant energy. All photonic technologies rely on appropriate materials, which may be organic, inorganic, or composites. Materials that respond nonlinearly to light are used in frequency conversion of lasers, as optical limiting materials to protect eyes or optical sensors from laser pulses, and as contrast agents in nonlinear optical imaging technologies. Materials that change their optical properties in response to applied electric fields can be used to fabricate electro-optic modulators for electrical to optical conversion in fiber-optic communications. Photonic band-gap crystals, periodic dielectric structures that forbid propagation of a certain frequency range of light, have potential applications in ultra-low-threshold lasers, optical filters, polarizers, and waveguides. Metamaterials are those that exhibit novel optical properties leading to compact imaging systems and even "cloaking" devices. Research in this area is highly interdisciplinary and spans solid-state physics, surface science, optical physics, physical chemistry and applied mathematics.

Nanoscale electronics - " Nano-electronics" is poised to provide the next technological revolution in computer design. Moore's prediction of rapid miniaturization has already pushed commercial transistors well below 100 nm in size. Developing an in-depth understanding of the fundamental properties of nanoelectronic devices is of crucial importance because Nature behaves quite differently at the nanoscale, and an extrapolation of our knowledge at larger dimensions is not possible. It is not prudent to invest a vast amount of time and effort to try to compete with the immense silicon industry. Instead, it is more attractive to look into nanoelectronic devices that could play a role complementary to the silicon technology, with a strong focus on exploring the possibilities of organic materials, for example in the form of single molecules or self-assembled molecular monolayers. Investigating the use of complex transition-metal oxides in nanoelectronic devices is another field worth exploring since these materials show a wide range of interesting characteristics, including strongly insulating behaviour, high-temperature magnetism and superconductivity. Nanoelectronics is the field where physics, material science, chemistry and electrical engineering inevitably meet.

Quantum information science - The tremendous miniaturization of electronic devices has led to the point where the spatial scale has hit the atomic limit. In this regime, the quantum properties of matter dominate, which, at first glance, seems to compromise information processing and storage, since quantum states are unstable and are

destroyed by the very act of making a measurement. However, this very fragility of quantum phenomena has the capability of revolutionizing the fields communication and computation. A quantum channel of information transfer is very secure, since any effort to eavesdrop leaves an imprint on the quantum state. Computation power is exponentially enhanced when using quantum bits instead of classical ones due to the property of entanglement, which adds immense parallel processing capabilities. Recently, quantum information processing has started influencing the agenda of condensed matter, and some of the implementable quantum bits which this field has contributed include superconducting structures (Josephson junctions), single-electron quantum dots and semiconductor photonic devices.

Photovoltaics - As the worldwide demand for energy increases, the need for renewable energy sources will become more and more urgent. Solar energy is the obvious answer, providing an unlimited, pollution-free energy source. Through the use of efficient photovoltaics, a relatively small amount of land area can in principle be used to meet the energy needs of the entire United States. For these reasons, research into more efficient and lower cost ways of turning the energy of sunlight directly into electrical energy is now, and will continue to be, an important field in the physical sciences. Photovoltaic devices can be grouped into two broad categories, each type having its advantages and disadvantages: solid state (semiconductor) devices, which may be organic, inorganic, or hybrid, and electrochemical cells.

The areas described above are particularly attractive because they offer the possibility of many different types of collaborations, both within UC Merced and at other nearby institutions. Potential industrial collaborators include Hewlett-Packard's basic research labs in Palo Alto. There are also collaborative opportunities with LLNL through LLNL/UCM adjunct faculty. We also anticipate that collaborations and funding through NASA/Ames will be available in the near future.

Current faculty in this research area include: Sayantani Ghosh (experimental condensed matter physics), Raymond Chiao (experimental condensed matter physics), Ajay Gopinathan (theoretical soft condensed matter physics).

Other faculty across disciplines who could contribute include: Roland Winston (solar energy, optics), David Kelley (experimental chemical physics), Anne Kelley (experimental physical/analytical chemistry), Jennifer Lu (materials engineering), Valerie Leppert (materials engineering).

Given the necessarily diverse and fundamentally interdisciplinary nature of this group, and the desirability of building on and extending current strengths, we would like to see recruitment of new faculty in fields that encompass and bridge condensed matter physics, physical chemistry, and materials engineering. We need to recruit faculty with related but complementary research interests in order to build a program that can attract graduate students, offer modern and compelling programs for both undergraduate and graduate students, successfully compete for funding, and achieve national and international prominence in research. Several searches underway during

the current academic year may result in new faculty who would contribute to this research area: Condensed matter physics (Assistant Professor), Nanoscale Physics (Senior). It is assumed that these positions will be carried forward if we are unsuccessful at filling them this year.

Funding potential: The level of support available is a primary concern when considering programmatic initiatives. This type of research is very well funded and we suspect will continue to be well funded in the foreseeable future. The Bush administration's American Competitiveness Initiative (ACI) commits to doubling, over 10 years, funding for research at key federal agencies that support physical science and engineering: NSF, DOE's Office of Science, and NIST. Part of the ACI is the Advanced Energy Initiative, which provides for a 22% increase in funding for clean-energy research at the DOE. The fields of solid-state physics, and materials science will be key to advances in new energy sources, and UCM could become a major player in a field in which few established universities yet have large, well developed programs.

Single-investigator or small collaborative group funding in this field is available from a number of different agencies and programs within these agencies. The following programs are now (October, 2006) soliciting proposals in Condensed Matter Physics and Materials Science:

- NSF: programs in Physics and Materials Research divisions.
- AFOSR Broad Area Announcement (BAA): programs in Metallic Materials, Ceramic and Nonmetallic Materials, Quantum Electronic Solids, Semiconductor Materials, Surface and Interfacial Science.
- ARO BAA: programs in Condensed Matter Physics, Quantum Information Science, Surfaces and Catalysis, Electrochemistry and Advanced Energy Conversion, Materials Synthesis and Processing.
- ONR BAA: programs in Electronic Materials, Semiconductor Materials.
- DARPA: solicitation in Nano-Composite Optical Ceramics.
- DOE: Several programs in Basic Energy Sciences: Condensed Matter Physics, Materials and Engineering Physics.

c. Biological Physics

Experimental, computational and theoretical methods and techniques from Physics have played a major part in recent advances in our understanding of biological systems. Examples include cutting-edge imaging techniques that have provided snapshots of biological molecules and their complex assemblies in action and have also led to dramatic improvements in medical imaging. The ability to control matter at the smallest scales, using for example optical and magnetic tweezers, has allowed us to study and manipulate biological processes at the single molecule level. Theoretical and computational modeling are leading the way in our efforts to understand protein folding/misfolding, the functioning of molecular motors and enzymes, ion channels, membrane structure and dynamics as well as the dynamics of complex biochemical and neural networks. The result of advances in biological physics will be a better

understanding of normal and pathological processes at both the molecular and systems level. Equally important, from a physics perspective, is that studies of biological systems that serve as paradigms of complex, self-assembling, non-equilibrium systems has led to new and interesting physics including emergent properties in dynamical networks, self-assembled, self-replicating systems, the thermodynamics of "active" systems and an atomistic understanding of complex macromolecules. Biophysics for its part is the most rapidly growing area in physics research attracting both seasoned physicists from several different subfields and large numbers of entering students

To develop a state of the art research program in biophysics requires individuals who have had extensive training in doing biophysical research, hailing from either traditional physics subfields such as condensed matter, polymer or statistical physics or from more interdisciplinary backgrounds including specifically biophysics, materials or bioengineering.

The SNS faculty at UC Merced who work directly in areas of biophysics are Mike Colvin, Ajay Gopinathan and Tao Ye. Others including Jinah Choi, Henry Forman, Anne Kelley, Michelle Khine, Andy LiWang, Patti LiWang, Matt Meyer, Alexandre Noy, Jay Sharping and Christopher Viney can contribute to this area.

A core group of at least six biophysicists is needed to establish a strong competitive program. Broad areas of interest include biomaterials and biopolymers, membranes and associated phenomena, single cell studies of biomechanics including motility and mitosis, microfluidics with biological applications and protein folding. Several specific research fields are listed below that would allow us to attract the best available candidates with interests in these broad areas.

- Biocompatible organic materials as organ replacements and/or as scaffolds for cell growth (links to Materials program and to Bioengineering)
- Development of ultrasensitive bioanalytical techniques, particularly for single molecule/single assembly measurements and/or high throughput screening
- Single molecule studies of molecular motors, DNA/RNA dynamics, transcription factor binding/functioning, viral genome packaging, ion channel transport etc.
- DNA and/or other biological macromolecules as scaffolds for fabrication of organized structures (links to Materials program)
- Protein folding, experimental and computational methods that quantitatively determine protein structure and folding pathways
- Atomistic modeling of biological systems: channels, membranes, receptors, proteins, enzymes (links to CCB)
- System level studies of mitosis, morphogenesis, cellular motility, cytoskeletal dynamics, viral self-assembly, cellular hydrodynamics, chemotaxis and pattern formation. (links to Systems Biology)
- Membranes and associated phenomena including fusion, exo/endocytosis, pore formation and functioning, lipid rafts. Also biomedical applications of engineered membranes. (links to Materials and Bioengineering).

It is to be noted that many of these areas will have a considerable overlap with research interests in Biochemistry and Molecular Biology. We anticipate hiring both theorists and experimentalists in these fields.

Funding potential: Funding for biophysics is growing at an extremely rapid pace. The NSF provides substantial funding for fundamental research in physics including its interfacial areas with biology. Research more directed toward specific problems in the life sciences is supported by the NIH, and also to a significant extent by the DOE and defense organizations (ONR, AFOSR, ARO). Funding for research in biological physics is also available from private foundations (*e.g*. Packard, Hughes, Burroughs-Wellcome) and for-profit companies. Faculty with research interests in this area should have a variety of funding opportunities available to them, although all of these sources are highly competitive.

*Cross-disciplinary and cross-school linkages**:*** The fundamental principles of Physics form the foundation for all of modern science and engineering. While there remain exciting unsolved problems in pure physics there is increasing interest in the frontiers that lie at the intersection with other disciplines including the life sciences, earth and environmental sciences, and engineering. The Biological Physics program is explicitly interdisciplinary between the physical and life sciences, and there should be extensive opportunities for collaboration across these groups. In particular, Biological Physics faculty are expected to have research interests that overlap Biochemistry, Molecular Biology and engineering, particularly Bioengineering. Finally, this research area offers a natural interface with the proposed medical school. Interdisciplinary collaborative science is one of the strengths that UC Merced can leverage as a research institution, and this strength should be fostered as a means of bolstering the resources and potential of both biological and physical science at UC Merced.

Resources - Development of a world class inter-disciplinary physics program requires faculty, space and access to core facilities.

Faculty: At a bare minimum twelve FTEs will be needed to teach the core of the undergraduate and graduate physics curriculum, with more faculty needed to provide depth in our course offerings and to provide a critical mass for an effective research environment. This implies a hiring rate of at least two faculty per year. We currently have five FTEs dedicated to teaching physics (Profs. Chiao and Winston at 1/2 FTE each and Profs. Mitchell, Ghosh, Gopinathan, and Sharping at 1 FTE each.)

Table E9: Summary of Proposed Physics Faculty Hires for the Next Five Years

Faculty	2007-2008	2008-2009	2010-2011	2011-2012	2012-2013	2013-2014
Current	5	9	11	13	15	17
Active searches	4	2	2	2	2	2
Cumulative	9	11	13	15	17	19

Space and Shared Facilities: We expect about a three to one ratio between experimental physicists and theoretical physicists. Thus, most physics hires will be experimentalists. Although the nature and configuration of the space required by different types of physicists are quite different, all of the experimentalists are likely to require an average of at least 1000 sq. ft. of lab space each, plus office space for the PI, postdoctoral fellows, and graduate students. Established senior faculty will require more space than this. Start-up costs for experimentalists depend on specific research needs but typically fall in the $400,000-$750,000 range.

Experimental condensed matter and AMO physicists sometimes need bench and fume hood space, but typically have large pieces of specialized equipment such as cryostats, vacuum chambers, and laser-based setups on large optical tables. They often also have specialized requirements for the space in which these instruments are housed, such as high temperature stability, low vibration, isolation from sources of electrical noise, and light-tightness. Because of the specialized nature of the instrumentation it is often not possible for a single room to be shared by multiple investigators

Experimental biophysicists tend to have research groups that require a mixture of wet lab space, with fume hoods, and dry space for specialized instruments. They are less likely to rely heavily on shared core facilities, though depending on the specific field they may require access to XRD or lithography facilities.

Theoretical and computational hires will require office space and computational facilities for the PI, postdoctoral fellows, and graduate students.

F. ACADEMIC PROGRAMS

The School Faculty participates in multiple graduate groups and contributes to teaching in undergraduate programs offered by the School of Natural Sciences and graduate programs in the Graduate Division. Individual faculty members can join multiple graduate groups. Current faculty members are active in Environmental Systems, Quantitative and Systems Biology, Applied Mathematics, Chemistry and Physics, Mechanical Engineering, Biological Engineering and Small Scale Devices, and

Mechanical Engineering. Strong graduate programs are essential for development of stellar research programs and graduate students are critical to serve as teaching assistants for undergraduate courses.

Table F1: Summary of Academic Degree Programs and Graduate Groups

Undergraduate Degree Programs
Applied Mathematical Sciences, B.S.
Biological Sciences, B.S.
Chemical Sciences, B.S.
Earth Systems Science, B.S.
Physics, B.S.

Graduate Group Affiliations
Chemistry and Physics, M.S./Ph.D.
Environmental Systems, M.S./Ph.D.
Quantitative Systems Biology, MS./Ph.D.
Applied Mathematics, M.S./Ph.D.

1. Undergraduate Programs

The opening of undergraduate majors to students occurred in a sequential manner. Biological Sciences, Human Biology and Earth Systems Sciences were available in 2005 followed by Chemical Sciences, Physics and Mathematical Sciences. An initial major Human Biology was integrated into the Biological Sciences major as an emphasis track in AY2006-2007. The existing majors provide attractive options for students interested in the science degree programs that are most popular at comparable UC campuses. The Faculty is considering options to open new majors, including biochemistry, integrative biology, microbiology and immunology and cell and developmental biology.

Table F2: Synopsis of Majors

Applied Mathematical Sciences	
Emphasis:	Computational Biology
	Economics
	Physics
Biological Sciences	
Emphasis:	Human Biology
	Integrative Biology
	Molecular and Cell Biology
Chemical Sciences	
Emphasis:	Biological Chemistry
	Environmental Chemistry
	Materials Chemistry
Earth Systems Sciences	

Emphasis:	Atmospheric Sciences Ecosystem Sciences Geochemistry and Biogeochemistry Hydrologic and Climate Sciences
Physics	
Emphasis:	Atomic/Molecular/Optical Physics Biophysics Earth and Environmental Physics Mathematical Physics

The distribution of students in SNS majors is shown below (Table F3).

Table F3: Natural Sciences Declared Majors in AY 2005 - 2007

Majors	AY 2005-2006[a]	AY 2006-2007[b]	AY 2007-2008
Applied Mathematical Sciences[c]	-	6	23
Physics[c]	-	3	15
Chemical Sciences[c]	-	6	23
Earth Systems Science	8	9	18
Biological Sciences	310	358	477
Nat Sci Undeclared	47	38	79
Total (% of campus)	365 (40%)	420 (32%)	673 (38%)

[a] Declared science majors at the 3rd week in Fall 2005 and Spring 2006
[b] Declared science majors at the 3rd week in Fall 2006
[c] Opened to freshmen in AY 2006-2007

Appendix 1 provides further detail about anticipated student demand, majors and student FTE, and faculty workload. While the lower division courses, with the exception of mathematics, are typically large classes, >100-200 students in many cases, upper division courses are expected to be considerably smaller. This will clearly be the case for majors that are small at the outset, such as chemistry, physics and mathematics. It is considerably more challenging to provide the same experience for students in large enrollment majors, such as biology. Thus, careful tracking of the success and experiences of students enrolled in upper division courses that define the majors is an important indicator of success of students and majors.

Applied Mathematical Sciences **-** Mathematics is a relatively popular major for undergraduate students. Approximately 1-3% of all undergraduates at the other UC campuses are mathematics majors. These enrollments are comparable to enrollments in other programs such as computer and information science and physical science. Among those undergraduate majors, a significant number of students are pursuing some form of applied mathematics where available. This interest is maintained because students realize their advantageous position in the job market when they have a strong foundation in

mathematics, extensive computational skills and expertise in another marketable area of study.

The applied mathematical sciences undergraduate major at UC Merced is designed to prepare students for careers in research, business and industry in a broad range of fields. This major uses a "core + emphasis" model. The core is designed to give students a rigorous learning experience in analytical and computational mathematical analysis and methods. The emphasis tracks are comprised of significant coursework in another field of study. The initial emphasis tracks are: *Physics, Computational Biology, Economics*; future emphasis tracks are: *Environmental Science and Engineering, Computer Science & Engineering, Electrical Engineering, Mechanical Engineering.*

Chemical Sciences - The Chemical Sciences major meets the requirements for approval by the American Chemical Society. Students who complete an approved curriculum may obtain a certified degree, a valuable credential which serves as national-level recognition for successfully completing a rigorous academic chemistry curriculum in an ACS-approved department. ACS accreditation may be sought upon graduation of the first majors and we anticipate accreditation in 2010. The curriculum is designed to meet the needs of students who plan to end their formal education with a bachelor's degree as well as those who wish to go on for an advanced degree. The UC Merced chemistry B.S. graduate will be well prepared to pursue a career in chemistry or an allied field. A basic chemistry program and three emphasis tracks in biological chemistry, environmental chemistry, and materials chemistry allow students to pursue interdisciplinary areas within a degree program that is still focused on chemistry.

A degree in the chemical sciences opens the door to a wide variety of careers in industry or government service, forensic chemistry in crime laboratories, commercial fields such as patent law and scientific writing, and high school science teaching. Many chemistry majors go on to graduate study to prepare for careers in teaching and/or research at the college or university level, or research positions in the chemical, pharmaceutical, electronics or other high-tech industries. A major in chemistry is also an excellent foundation for medical school or other careers in the health sciences.

Earth Systems Science - The Earth Systems Science (ESS) program was devised with an interdisciplinary core + emphasis model. Current emphasis tracks are: Atmospheric Sciences, Ecosystem Science, Geochemistry and Biogeochemistry, and Hydrologic and Climate Sciences. The ESS undergraduate degree program was formulated and is currently being supported by more ENG faculty than NS faculty (5 ENG vs. 3 NS plus two joint appointments), often through co-listed upper division ESS-ENVE courses. Because the ESS major is evolving to a true cross-school major, we propose that ESS should be formally established as a cross-school major, with potential re-formulation of the degree to be determined by the participating faculty. An exploratory committee is forming to perform the needed revisions to the major, and assure that an appropriate administrative structure is created to administer the major. We believe that with the recent and near term addition of critical faculty, and an aggressive revision and recruiting effort, ESS will be transformed into a long-term viable major at UCM. In established

universities, majors in the environmental area generally constitute about 3-5% of all undergraduates.

Biological Sciences - To-date Biological Sciences is the highest enrolled major on campus with more than 35% of undergraduate campus enrollments. UC Merced opened with two life sciences degrees: Biological Sciences B.S. and Human Biology B.A. Last year the faculty consolidated these two majors under the Biological Sciences B.S. as two core tracks –MCB and HBIO. Additionally, a third core track was established in IB; and a fourth Biochemistry/Molecular biology (BMB) emphasis requiring two years of chemistry is being elaborated.

Molecular and Cell Biology (MCB) is the most popular emphasis in Biological Sciences. A signature feature of this major is the large number of mathematics and computations courses, including mathematical biology and an emphasis on quantitative concepts in the biology core curriculum, as well as a requirement for at least one semester unit of research experience for all students. At the present time the growth of the biological sciences major is outstripping the growth of the faculty to teach the relevant core and emphasis tracks. Major goals for this coming year will be effectively to advertise other options to students, such as Earth Systems Science and the new Integrative Biology (IB) track. We anticipate that approximately 10% of the MCB students will move into the IB track

The HBIO emphasis shares cores courses and some emphases with the MCB track, but it also includes additional courses often required for health sciences professional schools. As with the MCB Core, the HBIO emphasis requires three additional thematically linked courses in topics such as human health, psychology, or environmental health.

The Biochemistry emphasis will emphasize chemical aspects of biology but will still be more biological than the similarly named biological chemistry track in the chemistry major.

The Integrative Biology emphasis provides students with a comprehensive education in all aspects of the complexity and diversity of life. IB is presented as a multidisciplinary science involving a wide range of complementary disciplines and contributes to, and benefits from, MCB & HBIO as well as ESS but also has its own unique organismal emphasis. This track is unique because it integrates multiple perspectives across the levels of life's hierarchy that extend from molecules to ecosystems.

Physics - Due to its foundational and applied importance, physics is an integral part of any general science program. The physics program at UC Merced is educating students in the basic physical properties of the natural world, and how these properties are manifest in a wide array of scientific phenomena. Physics students learn how to reduce complex problems to essential core issues, with an emphasis on quantitative and analytical reasoning. This broad range of fundamental skills is excellent training for a wide range of technical and/or analytical careers in the industrial sector, as well as for further graduate education in physics and related disciplines.

The physics major at UC Merced is distinguished from traditional programs by consisting of a core physics curriculum together with a student selected emphasis track. This is consistent with the other majors in the School of Natural Sciences. The proposed tracks include atomic/ molecular/optical (AMO) physics, mathematical physics, biophysics, and earth/environmental physics. Students may also design their own tracks with the assistance of their faculty adviser. The track structure allows students to explore physics within a variety of contexts, and it helps to build synergy between physics and the other scientific disciplines at UC Merced.

Minors - The SNS has developed minors to encourage students to increase their content knowledge breadth and to provide opportunities to develop additional depth in areas outside their major. Minors are available in physics, mathematics and natural sciences education (NSED). The NSED minor provides math, science and engineering students who are considering a teaching career courses in best practices of science-math teaching, and field experiences in K-12. The minor was designed so that courses articulate with those required by the state of California to become a credentialed teacher, facilitating student entry into credentialing programs and reducing the time post baccalaureate to receive a teaching credential. The students are also eligible to become an intern teacher after graduation, which allows them to be compensated during the credentialing process. This minor is part of the Science Math Initiative (see below).

Metrics for Success of Undergraduate Programs and Majors - One indicator of success for an undergraduate major is the number of students enrolled in upper division courses and the number of graduates from each major. Some majors, such as biology, have inherently high enrollments compared to mathematics, physics, chemistry and earth systems science majors. This is particularly problematic for the School, which strives to have an equitable workload policy (Appendix 2), because the School needs to balance faculty workloads, while encouraging success of all of the academic programs to which it has committed. Thus, it is important that School be realistic about taking on new programs if it is unable to meet the needs of existing programs. While the absolute number of students enrolled in upper division courses is important for faculty workload equity and instructional planning, the rate of increase of students in these courses over time can be used as an early indicator of success, particularly as the campus enrollments continue to increase. Steady growth of student enrollments in upper division courses and numbers of graduates in each major will be used to evaluate program success.

2. Graduate Programs

In fall 2006, the School Deans were given responsibility to serve as lead deans for selected graduate programs. In this role, the lead dean serves as an advocate for the graduate programs and balances resources needed for successful growth of graduate programs with resources needs for the undergraduate programs. The dean of the School of Natural Sciences serves as the lead academic dean for the graduate programs in applied mathematics, atomic and molecular science and engineering, and quantitative

systems biology. In this role, the lead dean is responsible for leveraging school and campus resources to ensure success of the graduate programs.

Table F4: Graduate Student Enrollment in Programs with Natural Science Faculty Participation

Graduate Programs	AY 2005-2006[b]	AY 2006-2007[b]	AY 2007-2008	AY 2008-2009
Applied Mathematics	-	5	9	18
CP	3	8	11	24
ES	16	19	21	25
QSB	8	14	24	48

As of 3rd week in Fall 2006

[a] Numbers based on campus enrollment report to UCOP

Resources needed for the graduate programs include sufficient faculty to deliver the graduate program, space for graduate students, and successful faculty research programs. A brief description of the graduate programs follows:

Applied Mathematics - Applied Mathematics (AM) was initiated in Fall of AY 2006-2007. This graduate group offers M.S. and Ph.D. degrees. This graduate program educate students in partial differential equations, numerical analysis and scientific computing, and asymptotic and perturbation analysis, among other special topics such as dynamical systems, computational fluid mechanics, nonlinear wave propagation, inverse problems, iterative methods, etc. Doctoral research projects are multi-disciplinary by construction and complement and contribute to the research going on in other graduate groups.

A focus of AM is to be highly interdisciplinary with contributions from faculty throughout the UC Merced campus. To facilitate this multi-disciplinary approach in manner that is flexible and inclusive, the AM faculty structure has "core" faculty and "affiliate" faculty. The core faculty is responsible for the development and support of the graduate program. Affiliate faculty members contribute by providing interdisciplinary research opportunities for graduate students thereby fostering multi-disciplinary research teams. While the current core faculty is primarily in the School of Natural Sciences, current affiliate faculty are from all three schools. Current affiliate faculty research interests include labor economics, neural networks, image processing, geometric modeling, and contaminant transport in aquatic systems, among others. Affiliate faculty members teach interdisciplinary graduate courses, advise graduate students, and/or serve on graduate committees. Through the participation of the affiliate faculty in this way, we ensure that AM builds strong linkages to other research programs on campus.

Applied mathematics at UC Merced is different from similar programs at other universities because all other applied mathematics programs are small programs or specializations within, or along side a larger "pure" mathematics program. Furthermore, the applied mathematical sciences program at UC Merced is developing along side other innovative programs rather than after all these programs are in place. The opportunity to

develop applied mathematics at UC Merced is attractive to students seeking an interdisciplinary mathematics graduate education. Because applied mathematicians are trained essentially in two or more disciplines, graduate students with that education have several options in the competitive academic job market. Moreover, the greater job market beyond academia is responding quickly and positively to graduate students with an interdisciplinary mathematics education. This graduate program, for instance, is well positioned to address growing demand in computational scientists in both industry and government research laboratories and centers.

Chemistry and Physics - Graduate students doing research in chemistry and physics at UC Merced are currently under the auspices of the Atomic and Molecular Science and Engineering emphasis area (proto-graduate group). Two second-year graduate students and four first-year students, all working with Natural Science faculty (two organic chemists, two physical chemists, and two physicists), are currently in the group, and the first of these students passed his advancement to candidacy exam in December 2006.

Graduate students in the physical sciences need to take a number of core graduate courses in order to acquire the fundamental proficiency in a discipline needed as a basis for Ph.D. level research. The group currently has a small number of approved graduate level courses geared primarily toward physical chemistry and materials engineering. Graduate level courses in organic chemistry and physics are under development. AMSE 290 (Special Topics) and AMSE 291 (Graduate Seminar) are offered every semester. AMSE 231 (Molecular Spectroscopy) was offered during Fall 2005, and AMSE 213 (Chemical Thermodynamics and Kinetics) was offered in Fall 2006. To provide a cohesive graduate program having the required disciplinary depth, we need to be able to offer about four graduate-level organic chemistry courses and at least eight physics and physical chemistry courses (in addition to AMSE 290 and 291). Each semester at least four faculty members will need to teach in the graduate program and be unavailable for undergraduate teaching. The small number of faculty in the group and the demands on the faculty for undergraduate teaching has made it difficult to accommodate the necessary graduate courses, most of which are being taught as overloads. Research-active chemistry and physics faculty at other research universities normally teach no more than one regular course, graduate or undergraduate, per term.

Because of the great disciplinary breadth spanned by the faculty, we have defined three emphasis tracks within the group: Physics, Chemistry, and Materials Science and Engineering. This organizational structure preserves the interdisciplinary flavor of the group's research interests, but it also addresses the fact that students need to develop a strong foundation in a core area of expertise before beginning scientific research. The three different tracks allow the CP group to administer tailored preliminary exams and to offer graduate courses appropriate for a student's area of expertise. At some point in the future, these three tracks will likely split into three distinct graduate groups, which nevertheless maintain their inter-disciplinary through shared research interests and goals.

None of UC Merced's current graduate groups are a fully appropriate home for faculty whose primary research interests are in Biological Chemistry and Physics. The CP group

is oriented toward materials, and while faculty who are primarily physicists, physical chemists or who have a strong biomaterials component may fit here, bioorganic chemists and biophysicists do not. Quantitative and Systems Biology may be a suitable home for the more biologically oriented members of this group, but its research programs are directed toward biology, not chemistry or physics. Most importantly, neither group is likely to be very attractive to prospective graduate students who come from a predominantly physics, organic chemistry, biochemistry, biophysics, or bioanalytical chemistry background and want a graduate program that is highly focused on biological chemistry and physics. Formation of a graduate group in Biological Chemistry and Physics would appear to be desirable once an adequate number of faculty in this area are on board. In the event of Chemistry and Physics graduate groups being formed, this group could also serve as a research pillar offering specialized courses with faculty belonging to the Physics or Chemistry graduate groups. In view of the popularity of biologically oriented chemistry and biophysics among students seeking Ph.D. degrees, it would seem foolish for us not to create structures for graduate education that will encourage such students.

Environmental Systems - Research in Evolution and Environmental Sciences is anchored by the Environmental Systems (ES) graduate program, which has been the most successful graduate program at UCM. The current census includes 7 M.S. and 15 Ph.D. students, with one masters student graduated in 2006. The ES faculty are currently split between NS, ENG, and SSHA, with several joint appointments (Table E5). The ES group (9 faculty) has already enjoyed enormous success in acquiring extramural funding in support of its research and laboratory facilities (more than $9M research funding between 2003 and 2009) and plans to continue this trajectory of extramural funding growth as the faculty expands. The ES group has already attracted strong graduate school applicants and is well poised for expansion if faculty growth is maintained. The SNRI is a key asset in building international prominence for our graduate program and facilitating high-impact interdisciplinary research. The ES faculty recognizes that the strength and uniqueness of the program lies in its position at the interface between science and engineering disciplines, and in its integration among chemical, physical, and biological Earth processes. As such, an important tenet of strategic faculty growth is to maintain a complementary balance of faculty in the Schools of Natural Sciences and Engineering, or joint positions, when appropriate, in strategic areas.

The ES group is developing plans to introduce professional M.S. programs in popular areas for individuals interested in career development (e.g., environmental systems engineering; water resources science and management; geospatial analysis; public lands conservation and management). In order to deliver this type of program while maintaining a strong Ph.D./M.S. research program and delivering undergraduate curricula, sufficient faculty will be needed in key areas to balance teaching load with research across all degrees levels. Complementary faculty associated with the School of Management will also be required to deliver this type of degree.

In addition to ES, several of the Evolution and Environmental Sciences faculty are affiliated with the Quantitative Systems Biology (QSB) graduate program; most of this faculty admit, or plan to admit graduate students through both degree programs,

depending on their students' interests. Given the dual affiliations of these faculty, several future course offerings will likely be cross-listed between the two programs, fostering interaction among QSB and ES graduate students. Several of the emerging research initiatives above may foster new graduate degree programs as they grow.

Quantitative and Systems Biology - In AY2007-2008, there are 24 graduate students in the Quantitative and Systems Biology Graduate Group (QSB), of which 9 were in the biomedical sciences. Based on the growth in QSB faculty over the past year and the concomitant growth in research funding awarded to UC Merced, we expect this number to grow steadily. Another source of growth in the biomedical sciences graduate programs will be M.S. students. There have already been many inquiries about the 5th year MS program being offered as part of the Molecular and Cell Biology emphasis track, so it may be reasonable to assume that 15-20% of the graduating Biological Sciences seniors would go on to this program.
The evidence from existing programs is that UC Merced has the opportunity to create a substantial graduate program in the biological sciences. Nationwide, the pool of biology doctoral students is very large. In 2002 nearly 4,500 life sciences Ph.D.s were conferred—by comparison in the same year 3,800 were conferred in all of the physical sciences combined. [http://nces.ed.gov/programs/digest/d03/tables/dt254.asp] Moreover, life sciences doctoral programs have a strong record of successfully recruiting women—approximately 45% of life sciences Ph.D.s went to women in 2002, compared with 28% in the physical sciences and 17% in engineering. [http://www.bls.gov/emp/mlrtab2.pdf]. The large number of biology Ph.D.s is driven by the large size of the biology research community. The US Department of Labor reports a labor pool of 75,000 life scientists in 2002 (exclusive of environmental scientists) and 62,000 medical scientists (who typically get Ph.D.s in the life sciences.) These two groups are expected to grow by 19% and 27% respectively by the year 2012.

Most graduate programs in the biomedical sciences are very discipline-oriented, e.g. biochemistry, cell biology, etc. This restricts the type of students entering the program and limits the training opportunities for students in the program. In contrast, the Quantitative and Systems Biology graduate group at UC Merced brings together faculty from a wide range of disciplines with broad expertise to investigate the complex systems and networks responsible for the biological functions of cells, tissues, organisms, populations, and ecosystems. The current QSB faculty is drawn from both the Schools of Natural Sciences (17 members) and Engineering (5 members) covering disciplines including molecular and cell biology, evolutionary biology, genomics, proteomics, signal transduction, experimental technologies, and computational biology. QSB students are involved in a wide range of biomedical sciences research projects, and this will continue to grow as new faculty join the graduate group. The doctoral program emphasizes quantitative analyses at multiple levels of biological systems, development and use of novel model systems, and computational and analytical approaches for the study of biological processes.

G. INITIATIVES

1. Biomedical Sciences Research Institute

Human health and health of the environment are two of the School's major research themes. These areas have many interconnections and synergies – the study of air quality in the Central Valley, the study of asthma and the study of atmospheric chemistry. These themes are captured in UC Merced's research institutes – the Sierra Nevada Research Institute, the Energy Institute and the Biomedical Sciences Research Institute (BSRI). This Institute builds on the stellar technologic base in biomedical research that is evolving at UC Merced. The Institute is envisioned to form one of the research arms of medical education as educational programs for health professionals develop at UC Merced. Originally proposed as the Biomedical Sciences and Systems Biology Research Institute, this institute was approved by the UC Merced academic senate in spring 2006. Subsequently, with the advent of new faculty in the School of Natural Sciences, much discussion ensued around the use of the term systems biology, and the involved faculty agreed that the title of Biomedical Sciences Research Institute was more consonant with the theme of the research intended for this research than systems biology. While the title of the institute can be modified in the future once the research agenda is further developed, it was agreed that eliminating systems biology for the short term is desirable. The proposed BSRI is the first UC Merced institute to focus specifically on human health issues and bring together faculty from the Schools of Natural Sciences and Engineering with research agendas in the health sciences. This institute will form a strong foundation for health science programs at UC Merced and support emerging plans to develop medical education and a School of Medicine. It will serve as the link between state-of-the-art biomedical and clinical research, creating a strong translational research component to addresses the health care challenges in the region. The integration of basic, applied and clinical research fundamentals will foster stellar biomedical and community health research, spawning discoveries, technological advances, community and public health strategies to address health disparities, encourage cultural competency, and importantly, impact the region in which the research is carried out. The BRI is envisioned to have a faculty director, 12-15 core faculty, and a larger number of affiliated faculty members with research interests that fall within the scope of the Institute's mission. The Institute is built around technologic cores of cutting edge research and instrumentation that can be accessed by faculty and students campus-wide. Cores that support the clinical and translational research for health and biomedical sciences may also be part of this institute. A 5-year plan with extensive fundraising efforts is envisioned. A search for a potential director of the BSRI is underway in AY 2008-2009 and is being led from the Provost's office.

2. Planning for Medical Education at UC Merced

The University of California recently completed a comprehensive analysis of California's short- and long-term health needs. The shortage of health care providers and the state's changing demographics, including aging, increasing diversity, and a growing load of chronic disease, in a population that is growing at twice the national average, mandate expanded health career training opportunities. Recent analyses of the health care status of the San Joaquin Valley revealed wide-spread disparities in health care access and health

care provider shortages across the region relative to the state of California. A number of recommendations to address these disparities were suggested, including increasing training opportunities for physicians and other health care professionals in underserved regions of California, such as the Central Valley and the Inland Empire. UC Merced has been actively promoting development of a medical education program, on a trajectory toward a medical school.

While this is a campus-wide initiative, much of the initial planning has been lead by the administrative leadership of the School of Natural Sciences, with input from faculty across the campus. A history of the chronology and planning process can be found at http://med.ucmerced.edu/. Briefly, the planning process involved conceptualization of a medical school at UC Merced by a faculty-community task force in December 2005, Divisional Academic Senate endorsement of a medical school concept for UC Merced in Spring 2006, submission of a plan for medical education to UCOP in June 2006, inclusion of a 32 seat allocation for a UC Merced inaugural medical school class by the UCOP Health Enrollment Task Force within the next decade (2012 proposed target date), and recommendations to UCOP by a joint UC Merced-UCD-UCSF academic task force that met in December 2006 to discuss development options for a medical school at UC Merced, based on inter-campus partnerships. A draft business plan completed in 2007 describes the educational mission of the medical school and initial research thrusts. The proposed school is based on a regional distributed model of medical education that leverages partnerships with community health care institutions for clinical training, while the instruction and research in basic and applied sciences are carried out on the UC Merced campus.

Continued planning for a medical school is a lengthy process requiring endorsement at multiple levels within the UC system and external to the UC system. Once this planning is completed and a medical school endorsed by the Regents and elected officials in Sacramento, UC Merced will have a professional school whose graduates will impact health care access in the region, and which will provide a research foundation for research in basic and applied sciences, as well as population-based health. The research agenda of the medical school will provide opportunities for integration of efforts across the campus in areas that impact health science and health care including health policy, economics, social sciences, health informatics, health care delivery, multi-cultural medicine, and of course basic and applied sciences. Most universities that belong to the American Association of Universities (AAU) have professional schools. The medical school at UC Merced will help the campus with its aspiration to become to belong to the AAU and become a comprehensive UC campus.

3. Science-Math Initiative (SMI): California Teach

To address the critical need in California for highly qualified K-12 teachers in science and mathematics, the University of California, in partnership with other segments of California's K-16 educational system, has the goal to produce annually 1,000 or more highly qualified science and mathematics secondary school teachers by 2010[1]. Since each

[1] See http://www.universityofcalifornia.edu/academics/1000teachers/proposal.pdf

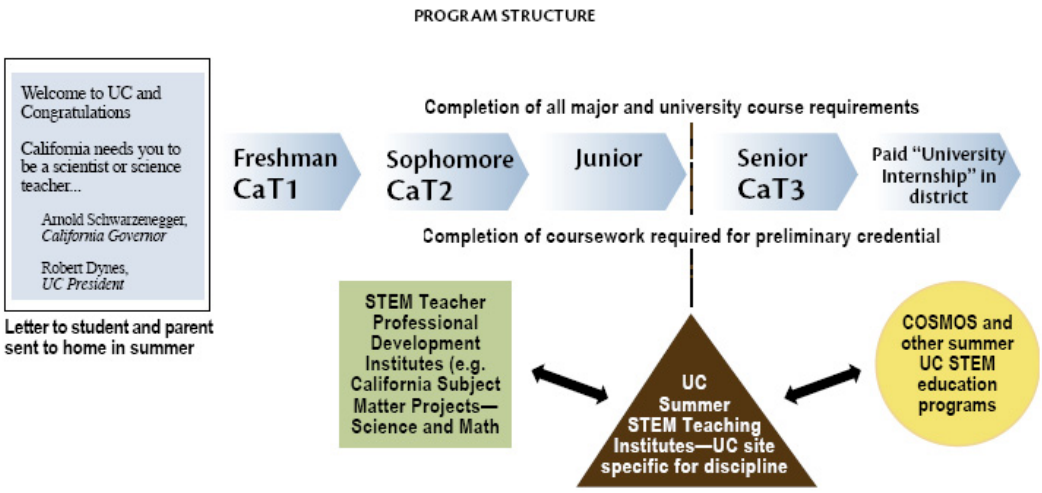
teacher can touch the minds of more than one thousand students during 10 years of teaching, one thousand teachers will touch the minds of more than one million California children. These UC-educated teachers will become the future educational leaders of our schools and will be a key element in helping California maintain its global economic position in science, technology and innovation.

The program enables UC Merced undergraduate students the opportunity to complete a UC major in a science, technology, engineering or mathematics (STEM) field while completing the coursework that will prepare them to be a highly qualified science or mathematics secondary teacher in four academic years. Immediately upon completion of this program, students would be eligible to become a "teacher of record" in a California high school, and be paid by the district at the level of an entry level teacher. These "University Interns" or "District Interns" will be supervised during the internship either by the sponsoring university or the district. In both cases, these interns would be considered as "highly qualified teachers" by "No Child Left Behind" definitions.

The model for this "dual track" program is depicted below. It is an idealized model for the student who had been accepted to UC as a freshman and who decided to begin the dual track program in the first year. We know from the experiences of the Texas U-Teach program that programs must allow for multiple entry points as different students may decide to enter teaching at different points in their undergraduate careers. We also realize that we will need to work very closely with our community college partners to ensure that community college students who are interested in going into science and math secondary teaching are given the opportunity to participate in this program prior to transferring to UC. Taking into consideration these guidelines as well as the SMI experiences of other UC campuses we are currently implementing the SMI program while adapting existing models to the needs and capacities of UC Merced and the local school districts.

The model consists of several elements including:

- initial recruitment of students into the program,
- coursework and fieldwork that will constitute the Science and Mathematics Education Track within Natural Sciences Majors and lead towards obtaining teaching credential, lower-division program elements,
- coursework required for subject matter preparation and education preparation,
- the UC Summer STEM Teaching Institutes, and
- financial incentives and support systems for student participants.



Current interest in the program is high, with 90 math/science/engineering majors enrolled in the first CAT course delivered in Fall 2007. The goal of this program is to graduate 30 science/math/engineering majors/year within 3 years, who are prepared to directly enter a teacher credentialing program. One component of the preparation is envisioned to be a minor in math and science education. Our initial partner for credentialing is CSU-Stanislaus, who will provide the training required for teacher certification. The ability of this program to graduate students with subject matter content knowledge in math and science to become teachers, who ideally will stay in the region, will substantially elevate the level of math and science preparation of students who will enter four year institutions, including UC Merced.

4. Student Academic Success

The School recognizes the challenges associated with preparing our diverse student body to be successful in science and math courses and in Science majors. The School has created a science student retention program, called "Excel!" that targets students who are struggling due to the lack of academic preparation for a science major. In reviewing various model programs for improving student achievement, one model emerged as both rigorous and successful. Natural Sciences students on academic probation and subject to academic disqualification are required to participate in the program. All Natural Sciences students are welcomed to participate. The program requires that Excel! Students participate in relevant lower division math and science workshops led by advanced students. These advanced students work with faculty to ensure that the workshop content is relevant to course. Excel! students are expected to attend skills workshops and tutoring established by the Student Advising and Learning Center to help them strengthen their study techniques and their understanding of the course material. These students are required to attend faculty office hours and TA office hours at least once each semester. Beginning Spring 2007, Excel! students have an opportunity to enroll in a one-unit seminar course to help them better acclimate to the university culture and expectations.

As part of the course, students will meet with an assigned faculty or graduate student in a small mentoring group for an hour a week to further develop material taught in lecture. Students who fail to meet the terms of their contract are dropped from the program. Failure to participate in the program coupled with poor academic performance results in dismissal from the School. This collaborative method enforces critical thinking and problem-solving skills. While this program is be very effective in helping low-performing students get back on track it is also useful to help students *avoid* being placed on academic probation or becoming subject to dismissal.

Excel! has worked with 149 Natural Sciences students whose grade point averages (GPAs) were below 2.0 since fall, 2005. The GPAs of 110 of these students have improved and returned to "good standing." More than 65% (96) of the 149 students earned at least a 2.0 or higher GPA after one semester and 74% (110) had achieved a GPA of 2.0 or higher after 2 semesters. Of the remaining 39 (26%) students who participated in the Excel! Program, 21 were dismissed after one or two semesters without improving their GPAs, 14 withdrew from the university and 4 are still working to improve their status.

5. Science and Math Education Center

Improving the level of educational achievement in the San Joaquin Valley is an important component of the rationale to locate the 10th campus of the University of California system in Merced. The SMI program is a natural extension of other UC Merced efforts to address the challenges of inadequate levels of preparation for students from the Valley and the creation of a college going culture in the Valley. As the relationship between SMI program and the local K-12 education partners grows and develops, it is important to consider programs that would directly benefit local teachers and students in preparing students for success in science and math courses and careers.

Some of the faculty in the School of Natural Sciences are considering creation of a Science and Mathematics Education Center. Such a center would encompass SMI and focus (i) on educating UC Merced science and math students who are interested in becoming teachers, (ii) working with in-service teachers and schools who want to improve the level of science and math education, and (iii) developing pipeline building programs that would benefit UC Merced by addressing the quantity and quality of students applying for admission to the university from the Central Valley. The prototypes of the components of such center already exist within the SMI program. Through the SMI courses, we are partnering with local schools and bringing inquiry-based science and math education methods into local schools through joint work of SMI students and local teachers. Summer institutes and seminars focused on both improving students' understanding of science and math concepts and their ability to communicate and teach them to others are in the planning stages and will help to serve as bridge programs for our students as well as preparation improvements for high school students from the region. These programs will help to recruit students into science and math majors. Early experiences with implementing and evaluating these programs will help guide the planning and development of a future math and science education center.

H. SPACE AND FACILITIES

The availability of research space is the greatest impediment to the development of viable and stellar academic programs in the sciences. The campus-wide space issue was addressed in the 2006 report of an *Ad Hoc* Campus Space Committee. While the report contains many useful data, some assumptions, particularly the expected number of graduate students and post doctoral fellows per faculty member, minimized the severity of the problem. Currently, a single campus building (the Science & Engineering Building, SE1) contains all of the offices and most of the research laboratories for the Natural Science and Engineering faculty, administrative space for Natural Science and Engineering, student support space, and the instructional laboratories for Natural Science and Engineering courses. Most of the SNS faculty have their research space in SE1. Some faculty (3 SNS faculty, and 2 joint appointments with the School of Engineering) are housed at Castle; an off-site UC Merced facility eleven miles by road from campus. The location of the SEM/TEM, mass spectrometer, Genome Center of Excellence, and two NMR's indicated that faculty needing access to these facilities should have priority for locating at Castle. Similarly, the emerging program in Solar Energy, which is also located at Castle, suggests that energy research is a good programmatic fit at this site.

To date, 38,495 asf (37%) of space in SE1 has been assigned to Natural Sciences. The School of Natural Sciences currently has 35 research-active faculty, and fifteen more searches are underway during AY 2007-2008. The space allocated to the School of Natural Sciences in the SE1 building will be completely filled with the 07-08 faculty hires. In fact, the School will be short 14 offices and approximately 3 laboratory spaces if all of the 07-08 searches are filled. The School uses the space allocation guidelines in recommended by the *Ad Hoc* Campus Space Committee as a baseline for assigning space. It is recognized that some faculty will require additional space, and some may require less, depending upon the size of the research group. The dean has authority over space allocations.

The second Science and Engineering building (SE2) is due to be ready for occupancy in 2013-2014. This building will contain 25,700 asf of research space. It is clear that the size of the building needs to be increased, and creative solutions for public private partnerships for new space need to be identified.

The administration and the faculty are working together to address the space constraints. Temporary (modular) buildings can help considerably in the short term, providing office space for graduate students and post-doctoral fellows, freeing up more room in the laboratory. Space for computational faculty and their research programs may also be located in modulars, freeing up office space in close proximity to laboratories for faculty with experimental programs. The Castle facility must play a role in alleviating the campus space crunch. Castle buildings 1200 and 1201 contain ~25,500 asf of research space and another ~20,000 asf of office space. The distance and time (11 miles, ~25 minutes) between the two Castle buildings and the main campus, the need for frequent

faculty supervision of students performing laboratory research, the lack of transportation between Castle and the campus, and limited parking on campus, complicate use of Castle for research programs. Significant resources would have to be invested into Castle to make it a viable satellite campus. Most UC campuses have satellite campuses within 10-20 min of the main campus and invest the resources to make the satellite campus viable for research-intensive faculty.

The Dean of Natural Sciences submitted a proposal to Provost Alley on October 17, 2007 requesting lab and office space for 2007 – 2013. Beginning in July, 2008 the School anticipates a shortage of 14 faculty offices and 3,000 ASF of research space. In order to recruit top quality faculty we are requesting 1,000 asf per lab as an incentive for faculty to locate at Castle. Table H1 presents our overall need for research and office space through AY 2013. By the year 2013 we will need new space for 54 faculty offices, 5 administrative offices, 43,000 asf for research space, 176 seats for graduate students and 112 post doc seats.

Table H1: School of Natural Sciences Space Requirements Summary

	Actual '05-'06	'06-'07	'07-'08	'08-'09	'09-'10	'10-'11	'11-'12	'12-'13
Faculty FTE	27	31	39	46	53	61.5	69	77
Unfilled Faculty FTE	4	10	5	7.5	8.5	8	8	8
Grads	11	27	45	90	114	138	162	186
Postdocs	11	25	32	48	64	80		
Space Needed[a]	29,800	28,000	39,000	47,000	55,000	63,000	71,000	79,000
Space Assigned to SNS[b]	*24,200*	*~38,000*	*38,000*					

[a] For faculty laboratories and offices only
[b] Includes space in Science & Engineering I

Table H2: Types of Research Space Required

	2007-2008	2008-2009	2009-2010	2010-2011
Research (wet & dry)	3,000	8,000	8,000	8,000
Office	1,820	1,040	1,040	1,040
Totals	4,200	9,040	9,040	9,040

I. PUBLIC SERVICE

Public service is one of the foundational elements of a UC campus. The faculty in the School of Natural Sciences addresses the needs of its stakeholders and beyond in three major areas: research, teaching, and community partnerships.

Research: The School of Natural Sciences faculty is involved in basic and applied research that increases understanding of environmental systems and environmental stewardship, health sciences and human health, materials science and energy, precise control over the fundamental building blocks of ordinary matter, and organic electronic materials, photovoltaics, photonic materials, nano-scale electronics, and "smart" materials. Faculty translates discoveries into practical knowledge and innovations that benefit California and the nation.

Teaching: Through its undergraduate majors and graduate programs the School of Natural Sciences at UC Merced is preparing the future workforce with science and math content knowledge that can be applied to a wide variety of careers in science, technology, government, education, health, and environmental stewardship. Through the Science and Math Initiative, faculty members in the School of Natural Sciences have taken the lead in developing programs to increase the number of math and science subject-matter-credentialed teachers in the region.

Community Partnerships: In addition to the partnerships of the School of Natural Sciences and the K-12 institutions in the region through the Science and Math Initiative, the School has sponsored programs to increase community awareness about science and mathematics career opportunities and benefits of science to society.

Public events are hosted by the School to stimulate interest by K-12 students in higher education and potential careers. 1) Health Careers Day provides information to potential UC Merced students about health profession career opportunities. 2) Weird Chemistry Night attracts over 300 elementary students and their families to campus to experience chemistry in an interactive presentation. 3) Dinner with a Scientist hosts science-START teachers who bring their high school students to meet faculty and interact over dinner.

The School hosted the regional finals for the 2007 Science Olympiad for more than 750 middle school and high school students. The 2008 Science Olympiad Regional finals will also be hosted at UC Merced. The School has also been the host to several summer institutes for underrepresented high school students (MESA), the Flynn Institute for high school Physics teachers and HECHT for Chemistry teachers.

School faculty participate in numerous public lectures and forums in the community and serve on a number of community advisory boards. They have forged collaborations with regional institutions around both research and teaching. An excellent example of these

collaborative efforts is linkage of SMI programs with the Center for Educational Partnerships. Faculty laboratories have been opened to tours of students in elementary and secondary schools and they have led and participated in summer institutes for secondary school students.

J. METRICS OF SUCCESS FOR RESEARCH AND ACADEMIC PROGRAMS

Overall Metrics

The success of the School in meeting its goal and objectives can be assessed using a number of metrics, some of which are described below.

A. Research excellence
   1. Peer-reviewed publications
   2. Natural Science contributions in moving UC Merced toward a Tier I AAU research intensive institution
   3. Peer-reviewed funding

B. Recognition of faculty stature and accomplishments
   1. Awards and elected membership in prestigious scientific organizations such as National Academies of Sciences, society fellows, etc.
   2. Elected scientific society leadership positions
   3. Participation in national and international science advisory committees
   4. National and international speaking engagements

C. Faculty recruitment and retention
   1. Normal academic advancement and progression
   2. Continued recruitment of outstanding faculty

D. Creating a School that reflects the diversity of California
   1. Moving toward creating a faculty that reflects the diversity of our anticipated student body (richly diverse in ethnicity and socioeconomic background).
   2. Increasing numbers of students from the region, the state and beyond enrolled in undergraduate science majors and graduate inter-disciplinary graduate programs.

E. Excellence in pedagogy and curriculum innovations.

F. Placement of students in higher education programs such as graduate school and professional programs.

G. Increasing enrollments of students in upper division courses in each of the majors offered by Natural Sciences and an increasing graduation rate in each of the majors.

H. Effective university and public service

Faculty Mentoring

The senior faculty members of the School of Natural Sciences strongly support the premise that the School, through its senior faculty, must provide each of our Assistant Professorial hires with a nurturing environment that will enable their development as researchers and scholars. This is particularly important in our current start-up mode where there are endless opportunities for diversion from those areas that are the necessary elements in successful promotion and tenure decisions.

The School of Natural Sciences is developing a mentoring plan intended to provide meaningful guidance and time needed to develop competitive research programs for all assistant professors. This plan includes a number of elements. One element of the developing program is facilitating establishment of ongoing counseling relationships with a senior faculty mentors. The senior faculty member will be a strong source of career guidance and will help assistant professors to make informed choices regarding their involvement in committee work and teaching activities that can reduce their commitment to research. Perhaps, most importantly, the mentor should help to facilitate the development of meaningful research collaborations both here and at other campuses.

Second, the faculty has agreed to a differential teaching load for junior and senior faculty members. In order to provide the most favorable circumstances for the junior faculty retention and success, the School has chosen to provide a reduced teaching load for all Assistant Professors during their first year of appointment. During this time, the teaching load is half that of their senior counterparts. This provides additional time for faculty members to establish and develop their laboratories and research programs, essential elements of success in the School of Natural Sciences.

It should be noted that implementation of this mentorship plan will be difficult if the initial goal of building a strong foundation of senior faculty is derailed as a result of budgetary limitations. Most established campuses have a preponderance of tenured faculty from which to draw appropriate mentors. At UC Merced, after the initial recruitment of senior faculty, most of the subsequent hires have been concentrated at the junior level. Continuation of this will dilute the School's ability to provide a meaningful mentorship program and hamper effective mentor.

School of Natural Sciences Planning Summary						
		AY 2005-2006 (actual)	AY 2006-2007 (actual)	AY 2007-2008	AY 2008-2009 (projected)	AY 2009-2010
INCOMING STUDENTS						
Frosh		273	201	243	284	284
Transfers (jrs)		25	44	44	32	32
Undeclar joining Nat Sci		37	45	72	85	85
Grad students		10	17	28	45	45
TOTAL Nat Sci STUDENTS						
Frosh		273	201	243	284	284
Soph		2	146	134	268	284
Jr		40	86	172	191	300
Senior		2	32	45	237	191
Grad		26	27	45	90	113
Totals		343	492	639	1070	1172
ENROLLMENTS by DISCIPLINE						
BIO		721	810	907	1483	1705
CHEM		497	835	1107	1730	1990
ESS/IB		62	58	646	920	1058
MATH		888	1242	1818	2610	3002
PHYSICS		259	421	539	1130	1300
NSED		0	61	124	150	173
Total UG enrollments		2427	3427	5141	8023	9226
Physics & Chemistry			35	42	84	168
ES		14	28	26	52	104
QSB		58	172	170	340	680
AMGS			17	92	184	368
Total Grad enrollments		72	252	330	660	1320
FACULTY *						
Filled		27	31	39	46	53.0
Unfilled		4	10	5	7.5	8.5
Total		31	41	44	53.5	61.5
Auth/Req for following year		10	9	9.5	8	8
Lecturer FTE		4	7	9 **	9	9
WORKLOAD RATIOS						
BIO				1:08	1:14	1:14
CHEM				1:33	1:33	1:33
ESS				1:14	1:11	1:11
MATH				1:44	1:40	1:40
PHYSICS				1:16	1:18	1:18
NSED				1:16	1:20	1:20
Total FTE/faculty		1:15	1:16	1:20	1:22	1:22

* includes all Asst, Assoc & Full Profs including Traina, Pallavicini & Alley who have primarily administrative positions

** budgeted for 5.5 lecturer fte, used 9.0 fte

Strategic Plan for the School of Social Sciences, Humanities and Arts, 2008-2013

March 24, 2008

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Strategic Plan for the School of Social Sciences, Humanities and Arts, 2008-2013
February 28, 2008

EXECUTIVE SUMMARY

Enrollments in SSHA programs will grow exponentially in the next few years Many new majors have been or will be added, some of which are known to attract large numbers of students. Over 40% of the total undergraduate enrollment is expected to be in SSHA in the near future and, in a longer range perspective, 55-60%. To ensure robust enrollments, the committee on Recruitment and Retention was has been given resources for various types of outreach.

The next five years will focus on strengthening existing programs and disciplines by a thoughtful faculty recruitment plan that assures a balance of tenured and non-tenured faculty and diversity. We will recruit, develop and retain a distinguished and diverse faculty and staff to increase national and international distinction and leadership in learning, discovery and engagement. Faculty will be added as necessary when programs grow and where a marginal addition can lead to new, potentially attractive programs. There will also be an emphasis on building resource pools for interdisciplinary programs, both with SSHA and with other Schools.

The faculty needs to grow by about 15 new positions per year as SSHA undergraduate enrollments grow from the current 616 to about 2,500 in AY 2012-13,.

A total of 17 FTEs are requested for 2008-9, 10 of which are considered the highest priority:

- Health Psychology, Professor
- Sociology, Professor
- Political Science (Behavior), any level
- Health Psychology, Assistant Professor
- Philosophy, Professor
- World History, Assistant Professor
- Musicology , Professor
- Cognitive Science (Visual Perception), any level
- *Media Arts, Lecturer PSOE*
- *African Diaspora, any discipline, tenured (any discipline)/Diversity opportunity*

The two last positions in the above group are considered as strategic positions that will either support the creation of a new major in an area where the critical mass is missing or to potentially increase the diversity of the faculty.

Currently an ‘opportunity recruitment’ is being pursued in History. If this effort is successful a new FTE in history will have a lower priority and the Musicology FTE from the second priority group would be given the highest priority. The African Diaspora position has many emphases possible and has high

priority since there is a great demand from students and because it has a high likelihood to contribute to faculty diversity.

Seven additional positions are needed in the short term, and have been placed in a second group with lower priority:

- Developmental Psychology, Full Professor
- Political Science, any level
- Philosophy, Full/Associate
- Economics, Lecturer PSOE
- Sociology, Full/Associate Professor
- Anthropology (Archeological), Full/Associate Professor
- Spanish Linguistics, Lecturer PSOE

There is also a need for more management faculty. However there are three unfilled positions in management. Furthermore, a proposal is underway to create a Management School. This proposal will outline several positions needed when the school is developed. Many of these positions will be joint positions with the management school and one of the existing schools. The need for management faculty will not be dealt with in this strategic plan.

An important factor in deciding on rank of new faculty is the need for mentoring of assistant professors. A formal mentoring plan should be developed next AY.

0. Overview of the Process and Faculty Support for the Plan

This strategic plan is a outcome of faculty discussions within the School of Social Sciences, Humanities and Arts in Fall 2007 and early 2008. Each of the three sections of the School has produced its own plans, and so have certain interdisciplinary groups. (See Appendix.). This plan is an update of the 2007-08 strategic plan.

The plan discusses the growth of the school and what new faculty positions should be sought for the coming five-years. The faculty discussed the prioritization of positions within the three sections. These rankings were then merged into a final list of prioritized FTEs, based on need demonstrated by student enrollment and strategic considerations.

1. CHALLENGES, VISION AND MISSION

1.1. Challenges

The School of Social Sciences, Humanities and Arts (SSHA) faces the several challenges over the next five years, including:

I. Forging a school that is distinct from but competes with and contributes to the intellectual activities of similarly constituted schools or divisions at other University of California campuses.

II. Developing strong disciplinary and innovative interdisciplinary undergraduate and graduate programs that will both attract and retain traditional and non-traditional students

III. Maintaining the highest standards of research, graduate education, and undergraduate instruction in light of limited resources, laboratory space, and University-based funding in the short-term if not the long-term

IV. Ensuring that the campus infrastructure keeps pace with and can accommodate planned growth within SSHA over the next decade

V. Acquiring external funding to support faculty and graduate student research within fields that often have fewer venues through which to obtain such support

VI. Addressing the special needs of an entering student body generally dominated by non-traditional students, to facilitate learning, decrease attrition, and promote scholastic success

VII. Encouraging a college-going culture within the Central Valley to develop a base of students who are prepared to meet the intellectual, financial, and personal challenges of a University of California education

VIII. Developing an internal structure that can evolve to meet the challenges of a diverse School and the complexities of a modern research university.

IX. Providing a supportive work environment for a proportionally large group of assistant professors, including those from diverse backgrounds.

1.2 Vision

SSHA will be an intellectual leader within and beyond the University of California through innovation based in both core multidisciplinary strengths and interdisciplinary collaboration and problem-solving to meet the challenges, address the changing needs, and facilitate socially responsibility understanding of society.

1.3 Mission

SSHA serves regional, state, national, and international communities as a multi- and interdisciplinary partner within a research-intensive public university committed to innovative and substantive research, excellent teaching, and student-focused learning. SSHA is dedicated to providing depth within a broad range of outstanding undergraduate and graduate programs that prepare students for varied roles as responsible, informed citizens and leaders. Research and academic programs encourage intellectual growth, prepare students for marketable, challenging careers and professions, instill the values of lifelong learning, and encourage civic responsibility, public service, and understanding in a diverse, global society.

2. STRATEGY

2.1 Strategic Actions

SSHA will pursue an aggressive five-year strategic plan. The goals include:

- strengthen existing academic programs and develop new programs through strategic hiring of ladder-rank faculty. Faculty recruitment will consider the balance between different ranks of ladder rank faculty as well as diversity of the faculty as a whole in the School;
- create innovative interdisciplinary research and educational initiatives within and beyond SSHA through University-wide collaboration and knowledge-sharing;
- anticipate and accommodate research and administrative needs (e.g., space) well in advance of critical junctures, and pursue needed funds through University, development, or grant sources;
- interacting with the community through both on- and off-campus events and initiates

2.2. Current State-of-the-School

2.2.1 Faculty

SSHA strives to create a rich learning environment by looking at people and society through the lenses of the many disciplines within the social sciences, humanities, and arts. As summarized in Table 1, 13 disciplines are currently represented by 31.5 ladder-rank faculty within SSHA. If all faculty searches for AY 2007-08 prove successful, 51 ladder-rank faculty will be in place within SSHA by AY 2008-09. The School will offer 8 majors and 15 minors. Nearly all of these existing programs are well represented at other UC campuses - Cognitive Science, as a relatively new discipline, being the exception. At least two new majors will be developed next, depending on whether the requested FTEs will be provided.

Currently, SSHA students account for nearly 40% of the undergraduate population at UC Merced. This share is expected to grow to 50% during the next five-year period as new majors and minors become available for students. In a longer perspective SSHA should, based on the situation at other UC campuses) account for 55-60% of the total undergraduate student population.

Table 1. Faculty by discipline 2007-2009.

DISCIPLINE	AY 2007-08 FACULTY	AY 2008-09 FACULTY
Anthropology	3	4
Arts	3	4
Cognitive Science *	2.5	5
Economics	4	6
Geography†	1	1
History	3	4
Literature	4	5
Management ‡		3
Philosophy	1	2
Political Science	2	4
Psychology	4	7
Sociology	1	3
World Heritage	1	1
Writing Program	1	1
Foreign Languages	1	1
TOTAL	31.5	51

* Includes one half-time appointment shared with School of Engineering in 2007-08 and two such appointments in 2008-09
† Two half-time appointments shared with School of Engineering
‡Faculty in Economics, Geography and Cognitive Science currently contribute to this program

Of the current 32 SSHA faculty members, only 9 are full professors and 23 assistant professors. If all new faculty positions are filled, 8 new tenured professors will join the faculty in 2008-09. Two assistant professors will be promoted to associates professors. This will make the proportion of tenured faculty members 40% of the total faculty. The long-term goal is to reach a 60-65% figure. Several assistant professors are expected to go up for tenure in AY 2008-09.

The SSHA faculty is committed to promoting diversity at all levels. Currently our faculty is 28 %, female, 72.3% Caucasian, 13.9 % Hispanic, 11.1% Asian American, and 2.7% Native American.

The last two years' recruitment has resulted in a less diverse faculty. To reverse this trend and to further foster diversity, this plan undertakes several actions: (a) recommending the adoption of a diversity plan (drafted AY 2005-06); (b) recommending several hires in all areas to generate diverse pools; (c)

increasing the proportion of senior faculty, who can mentor diverse assistant professors; and (d) taking active steps to provide a supportive environment to retain diverse faculty.

2.2.2 Curriculum

AY 2006-07 has been a year for curricular reorganization at SSHA, as founding programs have achieved critical mass of faculty and attracted substantial enrollments in both majors and courses. Part of this reorganization has been aimed at defining programs that are readily recognizable to non-traditional students who form that basis of much enrollment at UC Merced. The two founding majors of Social and Cognitive Sciences (SCS) and World Cultures and History (WCH), respectively, have ceased this academic year, and new, more marketable majors have been approved in their place. By the end of AY 2007-08, SSHA majors will consist of:

1. Cognitive Science
2. Economics
3. Psychology
4. History
5. Literature
6. Management
7. Political Science

One new major (Anthropology) will be offered 2008-09, pending final decision by UGC. Furthermore two majors will be developed, Sociology and GASP (Global Arts Program), pending EVC approval of and support for the recommendations for resource allocation outlined in this Strategic Plan (see Section 3.4). In addition to these majors, 15 minors are currently offered through SSHA—American Studies, Anthropology, Arts, Cognitive Science, Economics, History, Philosophy, Political Science, Psychology, Services Science, Literature and Culture, Spanish, and Writing.

SSHA also contributes to undergraduate education at UC Merced through general education. Students in Natural Sciences and in Engineering take courses in SSHA, including a required course in Humanities and a required course in Social Sciences in addition to two additional courses from SSHA for their general education requirement.

Two graduate programs are also currently supported by faculty within SSHA. The graduate program in Social and Cognitive Science draws on faculty within Anthropology, Cognitive Science, Economics, Sociology, Philosophy, and Psychology. The graduate program in World Cultures is an interdisciplinary program that brings together faculty from Anthropology, History, Heritage, Literature, and Philosophy.

SSHA also offers courses in a variety of foreign languages, including Chinese, French, Japanese and Spanish. The SSHA faculty approved a foreign language requirement as an addition to the School's General Education requirement in Spring 2007. The faculty considered pedagogical reasons and funding implications and recommended that SSHA students, originally starting with incoming new Freshmen in Fall 2008, to complete levels 1 and 2 of a foreign language (the first year of language study) to meet SSHA GE. More importantly, the addition of the foreign language requirement would make the SSHA GE consistent with seven of the other eight UC campuses with undergraduate programs. The Provost has not approved this requirement because of the resources that it would require and the issue of foreign language requirement will be discussed within SSHA again.

SSHA also houses the UC Merced Writing Program, which provides the majority of instruction for most UC Merced freshmen (WRI 1, WRI 10, and CORE 1), as well as an increasing number of lower and upper-division general education courses.

2.2.3 Undergraduate Enrollment

As of the Fall 2007 term, SSHA students totaled 616, or approximately 37% of the 1,671 total undergraduate students on campus. With the start of new majors popular at other UC campuses, we anticipate that the number of SSHA students will grow to 2,400 by the beginning of the Fall semester 2012[i]. The distribution of the students among the different majors is somewhat complicated to describe, since students began to change their declared majors during the Fall 2006 when new majors were offered. Table 2 shows the distribution of students between the different majors as of census data of spring semester 2008.

Table 2. SSHA student distribution by major AY 2007-08.

Major	**% of Total**
Management	20.9%
Psychology	36.0%
Political Science	10.1%
Cognitive Science	7.0%
History	6.2%
Literature	4.5%
Economics	4.2%
Social and Cognitive Science	2.9%
World Cultures and History	2.9%
Undeclared SSHA	5.2%

The students in the Social and Cognitive Science major and the World Cultures and History major will transfer into one of the other seven majors. The majors no longer exist.

The Student FTE by discipline will change considerably over the next few years as new faculty are recruited and new programs are started. Table 3 reflects calendar year 2006.

[i] It is anticipated that the total student count will grow by 800 each year and that the SSHA share of this count gradually increase from 35% to 40% over the next five years

Table 3. Student enrollment by discipline 2007.

Discipline	Student FTEs	% of Total	Student FTE by IoR	% of Total
Anthropology	36.3	2.3%	39.5	2.5%
Arts	68.3	4.3%	69.3	4.3%
Cognitive Science	79.2	5.0%	121.7	7.6%
Economics	74.7	4.7%	94.7	5.9%
History	119.7	7.5%	119.7	7.5%
Foreign Languages)	78.1	4.9%	78.1	4.9%
Literature	50.7	3.2%	54.7	3.4%
Management	114.7	7.2%	51.7	3.2%
Philosophy	47.7	3.0%	48.3	3.0%
Political Science	104	6.6%	121.1	7.6%
Psychology	338.7	21.3%	319.7	20.0%
Sociology	76.8	4.8%	76.9	4.8%
Geography	0.5	0.0%	2.9	0.2%
Heritage	1.6	0.1%	1.6	0.1%
Writing Program	396	25.0%	396	24.8%
Total	1587	100.00%	1595.9	100.0%

2.2.4 Graduate Groups

SSHA faculty currently participate in two graduate groups—the World Cultures graduate group (WCGG). Social and Cognitive Science graduate group (SCSGG).

WCGG

Fifteen faculty members in history, literature, anthropology, the arts, philosophy, and foreign languages are affiliated with the WCGG. This graduate program offers regular and individualized, research-based courses of study that explore cultures in both their local manifestations by focusing on the rich cultural and historical heritage of California, the San Joaquin Valley, and the Sierra Nevada in a global context. The program pays particular attention to world cultures in their historical, political, material, and literary manifestations, and to the effects of immigration and migration on society and cultural change. Both disciplinary and interdisciplinary courses are offered, while students may also take courses within other graduate programs or Schools at UCM. Currently, there are 15 graduate students in the WCGG, 12 in the Ph.D. program and 3 in the M.A. Twenty additional students applied to the WCGG for admission in Fall of 2008, and it is anticipated that approximately six new students will enter the program at that time. Admissions rates for the program confirm that demand greatly exceeds the program's ability to admit all qualified applicants. For the past two years, admission percentages have been 25% and 30% of applicants; by far, the most common reason for denying admission has been the lack of faculty to supervise students. This suggests that, given appropriate growth in FTEs, the WCGG could easily become one of the flagship, most vibrant graduate programs at UC Merced.

In the planning period covered by this strategic plan, it is anticipated that the faculty, curriculum, and graduate student body of the WCGG will continue to grow as an interdisciplinary program with several emphases. The current WCGG structure provides a distinctive interdisciplinary experience for students, and also serves as a venue for innovative collaborative teaching and research for faculty.

Although the program is yet to produce its first graduates, it is anticipated that M.A. students will continue their studies in an appropriate Ph.D. program, and that doctorates will find employment in academia or in private or public positions such as museums, presses, and governmental agencies. During this five-year period, some traditional disciplinary programs may also emerge from this group, although such efforts have yet to be initiated. Such diversification will depend, in part, on the growth of disciplinary faculty and necessary critical mass to pursue such programs. Still, given the scholarly opportunities created for students and faculty through the WCGG, this program will likely serve UCM for at least the next five years.

SCSGG

The social and cognitive sciences (SCS) graduate group is the broadest graduate group at UC Merced, spanning the following disciplines: anthropology, cognitive science, economics, management, philosophy, political science, psychology, and sociology. Each of these disciplines would likely constitute its own graduate group at a mature university; some, like psychology, could easily span two or three graduate groups. The breadth of SCS has already led to a relatively large number of total faculty (23) and a growing number of students (16 in 2007-2008, adding about 7 in 2008-2009). Also, the breadth of SCS lends itself well to interdisciplinary research and well-rounded graduate students.

At the same time, the breadth of SCS poses some challenges. Each discipline, taken alone, faces the "critical mass" problem of having only a small number of faculty, each with other responsibilities including building undergraduate majors. Hence, putting on a sufficient number of graduate courses in each discipline is challenging, and the overlap between needed graduate courses in some disciplines can be as low as zero, e.g., anthropology versus economics versus psychology. The SCS graduate group has taken several approaches to this problem, including having some shared graduate courses (e.g., for both cognitive science and psychology students), cross-listing graduate courses with upper division undergraduate courses (with additional requirements for the graduate version), obtaining an outside instructor to teach one graduate course (advanced psychological statistics), only admitting graduate students (in economics) who already have Masters degrees and do not require coursework, and, in some disciplines, not admitting any graduate students at all because the needed courses cannot be given. The critical mass issue within each discipline can be addressed by additional faculty hiring, as specified in the SSHA strategic plan.

Because the SCS graduate group is a conglomeration of so many disciplines, it is considered by faculty to be an incubator for future, more focused graduate groups, rather than being an end in itself. These future graduate groups would be more workable in terms of governance and each would be more able to specify a common set of courses required by all of its graduate students. Planning for future graduate groups (e.g., CCGA proposals) is furthest along in cognitive science and psychology, with some discussions already taking place in economics and political science. Again, the establishment of these future graduate groups will depend on additional faculty hiring.

Another challenge faced by SCS is lack of laboratory space, for cognitive science and psychology particularly, and for anthropology. Conducting laboratory-based research is an essential element of graduate student education in these disciplines. The Classroom and Office Building, by design, has zero laboratory space. Although the future Social Sciences and Management building will address this issue to some extent in 2010, current laboratory research is being housed in converted faculty offices, which will soon be needed for faculty. Hence, there is serious concern about laboratory space for SCS in the 2008-2010 period.

Finally, it should be noted that most SCS graduate students are funded by teaching assistantships, although there are a few supported by industrial funding or faculty research grants. In general, SSHA faculty do not have start-up packages that are conducive to supporting graduate students. In the medium term, SCS faculty plan to apply for external funding such as training grants. Currently, graduate student growth in SCS is closely tied to, and limited by, the growth of teaching assistant funding in SSHA.

3. GOALS AND STRATEGIES

SSHA's vision acknowledges that higher education will be challenged to meet the needs of society in the 21st century. UC Merced must be positioned to accept this challenge and responsibility, so that we can lead advances in educational innovation, scientific discovery, creative expression, and artistic production by fostering an atmosphere of intellectual excitement, innovation, and entrepreneurship. To exploit our comparative advantages and identify opportunities for fruitful collaboration beyond our boundaries, we remain committed to interdisciplinary research and education, not only within and across academic fields and schools, but also across institutional, national, and cultural boundaries. We will continue to focus our attention and resources where we can achieve excellence and comparative advantage in achieving our mission.

3.1 Research Opportunities and Funding

SSHA's goal is to develop and maintain sufficient internal and external funding to carry out innovative research and realize objectives of outstanding research and teaching. Multiple and varied sources of funding will help promote research that distinguishes SSHA faculty and programs from similar programs at other UCs, while research funding will also help support graduate students and provide undergraduate research opportunities that will attract students to our school. Faculty in several disciplines in SSHA have already been very successful in securing significant external grants. This is particularly apparent in social sciences including cognitive science, economics, geography, and psychology. Grant sources in these disciplines include the National Institutes of Health, National Science Foundation, the National Atmospheric and Oceanic Administration, Centers for Disease Control, and the TIAA-CREF Institute. In the years to come, such disciplines may also attract funding from university partnerships, such as UCOP Discovery Grants and CITRIS, and the private sector, including information technology and high-tech businesses such as Google, IBM, and ESRI. Other disciplines in the social sciences including anthropology, economics, and sociology have access to funding opportunities through both local and national granting agencies and foundations. Although the amount of such funding is usually more modest than that available for research in natural sciences or engineering, valuable, high-impact research can be undertaken with such support. The specific types of research undertaken are discussed in the disciplinary strategic plans included appendices to this document.

The humanities, on the other hand, generally have fewer opportunities for external funding and, thus, faculty often have difficulty attracting and securing such funding for research in traditional fields. Rather, the humanities often must look to internal funding to support both faculty and graduate student research, although there are other opportunities via programs such as UC-Mexus. Faculty in literature and cultures at UCM have also suggested that this program may serve as a model to develop strategic partnerships with universities in Spain and North Africa to further support faculty and graduate student research on transatlantic literature and culture of the Spanish-speaking world. In addition, innovative interdisciplinary programs or multidisciplinary "research pillars" such as those envisioned in world heritage, public culture, spatial analysis, global peace and security, health, cognitive and information sciences, decision sciences, and labor studies may serve as vehicles to attract grant monies that can contribute to research in underserved disciplines across the social sciences and humanities. These opportunities may include targeting grant funds specifically earmarked for collaborative or interdisciplinary research from traditional sources such as the National Science Foundation. Conversely, some interdisciplinary programs may be able to access funds from entirely new sources. For example, the signature program in world heritage may attract funding from UNESCO.

Regardless of funding source or the amount of grant money available, however, the development of research opportunities in the social sciences and some interdisciplinary programs is threatened by the lack

of research laboratory space in the social sciences. The new building for Social Sciences and Management, which will house laboratories for faculty in the social sciences, will not be completed until January 2010, at the earliest, and the current office and laboratory space in the Classroom and Office Building will not be sufficient for the projected growth of the school before 2010. Lack of necessary research laboratory is already having a negative impact on research in cognitive science, psychology, anthropology, and other fields, and promises to have an increasingly detrimental effect on faculty research over the period covered by this strategic plan. A working solution is critical, especially given the large percentage of assistant professors. Inadequate lab space puts these faculty members at risk given that they will be largely evaluated on research productivity at tenure time.

3.2 Teaching Opportunities and Enrollment

As a school with a broad range of disciplines at a brand new campus flanked by a School of Natural Sciences and a School of Engineering, SSHA is in a good position to build and sustain innovative yet substantive interdisciplinary instructional programs over the next five years. At the same time, SSHA will continue to serve the campus by offering majors and minors in disciplines that traditionally attract the most students to UC campuses, and by contributing instruction to general education and as electives. To boost enrollment at UC Merced, SSHA will continue to develop strong disciplinary and innovative interdisciplinary programs. In academic year 2007-08, SSHA faculty offered a proportionally large number of courses, including 65 lower-division; 82 upper-division; 21 graduate courses. These figures do not include the large number of WRI 1, WRI 10 and CORE 1 sections taught by our Writing Program faculty or the growing number of independent and group study offered by our ladder faculty.

SSHA disciplines will continue to attract the most students to UC Merced, just as they do at the other UC campuses, while US statistics for fields such as anthropology and sociology demonstrate growing demand for such majors within the United States. The diversity of minors within SSHA also serves students across campus, preparing them for more thoughtful and nuanced understanding of their world and interactions with clients and stakeholders in future careers. SSHA has added several new majors and minors during AY 2007-2008 in order to satisfy student demand and increase recruitment and retention, as well as increasing the array of courses offered in foreign languages and the writing program. SSHA majors are considered practical for future careers in diverse areas such as business, journalism, social work, and politics, as well as professions such as law and medicine. Traditional disciplines including psychology, economics, management, and history are readily recognizable to potential students and accessible based on their high school education, while other programs such as anthropology and cognitive science may attract students who initially come to UC Merced intending to major in disciplines within Engineering or Natural Science. Although many disciplines within SSHA require quantitative skills, these requirements are often considered less onerous by students than the many prerequisites and required courses within some majors in other schools.

The primary obstacle to meeting the challenge of increasing enrollment and meeting student demand for more classes, majors, and minors within SSHA is the lack of necessary faculty. In some cases, this reflects limited FTE for new faculty hires to meet demand, while in other cases, understaffing reflects the difficulty in attracting faculty to UC Merced in particular disciplines. In the former case, existing programs such as psychology are currently understaffed and courses in political science have been overenrolled to meet demand, while other programs such as sociology and arts lack the necessary faculty to initiate a major. With respect to psychology, this major is not only the most popular major at UC Merced, it also enjoys the same success at nearly all UC campuses. Sufficient faculty in such programs is necessary to ensure continued growth in student enrollment at UCM. Similarly, comparative statistics for other UC campuses indicate that the sociology major will attract significant numbers of students to UC Merced, but there must be sufficient allocation of FTE to this and other disciplines to allow popular

majors to develop. Understaffing in other disciplines may reflect the highly competitive job market (e.g., management) or the perceived lack of resources such as intellectual centers (e.g., public policy) at UC Merced. Laboratory space issues may also negatively impact our ability to attract and retain top faculty in disciplines such as psychology, while limited library resources may undermine growth in disciplines such as literature.

While obstacles to teaching and enrollment exist, there are also some opportunities for growth and innovation in these areas that are unique to UCM given the start-up nature of the university. Particularly important in this regard is administrative and SSHA faculty support for signature interdisciplinary programs that will allow us to attract students beyond traditional disciplines available at other UC campuses and, even, other research universities. The success of cognitive science is an excellent example of the teaching and enrollment opportunities created by interdisciplinary thinking, and this serves as one model of how UCM can create signature programs that distinguish it from other UC campuses. Similarly, the strategic plan for philosophy calls for an innovative focus on "applied philosophy," which will likely attract students to UCM and serve students majoring in diverse disciplines from management to political science to the natural sciences. Other signature programs may include world heritage and spatial analysis – the former is not represented at any other UC campus, while the latter would be a significant contribution to the UC system, as a whole, and promote collaboration across all three schools at UCM. Similar cross-school collaboration in teaching may develop with the anticipated environmental science and policy program. SSHA is also actively working toward the development of new majors in sociology and global arts within the next academic year, with the latter representing a unique approach to the arts within the UC system and beyond. Majors in Spanish, and philosophy are also anticipated shortly thereafter, while other majors such as American studies and minors such as spatial analysis and world heritage are also planned.

While specific data and action plans for each SSHA discipline are included in the appendices, this discussion highlights threats that cross-cut disciplines. SSHA must be able to build out existing disciplines into majors to attract more students to UC Merced and have resources sufficient to meet what we anticipate will be significantly increasing enrollments. These efforts will also have to be accompanied by support to increase instructional infrastructure (i.e., more class rooms and lecture halls) to keep pace with growth. This is particularly true since many programs and majors will be competing for existing infrastructural support, and it appears that classroom space will be a significant bottleneck limiting the growth of UCM, as a whole.

Strengths = disciplines represented within SSHA have traditionally attracted the majority of students to UC campuses, and will likely continue to do so at UC Merced. Majors are considered practical/useful to diverse future careers, as well as professions such as law and medicine. Traditional disciplines are readily accessible/recognizable to potential students, and other programs will likely attract students who initially come to UC Merced intending to major in disciplines within Engineering or Natural Science. Although many disciplines within SSHA require quantitative skills, these requirements are often not considered as onerous as the many prerequisites (and required courses) within other majors in other schools.

Weaknesses = too few faculty to meet demand in some popular areas. Difficult to attract faculty in some of these areas (e.g., management)

Opportunities = (moral) support for innovative interdisciplinary programs that will allow us to attract students beyond traditional disciplines available at other/all UCs (and even CSUs).

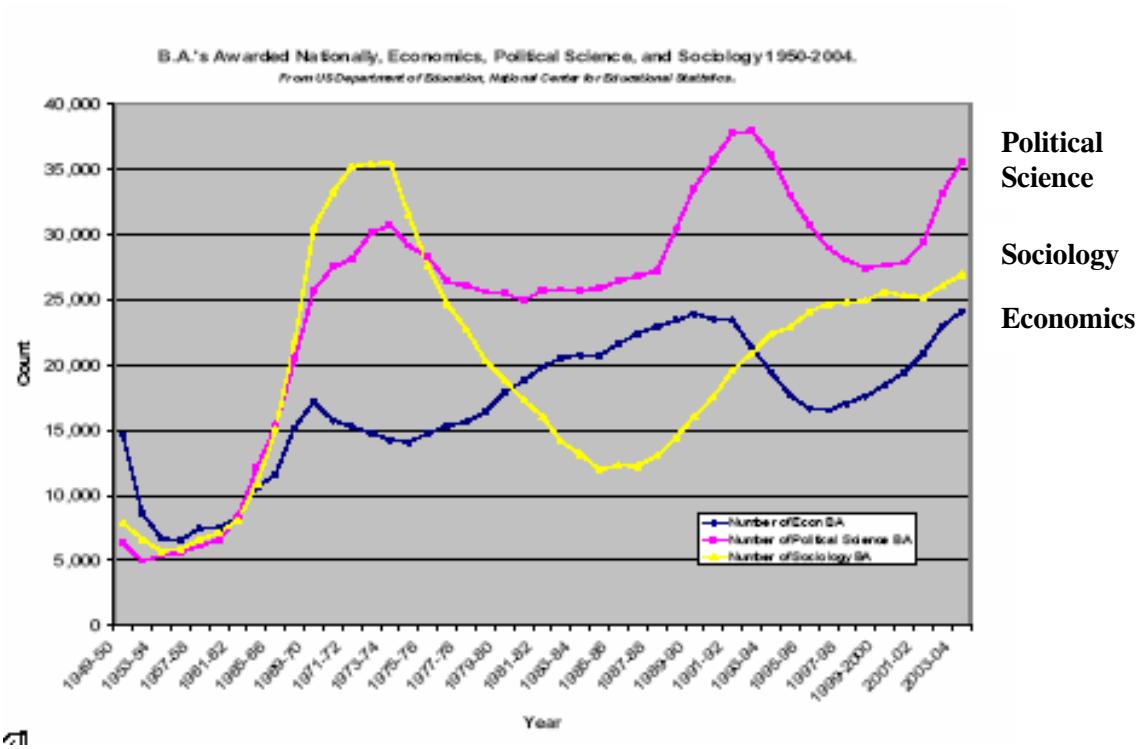
Threats = must be able to build out existing disciplines into majors to attract more students to UC Merced and have resources sufficient to meet what we anticipate will be

significantly increasing enrollments. May also need instructional infrastructure (i.e., more class rooms, labs and a larger lecture hall than Lakireddy Auditorium) to keep pace with growth, particularly as other/multiple majors/programs will be competing for that infrastructural support.

3.2.1 Emerging educational needs

SSHA will focus on strengthening the existing eight majors (including Anthropology that is pending approval) and open new programs when available resources are at hand.

Sociology is one of the most popular majors throughout the UC system, on individual campuses and across the nation[ii]. However, there is only one Sociologist in SSHA. In a time of limited resources, it is impossible to build every major that is represented in typical social science schools.



However, given Sociology's prominence at the undergraduate level in both the system and nationally, it is important for SSHA to move quickly and aggressively so that a major can be started on campus soon.. This will require the addition of at least one new faculty position. A Sociology program can also help build the Management program. At most universities with Management programs, Sociologist play an integral role in a variety of working groups and emphases. They contribute knowledge to areas such as Behavioral Studies, Entrepreneurship, Organizational Studies, Decision Sciences, and others.

A **Geography** program should be built jointly with the other two schools. Geographic analysis can contribute to excellence in every discipline of the university. It would also support a future program in Urban and Regional Planning. With the emergence of ubiquitous and intuitive services such as Google Earth, awareness of the spatial perspective is becoming more widespread, and scholarship, publishing and instruction are increasingly employing spatial analysis. Students recognize this, filling GIS classes wherever they are offered and developing highly marketable expertise. The Park Service, one of this

[ii] Sociology typically accounts for 10-15% of total enrolment in Social Sciences, Humanities and Arts

region's largest employers, is forced to offer GIS courses in-house because they do not have sufficient appropriately trained staff. About one-third of all current UC Merced faculty incorporate spatial analysis into their research. Within SSHA, faculty who employ an explicitly spatial perspective include individuals in Anthropology, Economics, Geography, History, Heritage, Literature, Political Science and Sociology. The plan for Geography is further described under 3.3.2b.

UC Merced emphasizes undergraduate education in the **Arts**. The growth of digital technology has brought about an opportunity to bridge the separation between the arts and sciences which grew out of the industrial revolution and increased during last century. The rapid technological development that characterizes our times requires new approach to education which emphasizes adaptability and creativity, as well as integration and inclusivity made possible by digital technology. A new **Media Arts Technique Program** plans to function on several levels. The proposed curriculum emphasizes the essentially interdisciplinary character of contemporary arts by giving students the opportunity to sample multiple art disciplines and techniques from fine arts to performing arts, from traditional to experimental. The plan is to offer technique courses in the following art forms: Architecture, Digital Media Graphics, Digital Film-Making, Drawing, Music (Voice, Instrumental Music, and Composition), Painting, Performing Arts (Acting, Directing, and Dance/Movement), Photography, Sculpture and Ceramics. Art technique courses will be offered to all UC Merced undergraduate students. The Media Arts Technique Program Major will be individualized. Each student will be able to create his or her own course of study, choosing courses amongst the above mentioned art disciplines.

Management at UC Merced works with a wide range of different programs and areas within the university. The **Management Major** and **Management Minor** focus on providing future business leaders with the high-level quantitative, communication and problem solving skills they need to succeed in the 21st century economy. The minor in management is offered to allow students in other disciplines or schools to obtain advanced training in management. While Management has a well-established core curriculum in Economics, Accounting, Strategy and Finance, the undergraduate program emphasizes the natural connection with Cognitive Science as well as Engineering. The SSHA approach is for students to learn to integrate key ideas from across subject areas to understand all the dimensions of a given issue and relate these to the central elements of management before drawing a conclusion. **Creativity, innovation** and **entrepreneurship** are emphasized. In the short term management will seek to build a strong disciplinary base in management as well as work to build interdisciplinary links within SSHA to support our current major. In the longer term there is an opportunity to expand the management program and complement programs in engineering and natural sciences with courses, and maybe a minor and/or minor, in **Management of Technology.** This would require integrating management training and education with programs in engineering and science while at the same time educating leaders that are well-rounded in many disciplines. There are special opportunities to build on existing strengths at UC Merced and establish special tracks in **Information Systems Management** and **Natural Resources Management**. With discussions about a future School of Medicine, there also exists a unique opportunity to incorporate **Health Care Management** into the future curriculum. SSHA will collaborate with the planned School of Management to establish such interdisciplinary programs.

In the inaugural year of 2005-2006, UC Merced offered courses on only one **foreign language**: Spanish. This situation changed and SSHA started offering elementary French and Japanese in fall 2006, and elementary Chinese in Spring 2007. During the current academic year UC Merced students can take the long distance course "Arabic without Walls," an introductory Arabic course that will receive resource assistance from the UC Consortium for Language Teaching and Learning.

Because of the importance of foreign languages in the academic education, the professional future of students, and the understanding of other cultures, we believe that foreign language learning should have a stronger presence in UCM majors. Unfortunately, some majors leave little space for students to take courses outside of their field. However, SSHA is committed to foreign language education. The SSHA faculty approved the requirement as an addition to the School's General Education requirement in Spring 2007. The faculty recommend that SSHA students complete levels 1 and 2 of a foreign language (the first year of language study) to meet SSHA GE. More importantly, the addition of the foreign language requirement makes the SSHA GE consistent with seven of the other eight UC campuses with undergraduate programs. The Provost did not approve the requirement based on CAPRA's

3.3 Interdisciplinary opportunities

The development of research and/or educational programs that set us apart as School and University is critical to our short- and long-term success within the UC system and beyond. Likewise, such success is necessary to fulfill our vision of addressing the needs and challenges of society. Given that traditional disciplines represented at UC Merced are also available at all other UC campuses, our greatest potential for distinction and innovation lies in interdisciplinarity.

SSHA has done well in terms of initiating and implementing interdisciplinary research on the campus, both within the school and across the university. A number of innovative programs have already emerged. Examples include various programs within SSHA and across schools. World Cultures and Heritage , for instance, integrates Literature and History within SSHA. The Arts program interacts with cognitive science program that spans all Schools on the campus. And Cognitive Science and Environmental Geography both successfully combine efforts from SSHA and the School of Engineering. Spatial Analysis has generated interest in faculty across SSHA and all three schools. SSHA faculty are also included within the Sierra Nevada Research Institute. A solid foundation in interdisciplinary work -- the path is already forged -- will ensure excellence in research and teaching, promote new hybrid programs, encourage entrepreneurship and facilitate the acquisition of extramural support in the years to come. It will be critical to continue to implement and maintain interdisciplinary research and teaching efforts in the next five years and beyond. The challenge will be to pick and choose new programs carefully, and to support the efforts that seem most tangible and viable to the success of SSHA and its students, and more generally, to the success of UC Merced.

Strengths = Many faculty are already committed to interdisciplinarity. The program in COGS and minor in American Studies already exist, and signature programs in World Heritage and Global Arts and Labor Studies are underway..
Weaknesses = Unfortunately, there are also many faculty who have not committed to or envisioned opportunities for interdisciplinarity that draw on their fields, or they have expressed reluctance to participate in such programs or research since tenure and promotion decisions may not reward such work. Such resistance may hamper efforts to develop interdisciplinary studies that encompass other disciplines.
Opportunities = SSHA is in good position to form interdisciplinary teams, often with the other schools on campus, to tackle the major societal issues that not readily fits into a single discipline. Issues such as poverty, equality, clean water and air, traffic problems are examples that are pervasive in the Central Valley.
Threats = underfunding, reward (tenure/promotion) based on traditional disciplinary breakdown

3.3.1 Entrepreneurship

Innovation drives economic growths. University research is a key component of innovative capacity. In an increasingly dynamic and global economy, the infrastructure is inefficient at moving university

innovations to the marketplace. University researchers need guidance to commercialize their innovations. It is for that reason entrepreneurship programs of various kinds are emerging at many universities around the world.

Together with the two other Schools, SSHA will take initiative towards establishing an Innovation and Entrepreneurship Center at UC Merced that proactively promotes entrepreneurial spirit throughout all Central Valley schools and colleges. The center will be a platform for networking of different disciplines, recognizing that scientific discovery and technology has transformed and will continue to transform the way human beings labor, live, and learn.

Because entrepreneurship is such a multi-disciplinary, opportunistic and dynamic phenomenon, the Center will emphasize integrated, applied, hands-on learning, and will bring together students, entrepreneurs, mentors, alumni, faculty, and business advisors from diverse backgrounds to work on real-time projects. As the only research university in this region, UC Merced has an opportunity to study and actively take part of the transformation of discoveries in all sciences to new services and products. There will also be a strong emphasis on social entrepreneurship as well as on venture creation based on science and technology in general and biosciences, energy, environmental sciences, and information technologies in particular. Such ventures require the combined knowledge from many disciplines..

The Entrepreneurship Center's will develop a “Business Application Lab” that provides a supportive work space for teams working on new venture projects as either entrepreneurs or consultants. It will also be a home for a network of mentors, business advisor partners, faculty, students, and staff. The Lab is meant to provide a creative, confidential, and collegial space for the development of new business concepts.

3.3.2. Geography

Geography is the study of the Earth and its features, and of the distribution of life on the Earth, including human life and the effects of human activity. Geography programs at other institutions typically consist of three elements: tools for Spatial Analysis, Human Geography, and Physical Geography. Environmental Geography is a field that combines aspects of Physical and Human Geography and looks at interactions between the environment and humans. Environmental Geography degree programs provide students with the knowledge and skills required to analyze environmental questions and to recommend solutions. Spatial Analysis and Environmental Geography are the areas with the greatest immediate opportunity for Geography to contribute to the development of world-class teaching and research programs at UC Merced. Building a more sustainable civilization is an urgent challenge for humanity in the coming decades--as we confront inter- related challenges related to climate change, energy supplies, pollution and land use--and should be the central concern of an Environmental Geography program at UC Merced. Tools and conceptual frameworks for Spatial Analysis will be critical to analyzing and addressing these challenges, and Geography should support the integration of these skills into educational programs at UC Merced.

Geography presently has only two 0.5 FTE appointments. Competing needs for scarce new FTEs will limit the rate of growth of Geography faculty for some time to come. By focusing on program development where existing faculty resources can be leveraged across the Merced campus, Geography can contribute to programs that can be created immediately with robust faculty support. The immediate goals for Geography in SSHA are:

1). To work with other faculty in SSHA and across the campus to develop a unique Spatial Analysis minor program that makes a cross- school contribution by teaching tools for spatial analysis that can be applied across diverse disciplines, serving students in many majors.

2). To participate in the development of cross-school undergraduate degree programs in Environmental Science, Policy and Management.

An FTE in Spatial Analysis, with an emphasis on methods, would be a crucial addition to Geography that would make SSHA a key partner in cross-school programs, and help to anchor a cross-school Spatial Analysis minor within SSHA. In addition, opportunities for split hires should be pursued. FTEs for sustainability, spatial analysis, resource management and environmental health figure in the strategic plans for ES, ENG, and/or NS. These are all FTEs that, depending on the candidate, might be appropriate for split appointments in Geography, creating further opportunities to leverage resources within the schools and to build research and educational collaborations across the schools.

3.3.3 Comparative Race and Ethnic Studies

Comparative Race and Ethnic Studies will develop as an interdisciplinary program with opportunities for teaching and research on topics of race and ethnicity from both domestic and international comparative perspectives. The interdisciplinary program will focus particularly on the histories of racialization and ethnic formation in the US, with attention to African Americans, Chicanos/Latinos, Native Americans and Asian Americans. Understanding race and ethnicity in the US involves the study of diaspora and migration from both historical and contemporary national and transnational contexts. The program will emphasize the relationship between social structure and social inequality and literary, artistic, and overall cultural practices with attention to other intersections of social stratification such as gender, class, and sexuality. Among the core SSHA disciplines that may contribute to the Comparative Race and Ethnic Studies curriculum are history, literature, global arts, sociology, anthropology, economics and political science. A new position to support research and education on the African Diaspora would support the SSHA goal for developing this interdisciplinary program for which we know there is a strong student demand.

3.3.4 Global Studies

This term incorporates the study of international relations, migration, transnationalism, comparative politics and literatures, area studies, foreign languages and cultures, world and regional histories, international economics, foreign trade, and studies of global phenomena in all disciplines and for all world areas. In short, it includes the entire range of scholarship and education that touches upon structures, processes, societies, works, cultures, histories, policies, and traditions of the world outside of the United States. Every SSHA-affiliated discipline at UC Merced either already includes faculty with global, comparative, or international interests, or plans hiring in these fields.

Global studies is a critical area of planning both within SSHA and in coordination with the entire university. Every research university has structures to support and advocate cross-disciplinary research and education in foreign languages, cultures, and societies, and the transnational processes that bring them together; mechanisms to help faculty build relationships with international colleagues; institutions to coordinate exhibitions and performances by visiting international artists; and offices to manage student fellowships such as FLAS, Fulbright and NSEP, and staff to direct study abroad experiences. At present, all of these functions are lacking at UC Merced. While many of these activities will not be housed within SSHA, much research and all instruction will be located in the school.

The mission statement for the School of International and Area Studies at Berkeley provides one suggestion about the range of services that a campus global studies institution can provide: "IAS is dedicated to promoting all aspects of international and global studies at Berkeley. It oversees and works

with research units and programs concerned with non-US areas and issues from Africa to Southeast Asia, International Economy to Romance Studies. IAS provides a range of services, including study abroad and faculty exchange, and hosts a range of interdisciplinary teaching programs."

Global Studies is the name of a new undergraduate major at University of California, Riverside. Its broad-based steering committee includes faculty representation from Anthropology, Sociology, History, Political Science, Psychology, Philosophy, Economics, Comparative Literature, Music, Religious Studies, English, and Environmental Studies. The mission statement of this new major provides a contemporary perspective on the concept of global studies: "Global Studies is a broad-based study of processes and problems that transcend national boundaries, preparing students to become global thinkers and problem solvers for the twenty-first century. Global Studies crosses disciplines, drawing on the fine arts, social sciences, humanities, and sciences. The Global Studies major includes the study of global historical processes that have made the world more interconnected, as well as contemporary issues of global politics, violence, security, global migrations, travel, social movements, global literature, arts and media, the global economic system of trade, finance and labor, global health and disease, and environmental change and sustainability. Students are grounded in two disciplines, as well as a single geographic area of study and a foreign language. Global Studies is a way to give powerful support to re-conceptualize the meaning of place in the contemporary world and to retool faculty and students to become global thinkers. It focuses on transnational processes rather than relations among nations."

A new position to support research and education on **African Diaspora** would support the SSHA goal for accomplishing its mission.

3.3.4 World Heritage

World Heritage is an emerging interdisciplinary area that includes architecture, history, archaeology, art history, geography, anthropology, planning, law, and other disciplines. As outlined by UNESCO, World Heritage studies take an explicitly global perspective on the "protection, conservation and enhancement of cultural and natural heritage" objects, sites, and districts around the world (http://whc.unesco.org). This field encompasses formulation of national and international policy; the domestic management of heritage sites, including consultation with stakeholders; and the representation of heritage resources to both domestic and foreign audiences either on-site or through digital media. Practitioners must also confront challenges ranging from war to poverty to concepts of intellectual property in an increasingly globalizing world. Thus, faculty in this field bring together the humanities, social sciences, policy, and management, consistent with the interdisciplinary intent of the World Cultures program within SSHA.

During the next few years a unique interdisciplinary undergraduate and graduate program for students with interests in global cultural and natural resource management, representation, or policy should be built.

UC Merced is particularly well-positioned to contribute to the professional development of, and research within, World Heritage given existing faculty strengths in disciplines such as Anthropology, Earth Systems Science, History, and Management, as well interdisciplinary centers such as the World Cultures Institute and the Sierra Nevada Research Institute. In addition, the campus is located in a region with a high density of protected and publicly managed lands, and existing partnerships with Yosemite National Park and Jiuzhaigou National Nature Reserve in China provide an initial foundation from which to grow innovative research and educational programs in World Heritage. Our vision for a World Heritage program represents a commitment to interdisciplinarity and to creating ties between the university and the world, bringing together the humanities, public policy, and informatics in order to bring the study of culture into a vital dialogue with the rest of the campus and engaging with constituencies beyond it.

3.4 Resources

3.4.1 Faculty

To maintain excellence in research and teaching, SSHA must be able to recruit and retain first rate faculty at all levels. This requires building and maintaining coherent sustainable programs in addition to adequate resources for research. In some cases, searches for full professors have failed (e.g., small subject pool, not a good fit, below UC standards) , and this is of concern to current SSHA faculty, students, and administration. But in some other areas, hiring has been quite successful. Critically, senior faculty are needed to play important administrative roles (e.g., personnel) and mentor assistant professors as needed.. More senior hires are needed in the coming years.

Strengths = high enrollments justify the addition of new ladder rank faculty
Weaknesses = some disciplines will be small, but warrant representation as part of SSHA's mission; must support these programs/disciplines despite limited enrollment
Opportunities = can attract pioneering faculty interested in interdisciplinary research or creating new programs at a new campus
Threats = basis of hiring based on large enrollment figures, especially in traditionally large enrollment areas

Given that resources are limited, SSHA will be conservative and consider enrollments in disciplines. However, SSHA will not restrict itself to enrollments in any single major. Instead, it will consider enrollment in courses in each discipline, especially the school serves a critical role in terms of general education at UCM. SSHA will adhere to the following guiding principles, listed in order of priority:

1. No new programs requiring faculty outside of disciplines already represented will be added to the SSHA roster after AY 2007-08 until existing programs have been adequately staffed with ladder-rank faculty following guidelines No. 2 and No. 3;
2. Disciplines with existing majors (i.e., Cognitive Science, Economics, Political Science, History, Literature, Political Science, and Psychology) must be adequately staffed with ladder-rank faculty to achieve at least the minimally acceptable faculty for that undergraduate program (recognize that this is really a "moving target," in that existing majors will, by default, attract more students, so these disciplines will likely be undergoing a more-or-less constant process of 'backfilling" as other existing disciplines simply strive to achieve critical mass to be able to "compete" in this pool);
3. Existing disciplines with planned majors (i.e. Sociology and Arts) must be adequately staffed with ladder-rank faculty to achieve at least the minimally acceptable faculty for that undergraduate program; and
4. Interdisciplinary programs that draw on the strengths of existing faculty can be developed and staffed; or existing disciplines can grow beyond minimum adequate to staff undergraduate program.

To help implement this plan, SSHA developed enrollment projections by drawing on enrollment data from the same or related disciplines at other UC campuses. Berkeley and UC Riverside were chosen because they are readily available and reflect two steps of development. Critically, the data from these two campuses are intended to serve as caricatures or approximations. Obviously, both campuses are well-established and at a different stage of development. Moreover, each campus has a different school infrastructure and different set of disciplines.

Table 4 projects the distribution of faculty in three scenarios, Alternative 1, 2, and 3. Each represents an estimated size of the School expressed in terms of number of ladder rank faculty. It is assumed that there will be at least 90 faculty members (Alt. 1 in Table) in SSHA at the start of the AY 2012-13. (See section on Projections). Based on estimated workload distribution, the faculty has been allocated to various disciplines in SSHA. The contribution of the different disciples to interdisciplinary programs has been accounted for.

Table 4. Anticipated workload distribution and number of faculty at UC Merced 2012-2013. Compared to figures from UC Riverside and UC Berkeley[iii]

		Alt 1 90 FTEs	Alt 2 102 FTEs	Alt 3 126 FTEs	Riverside		Berkeley	
	Workload % of Tot		Number of Faculty	Number of Faculty	Workload % of Tot		Workload % of Tot	
Anhropology	5%	4.5	5.1	6.3	2.9%	144	5.2%	236
Arts	5%	4	5.1	6.3	3.0%	153	5.8%	263
Cognitive Science[iv]	7%	5.6	7.1	8.8	4.5%	349	2.7%	122
Economics	11%	8.8	11.2	13.9	13.8%	695	14.1%	636
History	9%	7.2	9.2	11.3	8.8%	446	8.2%	367
Languages	3%	2.4	3,1	3,8	,0%		0%	
Literature	5%	4	5.1	6.3	3.2%	160	2.1%	93
Management	14%	11.2	14,3	17.6	18.4%	929	13.8%	622
Philosophy	3%	2.4	3.1	3.8	2.5%	125	4.0%	182
Political Science	11%	8.8	11.2	13.9	15.3%	771	18.9%	848
Psychology	18%	14.4	18.4	22.7	20.7%	1042	15.3%	688
Public Policy		0	0	0	0%		0%	
Sociology	7%	5.6	7.1	8.8	10.6%	534	9.8%	441
World Heritage	2%	1.6	2.0	2.5	0%		0%	
	100%		102.0			5045		4498
		90	102	126				

The SSHA faculty recruitment plan is shown below.

Table 5. Faculty 2007 and FTE Requests 2009-2012

	2008	**2009**	**2010**	**2011**	**2012**	**Total Request**
Cognitive Science	5	1.5[v]	2	1	1	5.5
Political Science	4	2	2	2	2	8
Philosophy	2	1	1	1	1	4

[iii] Note that Alternative 2 represents the number of faculty and the distribution over the disciplines if there will be 102 faculty positions 2012. This reflects the aggregated view of the individual strategic plans for the different disciplines and programs. Alternative 3, reflects the situation where the number of faculty is aligned with the number estimated from the "ideal situation," a student-faculty ratio of 18.7

[iv] Cognitive Science figures shown in Riverside column are from UCSD -- Riverside does not have a cognitive science program.

[v] Split appointment (Cognitive Neuroscience)

Sociology	3	1	1	1	1	4
Arts	5[vi]	2[vii]	2	2	2	8
Psychology	7	9	3	3	3	18
Economics	6	3[viii]	2	2	2	9
Management[ix]	3.5	2	2	2	2	8
Literature	5	1.5[x]	1	1	1	6
History	4	1	1	1	1	4
Anthropology	4	1	1	1	1	4
World Heritage	1	1	1			1
Foreign Languages	1	1		1	1	3
Geography	0.5					0
Writing Program	1	1[xi]				1
TOTAL	50	27	19	18	18	82.5

Specific requests by discipline or group

Cognitive Science

2009: Visual Perception, Assistant or Associate
Cognitive Neuroscience, Assistant or Associate, possible joint position with NS
2010: Computational Linguistics, Assistant or Associate
2010: Decision Science, Assistant, possible joint with Management
2010: Memory or Attention
2011: Philosophy of Language, possible joint position with Philosophy
2011: Visual Perception

Political Science

2009: Comparative Politics (any level)
2009: Comparative Politics/International Relations (assoc/full)
2010: 2 positions (any level)
2011: 2 positions (any level)
2012: 2 positions (any level)

Psychology

2009: Health Psychology (full)
Health Psychology (asst)
Developmental Psychology (full)
Health Psychology (full)
Developmental Psychology (full)
Quantitative Psychology (asst)
Developmental Psychology (asst)
Health Psychology (asst)

[vi] Of which one is Artist in Residence
[vii] Of which one lecturer PSOE
[viii] One of which is a lectuerer PSOE
[ix] Future request will depend on whether a management school is created
[x] One in African Diaspora that could be hired into any discipline and one in Spanish Linguistics, ideally shared with Cognitive Science
[xi] Position contingent on use of endowed funds

Quantitative Psychology (asst)

2009: 3 positions
2010: 3 positions
2011: 3 positions
2012: 3 positions

Arts
2009: Media Arts (lecturer PSOE)
Ethnomusicology (any level)
2010: 2 positions
2010: 2 positions
2011: 2 positions (1 "payback")

Anthropology
2009: Archaeological Anthropology (full)
2010: Socio-cultural Anthropology ("payback")
2011: Biological Anthropology ("payback")
2012: Biological Anthropology (full)

History
2009: World History (any level)
2010: World History (any level)
2011: US History, 19th century US West, Environmental History (asst)
2012: African/Middle East History (assoc or full)

Literature
2009: African Diaspora (any)
Linguistics (assoc or full) possible joint with Cog Sci
2010: British Literature (sr)
2011: Hispanic Literatures (assoc or full)
2012: Anglophone Literature (assoc or full)
: Anglophone Literature (asst)

Economics
2009: Lecturer PSOE
2010 2 positions
2011 2 positions
2012 2 positions

Management
2009: Entrepreneurship
Strategy
2010- Finance
Organiziations
Marketing
2011 Several
2012 Several

Philosophy
2009: Applied Ethics or Political Philosophy (full)
2009: Applied Ethics or Cognitive Science (asst)
2010: Aesthetics or Core Philosophy (asst)
2011: Applied Ethics or Political Philosophy (any)

Sociology
2009: Social Stratification (any)
2010: Economic/Organizational Sociology (any)
2011: Social Psychology (any)
2011 Economic/Organizational Sociology (any)
2012
World Heritage
2009: Law and Policy/Documentation and Preservation (asst)
2010: Visiting scholar position

The Writing Program
2009 Writing and Communication, (full)

The reasoning behind the above requests can be found in the appended detailed plans for the different disciplines.

3.4.2 Space Issues

A viable plan for dealing with adequate space (quality and quantity) must be developed during the next academic year. A large proportion (about 25 percent) of SSHA faculty require lab space to collect, code, or analyze human data. Growth of research and academic programs will be jeopardized unless adequate space is provided. More importantly, the lack of space could have dire consequences for some assistant professors, whose research productivity necessarily depends on human data. It also restricts important research opportunities that undergraduate and graduate students need to succeed, and could impair our school's ability to hire first-rate faculty in the social sciences.

At present , the School is housed in the Classroom Building. This Building will be able to accommodate the new faculty 2008 by the planed construction of 20 new offices in COB , but there will be a lack of laboratory space already during the 2008-09 academic year. A new Building for Social Sciences and Management is currently being designed and will be finished in the beginning of 2010. This building will be fully occupied at the start of 2011-2012.

An assessment of the space situation is currently underway.

3.5 The Organization

3.5.1 Governance

SSHA is organized into three bylaw 55 units, "sections", an organizational structure that meets the current needs of School. The challenged in organizing a school that spans over such a wide spectrum of sciences that are represented in SSHA, is to recognize/accommodate disciplinary diversity, and at the same time

also realize that strength/innovation/ within SSHA lies in unity and organizational structure that brings us together. The sections independently handle recruitment of new faculty, merit reviews and other academic personnel issues. Curriculum are developed both within the sections and between sections and the curriculum committee is common for the whole school. The student recruitment and retention committee is also serves the whole school.

Each section is lead by a chair, and the sections are overarched by a common administration and lead by the Dean. The organization will be evaluated during the AC08-09 and reorganization will be done before AC09-10 if it is found to be appropriate. The current sections are

Policy and Decision Sciences (or Social, Cognitive, and Information Sciences)
- Arts
- Cognitive Science
- Economics
- Geography
- Philosophy
- Political Science
- Sociology

Psychology
- Developmental Psychology
- Health Psychology
- Quantitative Psychology

Humanities and Cultures
- Anthropology
- History
- Languages
- Literature
- Writing Program

The School's governing body is the Executive Committee, and is chaired by the Dean. The Chairs of the three sections of the School are members of the Council as is the Faculty Chair and a representative for the untenured faculty. The Council is advised by its standing committees, namely, the Curriculum Committee, Student Recruitment and Retention Committee.

The Executive Committee has advisory responsibilities to the dean on:

- the mission and strategic direction of the School, as well as the annual budget;
- putting forward the annually updated strategic plan for the whole School to the EVC, including a prioritized list of new faculty
- overseeing and reviewing the management of the School and its performance;
- establishing policy and procedural principles that are consistent with legal requirements, UC rules, and community expectations

All faculty of the School will have at least one joint meeting per semester.

3.5.2 Administration

The SSHA Administration is currently comprised of a Dean and a Dean’s Assistant, an Assistant Dean, a Manager of Operations, an Administrative Analyst, a Manager for Curriculum Support and Planning, and

administrative assistant and two Student Advisors. SSHA seeks to build a Dean's Academic staff that meets the needs of the growing and diverse population of our students and faculty. With SSHA student enrollment, majors and minors, and faculty -- already, the faculty (including faculty from the Writing Program), lecturers and graduate teaching assistants we serve almost individuals-- all set to expand, and the faculty organizational structure evolving to 3 individual bylaw units, the administration needs more staff.

By 2012, SSHA will have upwards to 90 faculty (not including lecturers, Writing Program faculty, or graduate student Teaching Assistants). In order to appropriately staff the School's 3 bylaw units, faculty and students needs we predict that we will need the following **additions** to SSHA administration:

Associate Dean
Administrative Specialist (a second position to appropriate handle the growing number of searches, merit cases and faculty needs)
Budget and Finance and/or Development Officer
Communication and Events Coordinator (responsible for SSHA events and publications)
Retention and Recruitment Officer (responsible for the retention and recruitment programs for SSHA students, including "First Year"-type programs)
Articulation Specialist (perhaps in the form of another school advisor. Will be responsible for transfer issues and the articulation of courses and programs for all California Community Colleges and other 4-year universities)
Computing/IT Manager (responsible for SSHA offices, classrooms and faculty/staff computing needs)
Webmaster (reporting to Computing/IT manager)
Graduate Student Coordinator (responsible for advising, outreach and retention for the graduate groups under the SSHA umbrella.)
Additional support staff (administrative assistants, computing/IT personnel)

4. NEW FACULTY POSITIONS NEEDED 2007-08

4.1 Assumptions

What we will have achieved by the end of the five years covered by this plan:

1. fully (ladder-rank) staffed programs in all existing disciplines, including our interdisciplinary program in Cognitive Science that are relatively distinct (or unique) with UC system
2. poised to develop next core expertise in existing programs, add next tier of traditional disciplines and/or new interdisciplinary programs
3. realize UC Merced enrollment goal of by 2012 through our recruitment and retention efforts
4. achieved necessary administrative, research, and teaching space and have anticipated space needs for next 5/10 years already programmed; and
5. realize our goal of college-going mentality so that seeds planted in middle school students now readily visible in incoming freshmen

Based on new student enrollment 2008-20013 the need for new faculty can be projected as in figure 6. It is assumed that the university will grow with 800 students per year over the planning period and that the SSHA fraction of the enrollment will increase from the current 38% to 42%. Based on a student/faculty ratio of 20 the need for new faculty (anticipated FTE request) will average 16 new faculty per year.

Table 6. Projections – Enrollment And Faculty Recruitment

Academic year	Projected UCM Net Annual Increase	Resulting Student Enrollment	Targeted SSHA Student Enrollment	Resulting SSHA Student Count	Targeted Resulting S/F Ratio	SSHA Faculty FTE (total)	Anticipated SSHA FTE Request for next AY
2008-09	800	2700	38%	1026	19	54	10
2009-10	800	3500	40%	1400	19	74	20
2010-11	800	4300	41%	1763	19	93	19
2011-12	800	5100	41%	2091	19	110	17
2012-13	800	5900	42%	2478	19	130	17

To see how the new enrollment the fall of 2008 in SSHA will impact the figures of table 3 that illustrates how student FTEs are distributed over the different disciplines, the new applications and the ones that have been accepted have been tabulated in table 7. It can be expected that with new major coming on board the distribution of the students over the available majors will change over time. The distribution of students in table 7 have only marginally changed.

Table 7. Distribution of applicants and admitted students for Fall 2008

		Applicants	Admits	Applicants increase	Admits increase	% of Admits
Major	Psych	821	501	5.90%	11.60%	18%
	undeclared	463	299	19.60%	24.60%	10%
	Mgmt	449	274	8.70%	7.00%	10%
	Pol Sci	388	254			9%
	Econ	293	194			7%
	Lit&Cult	204	140			5%
	History	201	121			4%
	Cog Sci	36	28	20%	55.60%	1%
	SCS					
	WCH					
	Total	2855	1811	30.50%	37.10%	

The three sections have prioritized their requested FTEs as described by table 8. The faculty in the sections have voted on these priorities.

Table 8. FTEs requested by the sections of the school in order of priority

Priority	Poicy & Decision Sciences	Humanities & Cultures	Psychological Sciences
1	Political Science (behavior)	African Diaspora	Health Psychology
2	Philosohy (normative	Anthropology (archeological)	Health
3	Sociology (race/class/gender)	Literature (British)	Developmental Psychology
4	Ethmomusicology	Linguistics (Spanish)	Health Psychology
5	Politica Science (Institutions)	World Heritage (CRM/Digital)	Developmental Psychology
6	Cognitive Science (perception)	History (World)	Quantitative Psychology
7	Philosophy (of mind)	History (U.S./West/environm)	Developmental Psychology
8	Economics PSOE		Health Psychology
9	Media Arts Technique		Quantitative Psychology
10	Sociology (institutions)		
11	Philosophy (aestetics)		
12	Cognitive Science (neurosci)		
13	Economics (econometrics)		
14	Political Science (democarcy)		
15	Cognitive Science (linguistics)		

4.2 FTE Request

SSHA is requesting a total of 25 new faculty positions for the next academic year. These positions have been ranked in order of priority using the following criteria:

1. The necessity to support current enrollment
2. Possibility to build a new major where only marginal new resources required
3. Possibility to support interdisciplinary programs
4. Consolidation rather than expansion into new areas

The result of this prioritization is summarized in table 9. It has been judged that a minimum of nine new positions are warranted by current and expected enrollment. Thus nine positions have been given the highest priority. Another six positions have been placed in priority group 2. The rest of the positions that have been requested by the disciplinary groups have been placed in priority group 3.

Three positions requested with highest priority are considered “strategic recruitments”. The requests are not justified by current enrollment, but are motivated for other reasons. These positions are the ones in Arts, Cognitive Science and African Diaspora.

Table 9. Actual Faculty Lines Fall 2008 (assuming all current searches successful) and new hires 2008-09 (A total of 25 positions requested by the different groups in SSHA).

	Number of FTEs	% of FTEs	Prior 1	Prior 2	Prior 3	
Anthropology	4	7.0		1		To begin build major
Arts	2	3.9	1			To build major
GASP (Arts)	3	5.8	1			To build major
Cognitive Science	4.5	8.2	1			To meet demand for Perception studies
Economics	6	14.1		1		
Geography	1	2.4				
History	4	9.4	1			If current opportunity hire is not successful
Languages	1	2.4		1		Spanish Linguistics
Literature	5	11.8			1	
Management	3	4.7				
Political Science	4	7.0	1	1		Needed to support major
Philosophy	2	2.4	1	1		To support minor and interdisciplinary teaching
Psychology	7	11.8	2	1	6	Needed to support enrollment
Sociology	3	2.4	1	1		To build major
World Heritage	1	2.4			1	
Writing Program	1	2.4			1	
African Diaspora	0	0%	1			Possibility to increase diversity

<u>FTEs in Priority Group 1</u>

Psychology: The two lines for Psychology have top priority. The positions are necessary to accommodate the very large enrollment growth Psychology. Even with two new positions Psychology will have fewer faculty than warranted by enrollment. The proposed new FTEs with the highest priority will help to build one of the major emphases in psychology (health).

Full/Associate Professor in Health Psychology, preferably specializing in child health, cultural influences on health, rural health, or the prevention and treatment of health problems common in the Central Valley such as obesity or poor prenatal care.

Assistant Professor in Health Psychology, specializing in one of the areas not already hired.

Sociology: To support the a new major that is expected to be one of the most popular in social sciences at UCM as it is elsewhere at least one new faculty position is required. The position will also be serving the management major and interdisciplinary programs as discussed above.

Full/Associate Professor in Economic/Organizational Sociology

Political Science: The new major in Political Science is expected to attract a large enrollment. To support the major and to build a strong research program we will be seeking several new positions over the next few years. We aim to hire faculty with broad theoretical interests in political institutions and political behavior.

Full/Associate/Assistant Professor in Comparative Politics

Philosophy: There is strong evidence of student interest in an expanded philosophy program. Although an undergraduate philosophy major will probably not be implemented in the next couple of years, there is a need for additional faculty member. This need is warranted by the new demands by interdisciplinary programs for ethics education.

Full/Associate Professor in Applied Ethics or Political Philosophy

History: Enrollment in history classes motivates one new FTE. Whether the current effort to secure a target of opportunity hire pursued this year is successful or not will determine the priority of this position. Should the search fail, a new FTE is needed with highest priority. The focus of this position will depend on current searches.

Full/Associate Professor in World History or US History

Global Arts Studies Program (GASP): GASP is the scholarly arts major proposed by the Arts faculty. The enrollment in Arts classes is large and there are evidence that this new major will attract many students. To support the establishment of the major one new FTE focusing Musicology is needed.

Full/Associate Professor in Ethnomusicology

Cognitive Science: Cognitive Science has quickly become a signature program at UC Merced. It has captured the attention of cognitive scientists worldwide. To continue building on the links to the other schools to facilitate interdisciplinary research new cross-school faculty positions will be requested within the planning horizon. Cognitive Science also serves the Psychology major with important courses. There is a great need for courses on perception, a research area in Cognitive Science. To satisfy this need it is proposed that one FTE is allocated to Cognitive Science with focus on perception (e.g. visual perception). This position would not be requested with highest priority if it had not been for the near future need for courses on perception.

Assistant (or Associate) Professor in Cognitive Science with focus on Perception

Arts (Techniques): There is a strong demand for Arts Technique classes and during the next AC a Media Arts Technique major will be developed. To support this new major and to provide continuity to the Arts program one new FTE is needed.

Lecturer PSOE in Arts/Media Arts

African Diaspora: One position that will have a chance of increasing the diversity in the faculty and at the same time meet students' demand is proposed. The FTE can be open to many of the disciplines in SSHA.

Management: The management major attracts many students and it will be necessary to add new faculty in many areas to support this enrollment. The enrollment warrants at least one new FTE with highest priority. However, the strategy for hiring new faculty in management will depend on whether the proposed new management school will be established. We propose no new management faculty in this plan but assume that the current three unfilled positions will remain in SSHA if the new management school is not developed.

<u>FTEs in Priority Group 2</u>
Full/Associate Professor in Developmental Psychology
Full/Associate/Assistant Professor in Political science
Full/Associate Professor in Philosophy
Lecturer PSOE in Economics
Full/Associate professor in Archeological Anthropology
Lecturer PSOE in Spanish Linguistics

The argumentation for these positions is made in the appended disciplinary plans.
The total **cost for start-up packages** for this group of new faculty is estimated at $750-1,000,000.
The total cost for start-up packages for this group of new faculty is estimated at $350,000.

4.3. Resulting FTE distribution in the School

If the 10 new FTEs with the highest priority are allocated as requested, the FTE distribution I the School will be as illustrated by table 10.

Table 10. Distribution of FTEs

Current majors	No of students		Minors	Current FTEs	FTE as % of major[xii]	% of total FTEs	New FTEs	New Total FTEs	New % of Total FTEs
Psych	226	36%	29	7	20.0%	13.6%	2	9	14.6%
undeclared	32	5%							
Mgmt	129	21%	9	3.5	10.0%	6.8%		3.5	5.7%
Pol Sci	63	10%	8	4	11.4%	7.8%	1	5	8.1%
Econ	26	4%	4	6	17.1%	11.7%		6	9.8%
Lit&Cult	28	5%	5	5	14.3%	9.7%		5	8.1%
History	38	6%	15	5	14.3%	9.7%	1	6	9.8%
Cog Sci	42	7%	13	4.5	12.9%	8.7%	1	5.5	8.9%
SCS	19	3%			0.0%				
WCH	18	3%			0.0%				
Total	621			35	100.0%	68.0%		40	65.0%
Cont'd									
Sociology			21	3		5.8%	1	4	6.5%
Anthropol			8	4		7.8%		4	6.5%
Heritage				1		1.9%		1	1.6%
Philosophy			13	2		3.9%	1	3	4.9%
Geog				0.5		1.0%		0.5	0.8%
Arts			7	1		1.9%	1	2	3.3%
GASP				3		5.8%	1	4	6.5%
Lang			28	1		1.9%		1	1.6%
Wri			33	1		1.9%		1	1.6%
Hum							1	1	1.6%
			TOTAL	51.5				61.5	

[xii] Only faculty in disciples that support a major are included

5. IMPLEMENTATION

5.1 Likely Challenges For The Success Of The Plan And Recommended Actions To Address Them

There are several challenges that may difficult the success of this plan:

a. Space constraints: unless adequate space is made available for lab use, this plan would not succeed as designed.
ACTION: the school-wide space task force must devise proper plans to ensure adequate space. The use of Castle will be discussed with the other schools.

b. Lowering of the ranks proposed for the hires: for the success of SSHA's strategic plans it is essential to achieve a proper balance between senior and junior hires.
ACTION: we have recommended a conservative increase in senior hires in order to be proactive about this challenge.

c. Fewer hires authorized: fewer faculty lines would seriously impair our ability to strengthen existing programs, develop new areas, and foster first-rate scholarship.
ACTION: we have also acted proactively on this challenge by stressing intra-school interdisciplinarity, which should give us better flexibility to address hiring reductions should they occur.

5.2 Procedures To Evaluate The Success Of The Plan

The success of this plan would be measured by the degree in which we are able to achieve our goals. The following procedures should be of help in this regard:

a. Tenured/untenured balance would be easy to measure since this is quantifiable. When the proper balance is achieved, effect on diversity, mentoring, leadership, and overall school climate can be measured by a combination of surveys and hard data.

b. The creation of new programs will be evaluated by measuring student demand and satisfaction. Existing programs will also be evaluated in this manner.

c. Success of our students in terms of acceptance to graduate programs and job market competitiveness.

d. The effective use of resources would be best achieved by hires that connect different programs and areas. This can also be quantified.

e. Interdisciplinarity within SSHA will be measured by such things as team-teaching across disciplines, co-sponsored research, student mentoring across disciplines and areas, new curricular programs, academic conferences, and the like.

f. Research excellence will be evaluated by metrics such as peer-reviewed publications, attraction of external funding, and other traditional assessment tools.

APPENDIX A: Strategic Plan for Humanities and Cultures

FTE Request

1. African Diaspora, open rank [Literature; History]
2. Archaeological Anthropology, Assoc.-full Prof. [Anthro; World Heritage]
3. British Literature, open rank [Literature]
4. Spanish Linguistics, Ass,t. Prof. [SSHA/Foreign Lang.: split HWC and SPDS]
5. World Heritage/CRM/Digital, Ass't. Prof. [World Heritage]
6. * World History, Ass't. Prof. [History]
7. U.S. West/Environ., Ass't. Prof. [History]

* Position to be filled if opportunity-for-diversity senior hire unsuccessful this year.

LITERATURES AND CULTURES

I. Vision

The area of Literatures and Cultures is situated at a disciplinary crossroads that lends itself well for collaboration with the other schools and disciplines within SSHA. Presently, LIT courses count toward the B.A. in World Cultures and History, the BA in Literatures and cultures, the minor in Spanish or as electives for other academic programs. Language courses are the foundation students need for some of the LIT courses, and therefore we consider them an important component of our strategic plan.

In 2006, the LIT faculty devised a plan for a Literatures and Cultures stand alone program, consisting of two overlapping interdisciplinary areas: Literatures and Cultures of the Hispanic World, and Literatures and Cultures of the English-Speaking World. The University of California, Merced major in Literatures and Cultures seeks to ensure that students understand the basic notion of cultural production, and that they are, through a variety of courses, familiarized with the inherent relationship between society and literature, between reading and thinking, and between self and societal forms of expression.

The L&C major will enable a bold hemispheric and transatlantic approach, exploring commonalities and differences between native and postcolonial cultures in Europe, Africa, Asia, North America, Central America, South America, and the Caribbean. This broad multilingual, multicultural area is seldom studied in all its complexity, as more traditional programs tend to focus on specific linguistic or geographic areas.

The Literatures and Cultures of the Hispanic World concentration will have a global reach and interest. It will include Peninsular, American, African, and Asian literatures in Spanish. Courses in this area will be taught mainly in Spanish. However, some will be taught in English to encourage non-Spanish speaking students (especially those in the L&C of the English Speaking world) to explore Hispanic literatures in translation. The LIT courses taught in Spanish will also be available to students interested in cultural and linguistic proficiency in Spanish. The connections to the current minor in Spanish are strong and worth strengthening. We agree that the combined Literature and Languages faculty should propose a Spanish major. There are several viable options for such a major, and the faculty who will propose the major will articulate several of these in detail, evaluate these options against the reality of what resources UCM has available, and try to craft a compromise proposal that can sustain the support of both faculty and students

The Literatures and Cultures of the English-speaking World concentration also has global reach and interest, and it includes British, colonial, and postcolonial literatures. This would also include what is traditionally covered in American Studies, and a focus on Central Valley and California literatures. As with the other areas, Literatures and Cultures of the English-speaking World assumes an inherent relationship between language and culture, and will therefore include a linguistic component. We have pending a proposal for a Literature minor.

II. Strengths

The five current ladder faculty in literature—Professors Gregg Camfield, Ignacio Lopez-Calvo, and Manuel Martín-Rodríguez; Assistant Professors Jan Goggans and Cristián Ricci—are delivering the the required courses in the major with some significant gaps. Thus far, they have included the requisite lower division surveys in American and Spanish literature, lower and upper division courses in US Latino literature and film, and Chicano literatures and culture children's literature; as well as upper division and graduate courses in theory, regional and local literatures, including environmental and contemporary ethnic literatures of California; and in Hispanic literatures, including interdisciplinary connections to literature and history of Arabic and African cultures. They have once offered courses in British Literature,

taught by lecturers from the writing program, and have taught only the first half of the World Literature survey, with a lecturer, Linda Torres, teaching the second.

Overall, UCM's highly comparative approach to literature enables the interdisciplinary training of students in literature, cultural studies, theory, and comparative studies, while allowing us to address the school's goal of exploring both the world at large and the immediate community. All these emphases will contribute significantly to studies of gender, ethnicity and culture, and they will enable comparative studies of issues such as diaspora, migration, globalization, discrimination, nativism, gender roles, and other social phenomena.

III. Weaknesses

a) The lack of resources necessary to fund regular outside speakers (especially international scholars or writers) to keep up to date on the latest developments in the field.
b) Too few faculty in some major areas of literary study, including African-American, British, Asian, Asian American, Arabic, etc.
c) Lack of resources to sponsor Graduate Student travel and Research.
d) Current faculty have had to teach more courses than is required and to enroll upper division classes beyond the norm, simply to meet demand. Growth will require more full time faculty.

IV. Challenges

a) Attract, hire, and retain an adequate number of high-quality faculty to teach the electives in our major, as well as fulfilling the needs of lower division courses.
b) Obtain the administrative and financial support to leverage our current and future faculty strengths so that we can achieve prominence in the areas of (alphabetically):
    i. American Studies
    ii. California Studies
    iii. Children’s Literature
    iv. Ethnic Literatures
    v. Latin American Studies
    vi. Non-Traditional Hispanic literatures (i.e. Africa and Asia)
    vii. Peninsular Literatures
    viii. Transatlantic Studies Transcontinental Studies
    ix. US-Latino Studies
c) Attract many more undergraduate students to L&C while retaining the high quality and analytically challenging WCH program that is already in place.

V. Goals and Strategy over Medium Time Horizon (1-5 years)

a. Research Opportunities and Funding

i. Seminar Series in Literatures and Cultures
Key to our hiring goals and the establishment of UC Merced as a leading research institution is the creation of an active seminar series where visiting researchers present their latest findings. Speakers in this series will not only advance the research goals of the program, they will also provide a valuable opportunity for interaction with other UC Merced programs that share our interest in literatures and cultures research.

ii. Implement a Center for the Humanities.
All UC campuses have a Humanities Center. A similar center here will encourage cutting edge research on local and international literatures and cultures studies. The center will also provide possibilities of research collaboration with other disciplines such as history, anthropology, policy, sociology, political science and the arts.

iii. Take advantage of UC Mexus in order to enhance research on Mexican, Mexican-American Studies and seek collaboration with Mexican scholars.

iv. Seek the opportunity to establish UC Mexus-like research opportunities with Spanish and Northern African Universities (such as the former Del Amo Program).

v. Also, seek the opportunity to establish other campus research groups, including a California Studies initiative, currently funded by UCOP/UCHRI, a research group on Reading and Reception (already in its initial stages), and others. These campus-wide proposals represent interdisciplinary research that can take many avenues, including courses and colloquia, such as the one currently underway about Labor and Migration (supervised by Prof. Goggans) or the Chicano/a Literature Series (directed by Prof. Martín-Rodríguez), which has already brought to campus twelve scholars and writers.

b. Undergraduate Program

Near term, we simply want to bolster our new major in ways that retain UC Merced's interdisciplinary mission, both within the concentrations themselves, and by asking students to meet breadth requirements in the major through electives in other fields such as Arts, Music,
History, Sociology, and Anthropology.

c. Interdisciplinary Opportunities

In keeping with the campus primary directive of interdisciplinarity, the area of Literatures and Cultures is situated at a disciplinary crossroads, both inviting collaboration with the other schools and disciplines within SSHA and across the campus, and illustrating, within its own precepts, a wide ranging set of disciplinary approaches and interests.

The proposed Literatures and Cultures major will complement and be supplemented by a wide variety of majors already in place, or currently proposed. The highly interdisciplinary construction of literary studies makes the major a logical "breeding ground" for cross cultural, comparative studies with art, history, music, philosophy, sociology, anthropology, economics, and political science, to name only a few areas. Additionally, with courses such as environmental literature, the minor in American Studies, which requires one course outside of SSHA, and recent theoretical trends in literature and medicine, for example, literature has committed itself to the exploration of technology, science and medicine, and natural systems. The L&C major proposal requires that at least 8 units be taken in breadth studies.

d. Graduate Program

The LIT faculty currently plays a major role in the World Cultures Graduate Program (WCGP). The WCGP is currently at work on a proposal for the stand-alone program that will replace the Individual Studies currently in place. The group is seeking funding for a retreat this spring.

i. Likely placement of graduates

LIT and WCH students likely to be employed in educational settings, with the publishing industry, in advertising and media, in libraries and other cultural organizations, in local, state and national government offices.

At the graduate level, most degree recipients find employment in academe, but graduates from interdisciplinary programs (like the one at UCM) have a more varied set of possibilities.

LIT scholars are also employed in non-Humanities schools, as other disciplines have realized the benefits of having Literature and Humanities faculty within their ranks[xiii]. The College of Medicine at Pennsylvania State University, for instance, has an entire Department of Humanities, the oldest in the nation (established in 1967). A recent advertisement for an open-rank hire in Literature informs candidates that they would teach required courses in the first, second, and fourth year of medical school.18

The job market for Literature graduates remains strong. According to data from the Modern Language Association, a total of 2,349 job advertisements (most of them for academic positions) were published in the MLA's Job Information List during 2003-04, the last year for which this organization has released records. Most jobs listed in the MLA's list are for candidates who hold a Ph.D. or are ABDs.[xiv]

e. Hiring Priorities

i. Near-Term Searches

As part of the HWC by-law 55 group, the Literature faculty agreed that the first hiring priority was a scholar of African diasporas (rank open), with many emphases possible. Should SSHA authorize such a search, such a scholar might teach substantially in the Literature major. To support the literature major, we contemplate our next hire to be in European Renaissance (rank open), ideally a comparatist who could teach both English (especially Shakespeare) and Spanish (especially Cervantes). This would allow us to cover a major period usually represented in Literatures and Cultures Departments. A major priority in the Humanities, ideally shared with Cognitive Science and the Language Program, would be a Linguist who studies Spanish Language. While such a scholar would not explicitly be part of the Literature group, language and linguistics are historically allied with literary study and would be especially useful to support the Spanish Language track of our Literature major.
iii. Future searches

Ideally, we would conduct one search per year into the near future, alternating between Hispanic and Anglophone for some time. The first in the alternation would depend on the primary focus of our Renaissance hire.

[xiii] For some samples of placing records at different types of institutions see the following:
http://www.english.ucsb.edu/grad/job_placement/index.asp
http://web.princeton.edu/sites/english/new_web/documents/job_placement_by_school.pdf
http://www.auburn.edu/academic/liberal_arts/english/gs/prospective/placement.htm
http://www.brightsight.com/english/Grad/JobPlacementDetails.asp?l=b
http://www.as.wvu.edu/english/grad/index.html
[xiv] Chronicle of Higher Education. October 28, 2005. Pages: C49-50.

WORLD HERITAGE PROGRAM

World Heritage is an emerging interdisciplinary and cross-disciplinary area that includes architecture, history, archaeology, art history, geography, anthropology, management, law, and other disciplines. Thus, faculty in this field brings together the humanities, social sciences, policy, and management, consistent with the interdisciplinary intent of the World Cultures program within SSHA. It is a great challenge to start at UCM a World Heritage Program, because there a very few cases in the world of such educational programs at the international level, therefore it means that there are strong potentialities to get students, funds, visibility and relevance in a very short time. In order to obtain these results it is crucial to create a specific and dedicated infrastructure in term of human resources, hiring plans, research labs, spaces for demo and courses. In this way it is really possible to obtain very encouraging results in a very short time and according to a multidisciplinary approach. The key features of the program, strongly technology-oriented, will permit to create a new discipline and innovative profiles for new jobs in the field of the humanities, CRM, economy, computer science, educational purposes and many others. It will be also important to create a UNESCO chair (linked with WH Program) hosting at UCM a UNESCO educational program in collaboration with international scholars, managers and scientists. This activity requires a support from UCM and the approval of UNESCO. Whether it is in the domain of copyright and neighbouring rights, related rights of creativity, cultural policies, tangible as well as intangible heritage, cultural tourism, intercultural dialogue, the Chairs contribute in an efficient and multidisciplinary manner towards the sustainment of cultural diversity and by responding to the social and cultural requirements of our time.

The Culture Chairs show that the education systems in different countries are complementary and that they are required to function in complete synergy, and these criteria should also be applied to the other Chairs in UNESCO.

The Yosemite Park is in the World Heritage list and it needs diverse communication plans for preparing and integrating the experience of visitors. The involvement of the Park in the WH Program of UCM is a priority and it will be an important case studies for a multidisciplinary collaboration in training, research, workshops and, hopefully, for the creation of new visitor centers in Merced and in the Park (these could be realized by the WH Program).

In addition, the world of digital technologies for cultural and natural heritage is still a new and yet to be fully developed field of research. At the same time, a generation of students arrives on our campuses with extensive experience in the computer world. The challenge of digital technologies is to integrate the ontologies of data into a coordinated process of digital acquisition, processing, and communication (on line and off line). The University of California, Merced has the opportunity to develop a comprehensive program that will bring together faculty from different fields to work with students and technicians in the process of reconstructing the world cultural and natural heritage. I believe that this is a crucial moment in scholarship as we seek for ways to remain relevant in a world of communication through technology. On the other side a so ambitious program cannot depend on just one professorship and very few affiliations, we need to increase the capacity of this activity in order to have really “a program” at national and international level. For the while the development of the World Heritage program will also have many immediate and long-term benefits for SSHA and UC Merced. These include providing a unique minor

(and, eventually, a major) within SSHA to attract students to UC Merced, fostering and engendering interdisciplinarity across Schools within UC Merced, and attracting international graduate students who are seeking—and will be willing to pay for—a graduate program in this field. A World Heritage program will offer a range of funding possibilities to faculty throughout the humanities, an area in which financial sustainability is often challenging. For the WH Program are necessary new positions in the following fields: virtual heritage, law and policy, legal issues in world heritage, environmental sciences.
Since the high specialization of the world heritage field in cross-disciplinary sense, it is quite urgent also to create a specific Ph.D. program at UCM. In fact we have already received several requests from graduate students for applying a PhD program in WH. At the MA and Ph.D. level, we expect the program to attract heritage management professionals, and students with humanistic and technological background.

For the foreseeable future, the World Heritage program will be affiliated with the World Cultures graduate group, and with the faculty in a unit that includes History and Anthropology. In particular there are strong links and connections at UCM between the World Heritage Program, World Cultures and the School of Management.

The list of new courses proposed for the next semesters (upper division) for the WH Program are: WH150, Cultural Landscapes and Spatial Technologies, WH190, Topics in World Heritage, WH100, Virtual Heritage and World Heritage, WH105 World History and World Heritage, WH110, Reconstructing Ancient Worlds, WH140, Cultural Heritage Policy and Practice.

Spaces: Research Labs and Demo Rooms

The activity of the WH Program should be articulated in different multi-tasking spaces: training labs, research labs and demo rooms. The training labs should be shared spaces (with other schools and departments) where the students can learn software, implement case studies and technological devices (in the future 3D laser scanners, digital photigrammetry, remote sensing, haptics, and so on). The research labs have to be specific spaces addressed just to multidisciplinary research projects of virtual heritage. Here we will host digital archives, data, metadata and specific software. Currently we have space for a small lab located at the third floor of the SSHA building; it is a good starting point but we expect to increase it in the following months and years according to the growth of the WH Program.
The demo room will be the space for a public communication with virtual reality devices. Currently I am working with Marcelo Kalmann for the set up of the Power Wall, I think that we could share this space as demo room in this phase. One more space could be at the third floor of the library. Here we could create a permanent installation able to host virtual heritage applications from all over the world.

Curriculum Focus

World Heritage will be a multidisciplinary program that integrates the digital humanities, heritage management and global cultural studies. We have to face the reality of the short life of technology tools. Therefore, it is crucial that students not only learn how to use the current state of the art, but go beyond it to an understanding of methodologies that will shape the use of any research tool. The challenge for our

contemporary classroom work is to construct a curriculum that blends humanistic interests and technology.

Students will learn that the codes, metadata, and interfaces of today are in constant change and thus the fundamental task will be to determine how to set up a sustainable management system for digital media and global heritage study.

Such teaching must involve the interaction of anthropology, history, art, archaeology, sociology, philosophy, and computer science. The learning outcome from such teaching should be the acquisition of a methodology aimed at understanding and communicating information about intangible heritage cultural and natural sites.
For each student this methodology must apply to the specialization of their field or to specific case studies. These teaching methods, based on the relationship between cultures, information and spatial technologies, should be the core of what we might offer at the Merced campus.

Research Directions

The world of digital technologies for cultural heritage is still a new and yet to be fully developed field of research. At the same time, a generation of students arrives on our campuses with extensive experience in the computer world. The challenge of digital technologies is to integrate the ontologies of data into a coordinated process of digital acquisition, processing, and communication (on line and off line). The University of California, Merced has the opportunity to develop a comprehensive program that will bring together faculty from different fields to work with students and technicians in the process of reconstructing the world cultural and natural heritage.
I believe that this is a crucial moment in scholarship as we seek for ways to remain relevant in a world of communication through technology.

Key words: World Heritage, Cultural Sites, Natural Sites, Virtual Heritage, Anthropology, Ecosystem, Digital Technologies. Multidisciplinary

Topics (research and teaching):

<u>Introductory Courses</u>
-Cultural and Natural Sites
- Environmental Heritage
- Intangible heritage

<u>Heritage Management and Sustainable Communities</u>
- Laws, copyright and legislation issues
- Conservation and documentation in heritage
- Heritage and Tourism
- CRM and economics of heritage

<u>Virtual Heritage</u>
- Virtual Heritage
- Museum Communication

Spatial Technologies
-GIS
-WEB-GIS
- Remote Sensing
- Digital Photogrammetry

Methods and technologies

- Social and anthropological aspects of heritage (sense of place, collective memories, ethnology, philosophical and epistemological issues). Target: theory, principles, definition, methodologies.
- Spatial technologies in landscape analysis and eco-reconstruction (cultural and natural). Target: GIS, Web-GIS, VR Landscapes, Digital ecosystems
- Virtual Reality, Computer Graphics and Multimedia. Target: 3D communication, virtual-immersive environments, multimedia tools and productions.
- Display and communication of heritage. Target: museums, NGOs, public institutions, CRM, SMEs.

Possible initiatives

For launching the WH program it would be important to organize in UCM some international events, like workshops, conferences, seminars. For example in 2009 it could very interesting to organize a conference on digital landscapes at the Yosemite Park. In the same time, in collaboration with the library, it would be possible to plan a space (already identified at the third floor) as digital-virtual museum

Starting from spring 2008, a training activity on Second Life will be planned with the students. UCM Heritage Island is the name of the virtual space on SL.

A virtual space dedicated to the virtual reconstruction of the Roman Villa of Livia (wife of the emperor Augustus) will be implemented in Second Life for educational activities, e-learning, and virtual lessons with the students.

Research Projects (current and future)

UCM Heritage Island on Second Life
The VR reconstruction of the ancient Roman landscape of the Valley of Imperial Fora (WEB GIS)
The Virtual Museum of the Han Tombs of Xi'an
The Virtual Archaeological Park of Yosemite
Organization of Summer Schools in 3D Archaeology

ANTHROPOLOGY

SUMMARY

The Anthropology program at the University of California-Merced (UCM) distinguishes itself by focusing research and teaching on a select group of common research themes relevant to our local, state, and global communities. The undergraduate major emphasizes methodological skill and intellectual rigor in addressing specific issues within these themes, and promotes undergraduate research opportunities—including working on faculty research, service-learning, and individual research—that deepen learning experiences and attract students to our program. Anthropology faculty currently contribute to two interdisciplinary graduate programs, and we are also building our program in anticipation of initiating a disciplinary graduate program at some time in the future.

This document presents a plan for growth of the Anthropology program over the next five years, including plans for strategic hires in archaeological anthropology in AY 2008-09 and biological anthropology in AY 2009-2010 to support undergraduate, interdisciplinary graduate, and anticipated disciplinary graduate programs; development of dedicated damp teaching laboratory space in COB; continued development of appropriate damp and wet research laboratory space on campus in SSM, SE I, and/or SE II; and enhancement of library resources for undergraduate instruction. In addition, this plan suggests avenues for intra- and inter-disciplinary research and partnerships involving Anthropology both within and beyond SSHA.

1. CHALLENGES

The Anthropology program must address challenges that range from those similar to any start-up program at UCM to those unique to this diverse discipline. Within the next five years, the Anthropology program must:

- Recruit additional ladder-rank faculty in the three core sub-fields sufficient to support the undergraduate Anthropology major and minor requirements, interdisciplinary graduate instruction, and the longer-range goal of a stand-alone anthropology graduate program;
- Develop sufficient “damp” and “wet” research laboratory space for faculty and affiliated graduate students whose specializations necessitate such space;
- Acquire dedicated teaching laboratory space for undergraduate education in both archaeological and biological anthropology;
- Invest in instructional infrastructure in socio-cultural, archaeological, and especially biological anthropology to support undergraduate education;
- Improve library resources in ethnographic, archaeological, and biological anthropology primary literature and multimedia; and
- Identify and develop intersections for interdisciplinary partnerships in faculty, graduate, and undergraduate teaching and research within SSHA and across campus.

2. STRATEGY

Although an Anthropology program was envisioned within SSHA as early as 2005, the Anthropology program was not initiated until the Fall of 2006, with the hiring of DeLugan (socio-cultural) and Hull (archaeological), who represent two sub-fields within the discipline. At this time, Hull's offer letter was also included a promise of necessary research and teaching laboratory space, and negotiations with then-Dean Hakuta and administrative staff (S. Rabedeaux) resulted in identification of COB 110 for both of these uses. Office space for both DeLugan and Hull was assigned in COB.

At the request of the SSHA Assistant Dean, a proposal for the Anthropology major was prepared and submitted to interim Dean Bjornsson in August of 2006, with a proposed Fall 2007 start date. The proposal was shelved until Fall of 2007, however, since it appeared that FTE for additional necessary ladder-rank faculty for a Fall 2007 start could not be secured during AY 2006-07. Still, CRFs prepared by DeLugan and Hull encompassing all courses necessary for the Anthropology major were submitted for approval to the SSHA faculty and were approved by the UGC. In lieu of the Anthropology major, a proposal for the Anthropology minor was prepared and submitted to Dean Bjornsson by DeLugan and Hull in September 2006, and the Anthropology minor was approved by the Undergraduate Council (UGC) in November 2006.

In Spring 2007, DeLugan and Hull successfully hired Vicki Wedel as assistant professor in biological anthropology through the UCOP President's Postdoctoral Fellowship Program. With the successful completion of this search, we met the first of the goals set forth in the 2007 strategic plan for the Anthropology program. Dr. Wedel is an ideal colleague, with methodological expertise in histology and research interests in the effects of enslavement, emancipation, race, and class on health and nutritional status as measured through levels of skeletal maintenance and bone remodeling. Wedel's cutting-edge methodological and topical expertise represent an approach in biological anthropology that sets the UCM anthropology program apart from many other programs within the UC system and beyond. These strengths also promise potential partnerships with faculty in the Natural Sciences in both teaching and research, and will help us contribute to a cross-campus focus in health, nutrition, and the environment. Both Wedel and Hull were assigned research laboratory space at Castle in Fall of 2007, since no suitable damp laboratory space will be available on campus until construction of the Social Science and Management (SSM) building is complete in 2010. The Anthropology program also established programmatic infrastructure in the Fall of 2007, with the development of a recruitment brochure and program website.

The proposal for Anthropology major was submitted for review and approval by the SSHA faculty in November 2007, and we anticipate UGC approval for the major to begin in Fall 2008. As part of the major proposal and in response to the development of the biological anthropology curriculum, CRFs for eight new anthropology courses were also submitted for review and approval by UGC. With approval of these courses, the Anthropology program now encompasses 31 courses. Unfortunately, instructional laboratory space remains a problem for the program, despite the fact that Dean Bjornsson received verbal assurance from the Provost's office in September of 2006 that the previous agreement with Hull regarding use of COB 110 as an anthropology teaching laboratory would be honored. This space has yet to be set aside as a dedicated teaching laboratory required for teaching collection storage and security.

Service-learning components for two Anthropology courses are in place and others are in development. This service aspect of the UCM Anthropology program makes it stand out from other anthropology programs elsewhere in the UC system, as well as those of other research institutions. For example, ANTH 170 (Ethnographic Methods) is designed to have a service-learning research component. This course will also contribute to the Sociology minor and anticipated Sociology major, as well as other relevant disciplinary programs at UCM. Anthropology coursework also contributes to the American Studies minor and the proposed World Heritage program, and Anthropology faculty and instruction are already included in both the Social and Cognitive Sciences and the World Cultures graduate programs.

2.1 Vision

We envision that intercultural understanding and experience will be fundamental to social, political, and economic life within the increasingly globalizing world of the 21st century. Therefore, the Anthropology program at UCM will be recognized as a major intellectual center for research and teaching that fosters intercultural knowledge and competency through intra and interdisciplinary efforts and community engagement.

2.2 Mission

The Anthropology program at UCM strives to provide leadership in anthropological research and education by articulating diverse perspectives on the human condition through a program that integrates traditional sub-fields of anthropological practice (socio-cultural, archaeological, and biological) and seeks interdisciplinary partnerships across diverse disciplines. Through anthropological research and education, we value and promote engaged citizenship for an interdependent and diverse world, increasing knowledge of social and cultural dynamics within the University, local, state, national, and world communities.

3. GOALS AND STRATEGIES

Building on our currents strengths, while also considering long-term needs that fulfill our stated mission and initiatives within the UCM community at large, the anthropology faculty have identified four initial cross-field teaching and research areas for the program:

- indigeneity, race, ethnicity, and the nation-state;
- transnationalism, migration, and demography;
- health, nutrition, and the environment; and
- heritage, tourism, and public culture.

These themes and their potential cross-campus connections are considered more fully in Section 3.3.

Although there is only a short history of Anthropology at UCM, data from the American Anthropological Association, other UC anthropology programs, and the first year of anthropology instruction at UCM allow us anticipate how the program will grow over the next five years and, therefore, justify FTE for additional faculty beyond those necessary to minimally serve undergraduate majors and minors, interdisciplinary graduate students, undergraduate general education, and the long-term goal of a disciplinary graduate program. We also recognize that as the Anthropology program grows, its potential interdisciplinary contribution to UCM will likely increase, as well, supporting continued growth in four focal research areas or beyond. Therefore, the 5-year period covered by this Strategic Plan will be used to continue to fill basic needs for undergraduate instruction; track progress, enrollment, and emerging faculty partnerships within and beyond SSHA to facilitate future strategic planning; and envision future mid- to long-term goals with respect to faculty research contributions, graduate education, and the national and international profile of the program within the discipline.

3.1 Research Opportunities and Funding

Anthropology does not typically generate large external grants that bring funding to campus, although it is anticipated that faculty research will provide some funding and founding faculty have already been successful in acquiring external funding. For

example, DeLugan, along with Símon Weffer (Sociology), is currently working on a multi-year research project funded by the California Partnership for the San Joaquin Valley (through the Great Valley Center) to monitor changes in the quality of life of two targeted Merced County communities. The project responds to the Governor's executive order to address inequities in the Central Valley, and has already incorporated undergraduate and graduate research opportunities. Similarly, Hull has an initial grant from the Bureau of Land Management to support cultural resource management activities and cultural heritage initiatives in an under-served region in eastern Nevada. Fieldwork on this project will begin in the summer of 2008. Our faculty will continue to explore future funding opportunities from foundations and government agencies (e.g., the National Science Foundation, National Institute of Health), with an initial emphasis on funding projects that support local initiatives.

3.2 Teaching Opportunities and Enrollment

The Anthropology program at UCM made a modest, but noteworthy start in the Fall of 2006, and undergraduate course offerings and enrollment are continuing to grow in AY 2007-08. The initiation of Anthropology minor has apparently already spurred enrollment, and we anticipate that initiation of the Anthropology major will not only increase enrollment in anthropology courses, but also contribute to recruitment of new undergraduate students (both freshman and transfer) and retention of current UCM undergraduates rethinking their intended major. In fact, UCM lost at least two undergraduate students at the end of AY 2006-07 to other UC campuses (UCLA and UCSB), because the Anthropology major was not available.

Table 1 summarizes enrollment for courses taught by Anthropology faculty during AY 2006-2007 and 2007-2008, including disciplinary undergraduate courses and interdisciplinary undergraduate or graduate courses. We view the data from AY 2006-07 as reflecting a particularly successful beginning, especially in light of the fact that only one of the anthropology lecture courses (ANTH 1) was listed in the 2006-07 General Catalog and, therefore, readily known to students. In addition, several students who completed an anthropology course in Fall 2006 enrolled in at least one Anthropology course in Spring 2007. This pattern of students seeking out and enrolling in more than one anthropology course has continued during AY 2007-08, indicating the draw of anthropology courses in the future.

Table 1. Summary of Anthropology Faculty Course Enrollment Fall 2006 through Spring 2008.

Semester	Course #	Title	Instructor	Enrollment
Fall 2006	ANTH 1	Introduction to Socio-cultural Anthropology	DeLugan	42
Fall 2006	ANTH 135	Archaeology of Native California	Hull	24
Sp 2007	ANTH 3	Introduction to Anthropological Archaeology	Hull	24
Sp 2007	ANTH 95	Undergraduate Directed Research	DeLugan	8
Sp 2007	ANTH 110	Transnationalism	DeLugan	11
Sp 2007	CORE 90X	The Tourist and the Toured	DeLugan	10
Sp 2007	WCH 192	Public Research Project in WCH	Hull	8
Fall 2007	ANTH 1	Introduction to Socio-cultural Anthropology	DeLugan	34
Fall 2007	ANTH 5	Introduction to Biological Anthropology	Wedel	28
Fall 2007	ANTH 130	Archaeology of Colonialism	Hull	30
Fall 2007	ANTH	Upper Division Undergraduate Directed	DeLugan	2

	195	Research		
Fall 2007	ANTH 198	Upper Division Directed Group Research	DeLugan	6
Fall 2007	WCH 260	Social Memory Graduate Seminar	DeLugan	10
Sp 2008	ANTH 3	Introduction to Anthropological Archaeology	Hull	31
Sp 2008	ANTH 170	Ethnographic Methods	DeLugan	9
Sp 2008	ANTH150	Race and Human Variation	Wedel	17
Sp 2008	HIST 190	Applied Research	Hull	11
Sp 2008	WCH 193	Public Research Project in SCH	Hull	1
Sp 2008	WCH 262	Material Culture	Hull	1*

* one SCS graduate student also auditing course

The addition of biological anthropology to the curriculum in AY 2007-08 has also prompted further interest in anthropology courses by students within and beyond SSHA. For example, ANTH 5 (Introduction to Biological Anthropology) included students from all three schools during Fall of 2007, with students from the School of Natural Sciences accounting for more enrollment than students from the other two Schools combined. Clearly, biological anthropology is of interdisciplinary interest to anthropology students, as well as undergraduates with pre-med aspirations and majors and minors ranging from biology to engineering

As discussed in the proposal for the Anthropology major, the American Anthropological Association's *1998 Biennial Survey of Anthropology Departments in the United States* provides general data that allow us to estimate enrollment in introductory Anthropology courses as the campus grows. The report notes:

> Looking at enrollment per department, the average total [annual] enrollment for introductory courses is 1,138.... Average enrollment is higher in public (1,508) compared to private (414) institutions. As one would expect, the larger the institution the larger the average student enrollment in anthropology. Institutions with 15,000 students or more reported an average of 1,921 students enrolled in introductory anthropology courses, compared to 1,024 in institutions with 5,000 to 14,999 students, and 319 in those with 5,000 students or fewer.

At other UC campuses, enrollment in any given introductory course generally ranges between 100 and 400 students, and ANTH 1 (Introduction to Socio-cultural Anthropology) already attracted more than 40 students during the Fall of 2006. Adding enrollment in upper-division courses will, of course, increase these enrollment projections for the Anthropology program at UCM. The *1998 Biennial Survey of Anthropology Departments in the United States* notes that "for advanced courses, the average total [annual] enrollment per department is 536....[with] average enrollment in advanced courses...higher in public (651) than private (256) institutions, in larger institutions, and in Ph.D. granting institutions."

Anthropology majors comprise approximately 0.5 to 3 percent of the total undergraduate student population at other UC campuses during the 2004-5 academic year (the last year for which data are available). At the four UC campuses with the largest numbers of undergraduate Anthropology majors (i.e., Berkeley, Los Angeles, Santa Cruz, and Santa Barbara), these students enroll in the program at a rate greater than would be predicted given the size of the undergraduate population for the campus and the number of baccalaureate programs available. In fact, at UC Santa Cruz, Anthropology is the eighth most popular undergraduate major on campus. Anthropology is also consistently within the top 20 requested

majors for community college transfer students in the UC system. These data highlight the demand for Anthropology within the UC system, a demand that parallels the increasing student interest and matching academic investment in anthropology within the United States, as a whole.

We look forward to similar success with the Anthropology major at UCM, although we will have no data to anticipate growth until after the major is initiated. One initial gauge, however, is the popularity of the anthropology minor, which has been available for less than one year, as there are currently seven declared Anthropology minors. Curriculum for the proposed major relies exclusively on anthropology course offerings, but as the program grows, SSHA faculty may recognize potential for cross-listing or adding other upper-division Anthropology courses as electives within majors such as sociology, history, political science, world heritage or the arts. In addition, although anthropology has a unique burden of ensuring that students in the major receive training in three methodological sub-fields, we have also included an interdisciplinary articulation requirement for the major within one of four broad thematic areas that encompasses courses from other SSHA and Natural Science programs. Reflecting anthropology's links to other SSHA programs, Hull and DeLugan have already served as faculty advisors to senior thesis projects within World Cultures and History, and Hull oversaw WCH 192 in Spring 2007 and both HIST 190 and WCH 192 in Spring 2008.

The School of Social Sciences, Humanities and Arts (SSHA) *Strategic Plan and Academic Resource Plan* prepared in January of 2006 recognized the unique ability of Anthropology to make a contribution to the undergraduate and graduate programs of both the social sciences and the humanities at UCM. For example, it is clear that anthropology is a discipline of interest to students enrolling in the World Cultures and History graduate program, as there are current graduate students who are emphasizing anthropology in their studies and proposed dissertation research. In addition, Hull has been involved in cross-school discussions on the development of an Environmental Policy and Management program at UCM. These efforts demonstrate that anthropology provides a natural interdisciplinary base from which to promote faculty collaboration and attract students to UCM. All three anthropology faculty are affiliated with both the Social and Cognitive Science and the World Cultures graduate groups, and we envision continued interdisciplinary graduate instruction and advising, providing an anthropological perspective on cross-cutting research themes. In Spring 2007 and Fall 2008 both DeLugan and Hull led one session each for WCH 201. In Fall 2007, DeLugan taught WCH 260 (Social Memory) and Hull is teaching WCH 262 (Material Culture) in Spring 2008. DeLugan is also currently the major advisor for one World Cultures graduate student and in AY 2007-08 will serve on his and one additional Ph.D. oral committee. Similarly, Hull served on one Ph.D. oral committee in AY 2006-07 and will serve on two in AY 2007-08.

3.3 Interdisciplinary Opportunities

Anthropology is inherently interdisciplinary. Through its subfields, anthropology spans theory, method, and inquiry common to the social sciences, humanities, and natural sciences. Therefore, anthropology will substantially contribute to interdisciplinarity at UCM.

One of the six challenges outlined in Section 1 above is to identify anthropological intersections for interdisciplinary partnerships in faculty, graduate, and undergraduate teaching and research to fulfill the mid-term goal of creating distinctive interdisciplinary programs that make UCM unique within the UC system. Such programs will serve to attract both students and faculty who think "outside the box." As noted in our 2007 strategic plan, we suggest that this process be initiated by developing a prioritized list of possible interdisciplinary undergraduate minors and/or graduate tracks or emphases by the end of AY 2008-09 in consultation with SSHA faculty and faculty in other schools. Perhaps this will be addressed In the Strategic Academic Planning (SAP) effort currently underway at UCM. This list will contribute to faculty hiring decisions

across all SSHA programs for the next five years. Intersections with connections to anthropology might include:

- public culture and world heritage – drawing on faculty strengths in museums, cultural resource management, collective identity and social memory, tourism, and heritage studies
- citizenship and social action – drawing on faculty interests in social movements, poverty and social inequality, gender-race-ethnicity, the nation-state, migration, community-university partnerships, and activist scholarship/action research
- health, environment, and society – drawing on SSHA and other UCM faculty interests in medicine and natural and social environments, including urban, rural, and natural settings
- geographic information studies – drawing on faculty interests in spatial analysis, cultural resource management, and the unique applications to humanities-based teaching and research

The Anthropology faculty have already been engaged in conversations with Dean Pallavicini regarding anthropological contributions to the proposed UCM medical school, and faculty have also contributed to planning documents for the new World Heritage program.

Other avenues through which Anthropology faculty and the Anthropology program can contribute to interdisciplinarity at UCM are in the development of campus-wide research centers and institutes. Hull is already affiliated with the Sierra Nevada Research Institute (SNRI), and DeLugan is currently involved in the planning of a Center for Research on Inequality that will focus on regional, national and global disparities. As we look to the future—perhaps even beyond the five years covered by this plan—we can also envision the recruitment of a socio-cultural anthropologist with expertise in environmental issues who might contribute to initiatives at SNRI. In addition, DeLugan is participating in discussions regarding a potential Multicampus Research Unit (MRU) between UCM, UC Berkeley, UC Center-Sacramento, and UC Davis on Poverty and Justice in the San Joaquin Valley, to be housed at UCM. Anthropology faculty also support the recommendation that a Humanities-based Organized Research Unit be established at UCM, and anticipate contributing to that initiative if and when it is approved.

Likewise, anthropology faculty will continue to advance excellence in individual and collaborative anthropological research and scholarship, with particular attention to possible participation in university and community solution-oriented research collaborations. We anticipate contributing to or leading proposal development and grant-writing to draw resources to UCM for these research objectives. DeLugan has already devoted considerable energy to developing a new organization—Community-University Research and Action for Justice (CURAJ), a Central Valley-wide initiative—that will network the academic community with community-based organizations to address pressing local issues. DeLugan and Hull are also working to strengthen the support structure and communication network at UCM for faculty interested in developing and collaborating across campus on regional research as well as service-learning and student internship opportunities.

While DeLugan and Hull are currently focusing on cultivating local and regional community outreach projects, Wedel's work as a member of the New York African Burial Ground Project is demonstrating such partnerships on a national scale. This project involves collaboration of anthropological archaeologists, biological anthropologists, historians, and an active descendant community to refine national understanding of the effects of enslavement on New Yorkers of African descent. As a contributing partner in this network of scholars, Wedel has been able to exemplify the standards of excellence in community partnerships to which we aspire in our research.

Finally, Anthropology faculty will serve and support SSHA by promoting (both internally and externally)

SSHA's inherent value to UCM, its faculty, and students in its academic leadership in both traditional and nontraditional fields and in addressing the long-term goal that UCM serve as an excellent research institution in all fields it represents. We will work to identify existing or new fields in which SSHA and UCM can excel or lead in creative research and teaching, and support hiring in those fields.

3.4 Resources

As noted in Section 1 above, six challenges currently exist for the development of the Anthropology program at UCM, five of which are directly related to resources. First, the Anthropology program must have sufficient faculty in the three core sub-fields to support the undergraduate minor and major requirements and graduate instruction. The Anthropology program now has one faculty member in each sub-field, but the goal is to build this out to at least two faculty within each sub-field within the 5-year span of this strategic plan to meet these basic needs. Although the Anthropology major will likely be underway by Fall 2008 and can begin with just four ladder-rank faculty, at least one additional ladder-rank faculty in archaeological anthropology is required by Fall 2009 to move students through the major. In addition, at least one lecturer in biological anthropology will be necessary by Fall 2010, although a sixth ladder-rank FTE for this position is preferred. In addition to supporting undergraduate and graduate instruction, the anticipated hires will also facilitate collaboration across the sub-fields and with other social science, humanities, and natural science fields to foster creative thinking, research, teaching, and problem-solving.

We are currently searching for a senior socio-cultural anthropologist, who will bring a specialization in medical anthropology and be poised to articulate with the initial cross-field teaching and research areas identified for the Anthropology program in Section 3 above. In addition to providing critical mass for initiation of the major and important mentoring and leadership for the current junior faculty, this faculty member will engage with the social sciences, humanities, and possibly biological sciences as well as other campus initiatives including the proposed medical school. Research and teaching in medical anthropology may address issues of intercultural understanding in medical practice and access to care, disparities in health status, and non-western practices and concepts of illness, healing, and grief.

Our priority is to hire a senior archaeological anthropologist no later than Fall 2009. This position is critical to the development of required laboratory methods courses that are a bottleneck to student progress through the major, given necessary enrollment limits. Furthermore, only a tenure-track faculty member can access research collections required to support such instruction and work with other faculty to provide a variety of technical specialties. This faculty member will bring expertise in complex societies and methodological interests in faunal, paleoethnobotanical, or ceramic analysis, thus complementing existing archaeological expertise in small-scale societies and analysis of stone tools. The ideal candidate will have research interests in the social aspects of food, diet and nutrition, or plant or animal domestication, and will articulate with the social sciences, humanities, and natural sciences, as well as WCI and, perhaps, the proposed MRU on food studies based at UC Davis. Research expertise in the Americas is desirable, as we envision that the Anthropology program at UCM will initially emphasize a hemispheric perspective, capitalizing on existing faculty expertise and interests. This would also resonate with similar plans in Literature and History and will complement existing faculty research in areas such as indigeneity, colonialism, demography, the nation-state, migration and transnationalism, and public culture. The addition of this archaeological anthropologist will also facilitate flexibility in teaching rotations for anthropology faculty, as a whole, thus permitting more regular instruction of anthropology courses incorporated in the American Studies minor and new world heritage program.

As noted above, the next hiring priority after a second anthropological archaeologist is a second biological anthropologist. While a lecturer in biological anthropology might help service the major

through periodic instruction of ANTH 5 in the short term, a lecturer is unable to contribute to upper division laboratory instruction, since such instruction is generally based in faculty research collections. Therefore, a ladder-rank faculty is required, with a preferred methodological specialization in bone chemistry and stable isotope analysis pertinent for addressing questions of diet and demography. Such research would complement existing faculty and programmatic strengths in health, nutrition, and migration, while also possibly contributing to other keys areas such as ethnicity, identity, and demography. We envision that this faculty member could take advantage of existing core campus ICPMS equipment for such research.

The second resource need for the Anthropology program is sufficient "damp" and "wet" laboratory space for both research and teaching for faculty whose specializations require such space. This is a particularly critical issue with potentially serious consequences given the resources currently available. The lack of sufficient research laboratory space may hamper attracting and retaining top faculty, while the lack of sufficient teaching laboratory space will undermine initiation and maintenance of the Anthropology major and minor. Pending completion of SSM, our short-term strategy In AY 2007-08 turned to securing research laboratory space at Castle for both current and anticipated faculty in biological and archaeological anthropology. Anthropology research laboratory space planned for SSM—augmented by Wedel's laboratory at Castle—is sufficient for current faculty in these two sub-fields. This may not be true for future colleagues, however, particularly if we hire faculty whose research includes analysis of phytoliths, pollen, or genetic material. The inability to reconfigure SSM anthropology laboratories to permit the addition of fume hoods (due to building specifications, including the lack of back-up power) necessary for such research means that additional research laboratory space must be identified in SEI and/or SEII. Thus, anthropology faculty must be included in planning for SEII or these needs must be anticipated as space in SEI is reallocated with the completion of SEII.

Third, we need a commitment from the Provost's office regarding dedicated teaching laboratory space for undergraduate education in both archaeological and biological anthropology. Dedicated space is needed because substantial instructional collections must be stored on-site, institutions or agencies lending these archaeological and osteological collections impose strict security requirements for such storage, and off-hour access and layout space is required for students working with collections over the course of a semester for laboratory classes and/or individual undergraduate research projects. We have identified one room (COB 110) that can suffice in the short term, and use of the adjoining room (COB 114) would be desirable once that space is relinquished by the Arts program upon completion of SSM. In the long-term, anthropology faculty will require two dedicated, approximately 1,200 ASF teaching labs—one for archaeological laboratory classes and discussion sections, and the other for biological laboratory classes and lower division discussion sections. If a commitment is made to long-term use of COB 110 for Anthropology labs, than the most-likely candidate for the second lab is COB 114, which is currently used for art instruction. Since art teaching space has been programmed for SSM—and no Anthropology teaching laboratory space has been so designated within SSM or any other campus building—it appears this space could be available for Anthropology by Spring of 2010 if the planned SSM space is sufficient for arts instruction. Until COB 114 is made available, the Anthropology program would use COB 110 (once dedicated to Anthropology Instruction) for both archaeological and biological anthropology teaching labs. If Anthropology teaching lab space cannot be dedicated within COB, then it must be found in SEI or SEII. Given the delayed construction schedule for the latter building, however, this could severely impact necessary laboratory instruction for undergraduate students. We also see potential to incorporate landscaping outside COB 110/114 into instruction, providing an innovative and exciting learning experience for undergraduates studying archaeological techniques and methods.

Fourth, the Anthropology program must secure internal or external funding to develop instructional infrastructure to support undergraduate education. This is particularly critical given the substantial

financial investment required to support biological anthropology, in particular. Resources already acquired to support lower division instruction include a two locking metal storage cabinets, a glass display cabinet and casts of fossil hominids skulls, selected primate skulls and skeletons, and a modern human skeleton. Additional materials are required to satisfy needs for ANTH 5, and additional instructional resources are also required for one or more upper division biological anthropology course. These include casts or type collections used to assess age, sex, ancestry, pathologies, and other physical characteristics from human skeletal remains. We estimate that $15,000 is necessary to complete the collection of casts and specimens required for lower-division instructional needs in biological anthropology. Cost estimates for upper-division needs in biological anthropology will depend upon the next faculty hire within this sub-field, but expenses for the skeletons and models needed for Wedel's methods courses are estimated at $20,000. Similarly, upper division archaeological laboratory courses require modest laboratory equipment and laboratory furniture (e.g., digital scales, microscopes, calipers), and field equipment is required for an archaeological field course or field school (e.g., GPS units, compasses, screens, shovels, trowels, tape measures, etc.). It is anticipated that the total cost for both the archaeological laboratory and field equipment will not exceed $20,000. Anthropology faculty are pursuing internal and external sources of funding to acquire necessary instructional laboratory materials.

Finally, the Anthropology program—and, especially, undergraduate Anthropology majors—would be better served by improving the library resources in anthropology at UCM. Although we appreciate library space limitations and we support the use of electronic resources whenever possible, primary ethnographic and archaeological literature that is typically unavailable in digital format is critical to teaching specific anthropological subject matter as well as developing undergraduate research and writing skills. Archaeology, in particular, is inherently visual, drawing on material culture to make inferences ranging from technology to economy to sociopolitical organization. Therefore, students often cannot rely on web-based search engines or finding aids that only provide book or article titles, since these methods fail to identify appropriate materials for inter-library loans for research papers. Unlike some fields in which only the latest data are relevant and electronic journal articles are the disciplinary standard, primary ethnographic and archaeological literature are often revisited to gain additional insights and assess new hypotheses. We are aware of potential opportunities to acquire all or part of personal libraries of retiring faculty at other California institutions, and we hope that the Library will support or initiate these or other efforts to acquire classic monograph series such as the *University of California Publications in American Archaeology and Ethnology*, the *University of California Archaeological Survey Reports*, and primary ethnographic literature for California or other regions as identified by Anthropology faculty. Another option is to complete digital scanning of such classic series, since many are UC publications, and the Library has already supported a similar digital publishing effort for the *Journal of California and Great Basin Anthropology*, a publication of the Malki Museum. Efforts are also underway by anthropology faculty to begin building an anthropology multimedia collection.

In summary, this Strategic Plan calls for hiring one additional archaeological anthropologist (Associate Professor or Professor) during AY 2008-09, and one additional biological anthropologist (Open Rank) in AY 2009-2010**.** Ladder-rank faculty are required so that anthropological research emphases within our program can be strengthened and students will have access to laboratory instruction and research opportunities. Anthropology faculty are currently working with the SSM design team to ensure adequate research laboratories for new hires and existing faculty, and we are continuing efforts to make the administration aware of critical short- and long-term teaching and research laboratory needs in archaeological and biological anthropology. It is especially important that COB 110 be set aside as a dedicated anthropology teaching laboratory, as the anthropology major requires such space, and we hope that COB 114 will be available for the anthropology program after construction of SSM is complete.

3.5 Finances

See Section 3.1.

3.6 The Organization

Anthropology faculty are currently affiliated with the Humanities and World Cultures Unit within SSHA. Although Anthropology also has strong links to disciplines within the Policy and Decision Science Unit, we view our current affiliation as both positive and productive, since it facilitates interdisciplinary collaboration in the establishment of the World Heritage program, joint participation in the World Cultures graduate group, and development of an anticipated humanities research center.

As a small program for the foreseeable future, Anthropology must rely on other disciplines within SSHA for organizational support, as well as support for growth of the Anthropology faculty sufficient to initiate the major (i.e., Anthropology will not stand alone within the next 3-5 years). In the short term, support for growth of Anthropology based strictly on enrollment is inappropriate, however, due to the required laboratory methods courses that have relatively low enrollment caps. Nonetheless, the Anthropology major will incorporate some lecture-based methods courses to the extent possible, to facilitate start-up of the major with the smallest possible number of ladder-rank faculty. Anthropology faculty have worked and will continue to work aggressively to boost enrollment in both lower- and upper-division Anthropology classes for majors and non-majors to “subsidize” smaller upper-division laboratory methods courses. For example, Anthropology faculty have consistently participated in SSHA- or campus-wide recruitment events, and have marketed undergraduate anthropology courses both within and beyond SSHA.

3.7 Implementation

Implementation of this strategic plan for Anthropology depends, to a large extent, on the priorities and needs identified within SSHA and for UCM, as a whole. For example, prioritization in hiring the two additional required ladder-rank faculty for long-term viability of the Anthropology major will occur at the level of the School. Likewise, we depend upon the support of the administration in securing required dedicated teaching laboratory space, and we look to our partners across campus to support research laboratory needs and the development of interdisciplinary programs. Still, Anthropology faculty will work in partnership with SSHA to achieve all of the goals of this plan within the next five years, especially through our faculty participation in SSHA events and related efforts to recruit students to the Anthropology program, and through collaboration with our faculty colleagues to promote common academic interests through our teaching, research, and service endeavors.

APPENDIX B: POLICY AND DECISION SCIENCES

Table of Requested FTEs

Priority	Name of Position	Level (Lecturer/Assistant/ Associate/Full)	Primary Major Contribution (current or planned)	Secondary Major Contribution (optional)	Primary Graduate Group	Secondary Graduate Group (optional)	Estimated start-up costs	Estimated Space needs	Special needs and strategic considerations, if any
1	Political Science (behavior)	open	Political Science		SCS		~$50k	office	
2	Philosophy (normative)	open	Philosophy	Env. sci., biomedicine; mgmt	SCS	ENVE	~$50k	office	
3	Sociology (race/class/gender)	Tenured	Sociology		SCS		~$50k	Office	
4	Global Arts (ethnomus-icology)	Open	Developing the Global Arts program				~$50k	Office	
5	Political Science (institutions)	open	Political Science	potentially Economics & Sociology	SCS		~$50k	office	
6	Cognitive Science (perception)	tenured	Cognitive Science	Computer science	SCS	CSE	??????	??????	
7	Philosophy (phil. Of mind)	assistant	Philosophy	Cognitive Science	SCS		~$50k	office	
8	Economics (lecturer)	Lecturer PSOE series	Economics				none	office	
9	Media Arts Technique	Lecturer PSOE series	Developing the Media Arts Technique program				?????	?????	?????
10	Sociology (institutions)	open	Sociology	potentially Economics & Political Science	SCS		~$50k	office	

11	Philosophy (aesthetics)	assistant	Philosophy	Global Arts				office	
12	Cognitive Science (neurosci)	open	Cognitive Science	Biology	SCS		????	?????	????
13	Economics (econometrics)	open	Economics	Math	SCS	Applied Math	~$50k	office	
14	Political Science (democracy)	open	Political Science		SCS		~$50k	Office	
15	Cognitive Science (computational linguistics)	open	Cognitive Science		SCS		????	?????	????

This table was approved by a vote of the School of _____ faculty on (date).

Notes: This table should reflect school priorities, although it is possible that multiple positions will be assigned to the same priority level. Additional considerations such as opportunity hires, spousal hires, diversity issues, should be noted where relevant, with further description in the text of the plan.

COGNITIVE SCIENCE STRATEGIC PLAN

0. Executive Summary

"*UC Merced Cognitive Science will be one of the top ten cognitive science programs in the world by 2010.* "

Cognitive Science is an interdisciplinary field that combines theories and methods from computer science, linguistics, philosophy, psychology, and neurobiology, with the aim of understanding how cognition emerges within and between biological organisms and artificial systems. Some cognitive scientists conduct research in universities, and others pursue careers in areas as diverse as cognitive engineering, information sciences, management, law, service science, intelligent systems, graphic design, and medicine.

Cognitive Science has quickly become a signature program at UC Merced. It's popular among undergraduates, and has captured the attention of cognitive scientists worldwide. This success is the result of careful planning, outstanding hires, a strong vision, and an emphasis on excellence in interdisciplinary research. It is also the result of a growing interest in cognitive science as a field, as evidenced by a rapidly increasing number of cognitive science departments and programs in the US and abroad.

To thrive, Cognitive Science must maintain balanced ties to all its related disciplines. Only then can it benefit from the cross-fostering of ideas in various research and teaching agendas on the campus while providing added value to each of the other disciplines. Cognitive Science will, therefore, contribute in a balanced way to different strategic areas at UC Merced, for example, through links to Engineering, Biological Sciences, and Management. Cognitive Science will continue to serve as a hub of scientific and academic integration amidst the exceptional intellectual synthesis that promises to make UC Merced unique within the University of California system, and among universities around the world.

For 2008-2009, Cognitive Science plans two new faculty lines, one in visual perception and one in cognitive neuroscience, establishing links to biological sciences.

1. The Challenges

Cognitive Science has gotten off to a strong start at UC Merced, yet some challenges lie ahead. In particular, we need to

- obtain faculty positions to fill important gaps and further build areas of strength
- hire faculty who will actively seek and obtain extramural funding
- develop a stand alone Cognitive Science PhD
- strengthen ties to the School of Engineering
- build bridges to the School of Natural Science
- ensure that our program has strengths in multiple sub-areas of Cognitive Science
- improve recruiting efforts for undergraduate and graduate students
- expand research opportunities for students from underrepresented groups
- acquire adequate research space for faculty and graduate students
- achieve high goals and maintain visibility despite a lack of resources

2. The Strategy

By raising Cognitive Science as a beacon of excellence within UC Merced, an impressively large and diverse array of related disciplines will be similarly raised with it. Due to its integration of many researchers across all schools on the campus in their joint endeavor of studying how biological and artificial minds work, programs such as computer science, psychology, economics, management, and the biological sciences will all benefit from an institutional commitment to Cognitive Science.

2.1 Vision

When college seniors the world over ask where they should do their graduate work in cognitive science, the faculty advisors will rattle off the top PhD programs in Cognitive Science: UCSD, Johns Hopkins, Edinburgh, Indiana, MIT, Brown, Rochester, and UC Merced. Our vision of being a top ten program is viable given our growing visibility, research strengths, and ability to showcase a new cognitive science program at a UC. It is also feasible given that the number of Cognitive Science PhD programs is still considerably smaller than the number of programs in related fields (e.g., Computer Science, Psychology), and given that our PhD program will be one of two such doctoral programs on the west coast (along with UCSD).

Having a top ten program in Cognitive Science will yield many positive outcomes, especially to our students. Our undergraduates will be admitted to well-known Cognitive Science PhD programs, such as MIT or UCSD, or obtain profitable jobs, especially in companies in nearby Silicon Valley. The latter is a likely outcome for many of our students given current hiring trends. Many high tech companies plan to employ large numbers of service scientists (applied cognitive scientists with expertise in programming and management) in the coming decade. For instance, IBM will hire 50,000 individuals in this area to secure its position as a world leader in service science management and engineering. To ensure they will have service scientists to hire, IBM is providing seed money and establishing partnerships with universities worldwide, such as UC Berkeley, UCSC, and universities throughout Europe and China. (See recent issues of *Business Week* and *Computer World*.) (For other benefits, see section 3.)

UC Merced Cognitive Science will quickly become one of the signature badges of honor for the campus and the UC system, with considerably less investment than would be needed for building such prestige in other disciplines that are already represented at most universities. Essentially, institutional investment in Cognitive Science is a “lowhanging fruit” with enormous pay-off that will spread beyond the Cognitive Science Program to connected disciplines, including Computer Science, Psychology, Biology, Philosophy, Economics and Management. As Cognitive Science is an interdisciplinary hub that connects SSHA with Engineering and Biological Sciences, it has the potential to benefit more comprehensively than the sub-areas comprising it. The resulting accumulation of synergistic activities in and through Cognitive Science will feed back to the various supporting disciplines, improving their own visibility and prestige in return.

2.2 Mission

Through its scientifically rigorous integration of a variety of theoretical frameworks and methodological approaches in the study of intelligent behavior, the Cognitive Science Program acts as an interdisciplinary hub that both draws from and gives back to the research and education strengths that are growing at UC Merced throughout the Social Sciences, Humanities and Arts, Engineering, and Biological Sciences.

3. Goals and Strategies

Strengths. There are four emerging areas of research strength in the Cognitive Science program at UC Merced. Each provides multiple routes for multidisciplinary interaction, and together they form the foundation on which expansion will be based. These research areas will make our Cognitive Science program well-known:

1. *Computation*, e.g., robotics (Carpin, Kallman), machine learning (Carreira-Perpinan, Newsam), Bayesian reasoning (Heit), neural networks (Noelle), dynamical systems (Yoshimi, Spivey), distributed cognition (Maglio).
2. *Reasoning*, e.g., concepts (Heit), cognitive control (Noelle), artificial intelligence (Kallman), philosophy of mind (Yoshimi), problem-solving (Maglio)
3. *Perception*, e.g., computer vision (Newsam), spatial cognition (Matlock), visual attention (Spivey)
4. *Language*, e.g., psycholinguistics and cognitive linguistics (Matlock), sentence processing (Spivey)

Weaknesses. First, with the aim of a dozen Cognitive Science faculty in 2012, we will not be able to build definitive links among *all* areas of cognitive science or to connect to as many related disciplines as we might like. The key strengths listed above necessarily leave openings in certain cognitive research topics, where only one or two of our faculty will have expertise, such as memory, problem solving, action. However, these weaknesses are greatly outweighed by the benefits from having our four critical-mass strengths. Second, we will be unable to hire as many neuroscientists as we would like in the next five years because we have limited resources for some types of neurophysiological investigation. We hope more resources will be available when the Medical School comes onboard in a few years. Third, it may become increasingly more difficult to conduct cognitive science research in a school with humanists, artists, and social scientists who do not collect controlled laboratory data. Such a school cannot adequately offer the resources (e.g., lab space) that are imperative to publishing and to obtaining extramural funding for cognitive science research.

Opportunities. The opportunities that arise from building a strong Cognitive Science Program at UC Merced are numerous. Opportunities for interdisciplinary research methods that would be difficult or impossible at many other universities, such as cognitive engineering, computational linguistics, computational neuroscience, and decision science will be facilitated by the rich interaction among disciplines exhibited by our cognitive science program. Similarly, our program produces rare interdisciplinary educational opportunities for Cognitive Science undergraduates, such as project-based training that combines programming, systems design, experimental protocols, and experience with technologically advanced laboratory equipment. Undergraduate cognitive science courses and lab opportunities also allow other

majors in SSHA to combine science with the arts or humanities in any number of interesting projects (e.g., new media; cognition of music; visual processing of art; metaphor comprehension; discourse analysis of literary works; comparative linguistics). They also provide students from Natural Sciences (NS) and the School of Engineering (SofE), for instance, those majoring in biology and computer science, the opportunity to take social science classes related to their interests (e.g., *Introduction to Cognitive Science, Artificial Intelligence, Neural Networks, Cognitive Neuroscience*).

Graduate training in Cognitive Science can prepare PhD's for academic posts not only in cognitive science departments but also in psychology departments, philosophy departments, computer science departments, and linguistics departments, as well as for industry positions in areas related to cognitive engineering, data mining, and machine learning. Cognitive Science training on our campus will also benefit students from underrepresented groups. Many of our current undergraduates are from ethnically diverse backgrounds or are women. The low representation of women and other minorities (below 10 percent) is viewed as a problem in cognitive science departments and programs across the country, and among members of the Cognitive Science Society.

Threats. As with cognitive science communities everywhere, it will be important for our Cognitive Science Program's image to carefully avoid the mistaken impression that cognitive science is just a branch of cognitive psychology. With sustained emphases on our computational and neurobiological components, as well as our philosophical and theoretical linguistics components, Cognitive Science at UC Merced will succeed at maintaining its own unique identity as a dynamic interdisciplinary hub, and not an encapsulated discipline by itself.

It will also be important for us to garner as much support as possible from UC Merced administration over the next five years. Though our program is unlikely to have as many majors as some traditional disciplines such as Psychology, Economics, or Biological Sciences, our cognitive science courses will continue to have impressive enrollments and play an important service role for students in SSHA, Natural Sciences, and in the School of Engineering (see Section 3.2 for details). Moreover, in this early phase, it is critical for us to foster our reputation as a rapidly growing pillar of excellence and innovation in cognitive science research and teaching. A strong reputation will reap many benefits for SSHA as well as the campus at large, including further extramural funding and increased enrollments.

3.1 Research Opportunities and Funding

Although most academic programs generally seek research funding from one or two basic sources, the Cognitive Science Program's research projects can, and do, draw from a wide variety of external research funding sources, including grants from

- government institutions
  NSF, NIH, DARPA
- private institutions
  McDonnell, Sloan
- University of California partnerships
  UCOP Digital Media Discovery Grants, CITRIS
- local industry groups and high-tech companies
  HP, IBM Research, Google

Our Cognitive Science program is a natural candidate for a training grant (such as an NSF GK12 or NIH T32) including graduate student fellowships, post-doctoral fellowships, conference travel funds, and its own colloquium budget. We are already in a good position to seek this type of funding because our faculty have an impressive track record of external support.

3.2 Teaching Opportunities and Enrollment

UC Merced Cognitive Science has caught the attention of cognitive scientists worldwide since its inception in 2004-5. When the campus opened, cognitive science courses instantly caught the interest of students who wanted interdisciplinary training in human behavior, biology, and technology. In early 2005, a cognitive science emphasis track under SCS was created, and last year, our Cognitive Science majors, BA and BS, were created along with a Cognitive Science minor.

The number of cognitive science majors will never be as large as the more traditional "bread and butter" majors, such as psychology or political science. However, the number of cognitive science majors is already impressive (28 COGS majors and 3 COGS minors reported in September, 2007). Moreover, as is the case at UCSD, UC Berkeley or other campuses with cognitive science undergraduate programs, our courses function as service courses for students in other areas, including biology and psychology.

Student interest in cognitive science is evident in course enrollments. Last year saw 419 enrollments in COGS courses: 214 in Fall 2006 and 205 in Spring 2007. This Fall alone we have 294 enrollments. Many of these were crosslisted with other areas, for instance, Heit's COGS/PSY 121 or Maglio's COGS 152/MGMT 150.

2008-9 and beyond

Undergraduate Training. In 2008 to 2009, we will continue to teach undergraduate COGS courses for majors and non-majors, especially, COGS 1 (*Introduction to Cognitive Science*), COGS 5 (*Introduction to Language and Linguistics),* COGS 103 *(Introduction to Neural Networks in Cognitive Science*), COGS 110 *(Philosophy of Cognitive Science*), COGS 121 (*Cognitive Psychology*), and COGS 125 (*Artificial Intelligence*). We will not, however, be sufficiently staffed to cover all courses that are needed. Note that most Cognitive Science faculty teach in other areas (Heit, Psychology; Yoshimi, Philosophy; Noelle, Computer Science & Engineering; Maglio [adjunct], Management), and this restricts COGS offerings. Spivey (arrives 2008) and new hires (if successful) may teach required COGS 101 (*Mind, Brain, and Computation*) and COGS 105 (*Research Methods for Cognitive Scientists*) in addition to popular electives (e.g., COGS 140, *Perception*), but they will also need to develop and teach new courses for our graduate program. A larger teaching staff would enable us to cover courses that are of interest to students but that we are unable offer at present, for instance, COGS 102 *(Introduction to Cognitive Modeling*), COGS 128 (*Cognitive Engineering*), COGS 141 (*Cognitive Science Applications for Management*), COGS 175 (*Spatial Cognition*), in addition to courses that have yet to be developed, including *Introduction to Neuroscience*, *Introduction to Computational Linguistics* and *Seminar in Visual Perception*.

To meet our students' diverse needs and ensure their success in graduate school and the job market, we would like to establish new emphases for the Cognitive Science BA and

BS in 2008-9. For the BS, current plans include emphases in *Cognitive Engineering* and in *Neurobiology*. For the BA, current plans include emphases in *Philosophy of Mind* and in *Linguistics*. The Linguistics emphasis will meet the needs of many UC Merced students with an interest in language. Because there are no plans for a Linguistics major on the campus and because language is a pillar of cognitive science, our group is in an excellent position to provide training in this area. Other emphases to be discussed include service science.

Graduate Training. We are currently developing our stand alone PhD program and will apply for CCGA recognition later this year. Until CCGA approval is obtained, cognitive science faculty will continue to be members of, or affiliated with, the Cognitive Science emphasis track within the Social and Cognitive Sciences (SCS) graduate group. Faculty will fill graduate-level teaching needs, such as COGS 250 (*Mind, Technology, and Society* colloquium series), and in the coming years will develop COGS courses. There are currently five students in the Cognitive Science PhD program in SCS.

We have attempted to recruit students through our website and by distributing pamphlets (2006-7) or other materials to undergraduates in departments of cognitive science, psychology, philosophy, or computer science nationwide[15]. When we have more faculty, we shall explore other ways to recruit, such as team visits to other UC campuses.

3.3 Interdisciplinary Opportunities

Cognitive Science at UC Merced is already firmly committed to excellence in interdisciplinary research. Several of our faculty conduct interdisciplinary research or collaborate with scientists in other disciplines. For example, a computer scientist is developing virtual agent animation in collaboration with a psycholinguist. An engineer studying pattern recognition is connecting with a vision researcher who conducts eye-movement recordings. A cognitive linguist studying sentence comprehension is collaborating with a psychologist studying visually-guided reaching movements. A cognitive psychologist is collaborating with a political scientist on the effects of context on judgments about ballot propositions. And a computational neuroscientist exploring neural network modeling is interacting with a neurophilosopher experimenting with dynamical systems theory. With additional hires in the areas listed in the next section, there will be dozens of interdisciplinary research collaborations and educational initiatives stretching between SSHA, Engineering, and Biological Sciences, fulfilling the promise of UC Merced as an institution of unparalleled excellence in interdisciplinary research and teaching.

We will continue to initiate and foster interdisciplinary opportunities in SSHA and across schools. Within SSHA, we highlight our support for growth in the number of Philosophy faculty. (Philosophy currently has only one faculty member). Just as there would be many synergies between Philosophy faculty and Cognitive Science faculty, additional Philosophy faculty would provide many course opportunities for Cognitive Science majors and indeed all other majors around the university. In Natural Sciences, we support growth in neuroscience. Hiring neuroscientists will help round out Cognitive Science offerings and encourage interaction between Biology and Cognitive Science. In the School of Engineering, we continue to offer support for hires that open up new lines of interdisciplinary research between Cognitive

[15] See our website and the recruiting pamphlet at http://cogsci.ucmerced.edu

Science and Computer Science, including intelligent systems, information sciences, design, and data analysis.

3.4 Resources

UC Merced's Cognitive Science faculty have strong interdisciplinary research and teaching interests. In their research, key areas of group strength are emerging: computation, language, reasoning, and perception. In teaching, some COGS courses are covered full-time and some are covered half-time. Only one faculty member is covering COGS courses full-time: Teenie Matlock. In Fall 2008, Michael Spivey will devote all his teaching effort to COGS courses as well[16]. Faculty who teach COGS courses half-time are Evan Heit (also Psychology and Management), David Noelle (also Engineering), and Jeff Yoshimi (also Philosophy). Other faculty occasionally teach COGS courses, including Paul Maglio (Cognitive Science Adjunct with one COGS/MGMT course per year) and Shawn Newsam (Engineering, one graduate COGS course bi-annually).

Faculty who support the graduate and research programs in Cognitive Science at UC Merced but who do not teach COGS classes include Stefano Carpin (Engineering), Miguel Carreira-Perpinan (Engineering), Michelle Chouinard (Psychology), Yarrow Dunham (Psychology), Marcelo Kallmann (Engineering), and Steve Nicholson (Political Science).

Faculty Development In 2007-2008

Efforts are currently underway to fill 1.5 FTE tenure track faculty positions in Cognitive Science by the end of the 2007-2008 academic year. These positions include a senior position to be housed in Cognitive Science and a junior position involving a joint appointment between SSHA and the School of Engineering.

The senior opening is, in many ways, a replacement for a search that failed late in the negotiation process last year, when a very strong and interested candidate was lost due to delays in our hiring procedures. The reinstantiated senior search has been fairly broad in terms of research area scope, and preliminary indications from the search committee suggest a reasonable likelihood of filling this position with a very strong candidate, though not with a candidate whose research interests lie in the area of visual perception, which was the focus of the search that failed last year. Thus, while the cognitive science program stands to benefit strongly from this existing search, a priority remains for hiring a colleague with a research program in visual perception.

The current junior opening is in Cognitive Engineering. As such, it is planned to be a joint appointment with the School of Engineering. The search has focused on a few domains within the broader field of applied cognitive science, including the study of human-computer interaction and the development of computational models of group cognition. The schedule for

[16] Michael Spivey is already fully engaged in searches and programming building even though he is still at Cornell University. This year he is playing a leading role in the development of the Cognitive Science PhD program, and in the next few years, he will play a key role in easing Cognitive Science into department status.

this search is following standards from the field of computer science, in which interviews rarely take place before January, so there is currently little information concerning the likely outcome of this effort.

Faculty Development In 2008-2010

As described earlier in this document, the Cognitive Science program is strategically positioning itself to exhibit certain focal research strengths, including computation, reasoning, perception, and language. One additional faculty hire is needed in the next couple of years in order to firmly establish these areas of program specialization: a position in visual perception. Once this position is filled, we intend to shift our priorities toward areas of expertise that are needed to remove any residual concerns over the ability of our faculty to provide comprehensive training in cognitive science at both the undergraduate and graduate levels. The minimal degree of breadth and balance across subfields of cognitive science represented by these additional hires will be critical for launching a stand-alone, CCGA-approved, Ph.D. program in Cognitive Science, as well as for establishing the reputation of this program worldwide.

Four positions are sought for 2008 to 2010, with an initial preference for the first two of these during the 2008-2009 academic year. We note at the outset that each of these positions has some potential to be a cross-school or cross-area appointment, although ideally each search should have some flexibility in this regard. We intend to include broad interests on search committees, including representatives from both SSHA and the School of Natural Sciences for the Cognitive Neuroscience search and including representatives from both SSHA and the School of Engineering for the Computational Linguistics search, for example. During all of these searches, extra measures will be taken to solicit applications from women and minorities.

Our priorities for 2008 to 2010 are as follows:

1. Visual Perception.

Level: Assistant or beginning Associate Professor. This position could build ties with the School of Natural Sciences, possibly involving a split FTE.

While visual perception is perhaps the most thoroughly studied aspect of human cognition and of the human brain, there are still many foundational puzzles to be solved. For example, much early work on vision highlighted the forward-flowing chain of processes from the photoreceptors in the retina of the eye to the mental representation of scenes containing objects, but recent research is increasingly uncovering top-down and interactive effects in visual processing. Task-driven attention has been found to influence visual processing only one neural "step" from the retina. Some attentional effects are interestingly cross-modal, as when attention to a mobile telephone conversation hinders perception of the road ahead. Imagination has been found to activate perceptual processes in a manner similar to when imagined objects are actually perceived. Learning linguistic labels for different classes of objects can shape the nature of perceptual acuity. Attention to one aspect of a scene can make a person effectively blind to even radical, but unrelated, events in the scene. In addition to these issues of top-down influences, there are many other important open questions in the world of perception, ranging from the mechanisms that allow us to recognize a person by their pattern of motion to the

reasons that certain brain systems come to specialize on the perception of faces or buildings. Indeed, visual perception has been focal in recent investigations into the nature of consciousness. The Cognitive Science program at UC Merced needs an expert in this domain in order to meet its goals of program specialization, as well as to be recognized as a program of sufficient breadth to train the next generation of cognitive scientists. The ideal candidate for this position would bring extensive skills in the methods of psychophysics, which use behavioral measures to uncover the structure of perceptual processes. A research program with strong connections to the underlying neuroscience of vision would also be desirable. Through this association with neuroscience, this new faculty member could help build joint programs between the School of Natural Sciences and SSHA, introducing new opportunities for NIH funding. There are also opportunities for collaboration with School of Engineering faculty interested in machine vision (Newsam) or computer graphics and virtual reality (Kallmann). Research synergy within the Cognitive Science program would, of course, also be strong, with clear ties to Spivey's work on the interactions between object perception and language, Matlock's work on spatial perception and language, Heit's work on perceptual category learning, Noelle's work on attentional and cognitive control, and Yoshimi's work on consciousness.

2. Cognitive Neuroscience.

Level: Assistant or beginning Associate Professor. This position could build ties with the School of Natural Sciences, possibly involving a split FTE.

Cognitive Neuroscience is the study of the relationship between behavior and biology -- between cognition and the brain. Cognitive neuroscientists use a broad range of methods in pursuit of this goal, typically involving the augmentation of experimental psychology protocols with neuroscientific measures. Some cognitive neuroscientists use animal models, studying the effects of gene expression on behavior in rodents or directly recording neural activity in awake and behaving primates, for example. Some study patient populations, examining behavioral changes arising from focal brain damage or dysfunction in hopes of understanding the role played by specific neural systems. Most modern research programs in cognitive neuroscience, however, leverage sophisticated brain imaging technologies. These technologies allow brain activity to be measured during the performance of cognitive tasks. A variety of imaging methods exist, each with its own set of strengths and weaknesses. These include positron emission tomography (PET), magnetoencephalography (MEG), electroencephalography (EEG), and functional magnetic resonance imaging (fMRI). In addition to imaging the brain in action, technologies have been developed to temporarily manipulate neural function. These technologies include pharmacological methods and transcranial magnetic stimulation (TMS). Finally, techniques drawn from the fields of computational neuroscience and cognitive modeling may be used to give substance to elaborate theoretical accounts. UC Merced is poised to develop a world-class research and educational program in cognitive science, but this vision will not be realized without strong representation from the field of cognitive neuroscience. Increasingly, our understanding of the mind is being informed by our understanding of the brain. A faculty member in cognitive neuroscience is needed to legitimize and strengthen the cognitive science program at UC Merced. Such an individual would also contribute to the

university's interdisciplinary research mission by establishing connections between cognitive science in the School of Social Sciences, Humanities, and the Arts and the life sciences in the School of Natural Sciences. Such a faculty member would introduce opportunities to ground current behavioral research activities in physical neural processes, and she or he would substantially increase the competitiveness of UC Merced when attempting to garner research funds from NIH programs favoring behavioral research with a connection to neural function or brain disease. Recruiting a cognitive neuroscientist would also make a central contribution to multiple educational programs at UC Merced. Students in both social sciences and in the life sciences have expressed eagerness to enroll in neuroscience courses. While such courses are currently listed in the UC Merced catalog (e.g., Cognitive Neuroscience), we currently lack the appropriate staff to offer these courses. Undergraduate programs focusing on cognition or on human biology are fundamentally incomplete without some introduction to the brain and the central nervous system. Thus, this position will fill a critical gap in our course offerings and in our undergraduate programs. Social sciences and the life sciences represent some of the most popular programs at UC Merced, so this position is sure to have an enormous educational impact. At this point in the university's development, it is arguably unwise to commit to the development of a broad research and education program in neuroscience. Still, some expertise in cognitive neuroscience is needed to support our established programs. Without focal investment in a neuroscience infrastructure, some methods of the cognitive neuroscientist are impractical, including the use of expensive brain imaging technologies like fMRI. There are many qualified researchers with skills in other important methods, however. We envision recruiting an individual trained in relatively inexpensive techniques that are synergistic with established research practices at UC Merced. For example, a researcher who uses knock-out gene rodent models could collaborate with local biologists who use similar methods to investigate non-behavioral phenomena. Our preference for an initial cognitive neuroscience hire, however, would be for a researcher who uses some form of brain imaging technology with human participants. A research program of this kind would connect naturally to ongoing local research on computational cognitive neuroscience and neural network models (Noelle and Yoshimi), on motion generation and perception (Kallmann), and on eye movements and language (Matlock and Spivey). We are particularly interested in recruiting an expert in electroencephalography (EEG) and related "brain wave" analysis techniques, such as event-related potentials (ERP). This noninvasive imaging technology does not require much of an infrastructure, and it continues to provide deep insights into the neural basis of cognition. One promising possibility involves recruiting an EEG researcher who would be willing to develop methods for merging EEG imaging with the technologies used to track eye movements, in which our own Michael Spivey is an expert. The development of such a collaboration would place UC Merced on the map as one of the only institutions in the world in which the relationships between perception, eye movement, and neural function can be studied in humans at such a fine level of detail. In summary, the recruitment of a faculty member with expertise in cognitive neuroscience is critical to the success of the university's research and teaching missions across both cognitive science and the life sciences. The recruitment of such a scientist would not require any sort of commitment to the development of an extensive neuroscience infrastructure at UC Merced. By focusing on relatively inexpensive brain imaging technologies such as EEG, this researcher could immediately begin to make substantial contributions to cognitive science research and to neuroscience education across the UC Merced campus.

3. Computational Linguistics.

Level: Assistant or beginning Associate Professor. This position could build ties with the School of Engineering, possibly involving a split FTE.

This position will allow us to realize our goal of building strongly in language, strengthen our ties with the computer science program in the School of Engineering, meet important teaching needs in SSHA, permit us to hire in an area of linguistics that presents many opportunities for external funding, and provide training to our students in marketable skills. The ideal candidate for this faculty position will have relatively diverse training in linguistic theory, methods, and computer systems design, and he or she will have strengths in one or more of the following domains: statistical natural language processing, probabilistic context-free grammars, machine learning, case-based learning algorithms, speech recognition, latent semantic analysis, dialog systems, translation, comparative linguistics, phonetic analysis, and corpus linguistics. At the undergraduate level, this hire could teach COGS 5, *Introduction to Language and Linguistics*, which is both needed by Cognitive Science students and of interest to many non-majors in Literature, Psychology, and other areas of SSHA. This individual could also teach other undergraduate courses related to language, including COGS 180, *Topics in Cognitive Science*, for example. At the graduate level, this new faculty member would be expected to develop and teach new courses on computational linguistics and other advanced topics in language. Recruiting from this research specialization will provide support for Teenie Matlock's work in psycholinguistics, Shawn Newsam's work in machine learning and data mining, and Michael Spivey's work in sentence processing, among others.

4. Decision Science.

Level: Assistant Professor. This position could build ties with any new program in management at UC Merced.

Many of the most important situations in our lives require us to exercise our cognitive skills in deliberative reasoning under uncertainty in order to acquire rewards and avoid costs. Exciting work is currently being done on formally characterizing our reasoning processes in such situations, providing insights into our behavior at home, in the workplace, in the marketplace, and in society. This interdisciplinary field draws on data from cognitive psychology, behavioral economics, political science, and cognitive neuroscience. Some have characterized this innovative domain as "decision science", while others have dubbed it "neuroeconomics". The focus is on formal quantitative accounts of reasoning in a variety of areas, from financial decisions to judgments concerning health or environmental risks. Ideal candidates for this position will have research interests in areas like decision making and probabilistic reasoning in psychology, risk perception and management in behavioral economics, political cognition in behavioral political science, the brain systems involved in reward-based learning in neuroscience, or the use of information systems for policy enforcement and decision support in computer science. This new faculty member will facilitate ties with our Economics program and with any future School of Management. The position, once filled, is also expected to generate opportunities for industrial cooperation with the Cognitive Science program, including

research funding and student internship programs. This person would be expected to contribute to teaching in cognitive science, management, economics, and possibly political science. A new colleague with this background would naturally produce opportunities for collaboration incorporating Evan Heit's work on reasoning, Paul Maglio's work on service science, and Shawn Newsam's work on machine learning.

Faculty Development In 2011 And Beyond

We intend to make Cognitive Science at UC Merced a recognized world leader in terms of research and education by 2010. We expect that the variety of substantial developments that will occur in the next few years, including the expansion of our faculty, will have a profound impact on our plans for future growth. At this point in time, we continue to be committed to our focal areas of strength, and we plan to direct future hiring priorities toward a combination of these areas along with a foundational level of research-area diversity. To this end, we envision hiring a junior level faculty member specializing in motor control, complementing our strength in perception while building on local interests in such domains as eye movements. Our next priority would be for a colleague in spatial cognition or visual imagery, adding to our existing expertise in spatial effects on language and visual perception.

While a variety of faculty from across campus currently contribute to the cognitive science research enterprise at UC Merced, only 2.5 FTE lines are currently involved in the teaching of Cognitive Science courses. If all of the current searches are successful, and Spivey arrives on campus on schedule, this number will rise to 5 FTE total by the beginning of the 2008-2009 academic year. These are allocated as follows:

Faculty that Teach Only Cognitive Science Courses (3 total)
Matlock
Spivey
New Senior Hire

Faculty that Teach Half-Time Cognitive Science Courses (2 total)
Heit (and Psychology or Management)
Noelle (and Engineering)
Yoshimi (and Philosophy)
New Cognitive Engineering Hire

If we are successful in filling the top four priority positions outlined in this document, and if only two of these are hired as cross-school positions, our FTE count will rise to 8 by the beginning of the 2010-2011 academic year. The additional two positions foreseen for immediately beyond that point (currently expected in motor control and spatial cognition/visual imagery), would bring the number of FTE lines associated with Cognitive Science teaching to 10, which we see as approaching a healthy size for this program for the near future.

Summary Of Hiring Priorities

2008-2009 : Visual Perception

2008-2009 : Cognitive Neuroscience (Split Appointment)
2009-2010 : Computational Linguistics (Split Appointment)
2009-2010 : Decision Science
2010-2011 : TBD (Motor Control)
2011-2012 : TBD (Spatial Cognition/Visual Imagery)

3.5 Finances

Cognitive Science faculty members have an outstanding record of extramural funding, as shown in Table 3 (page 17). Continuing to aggressively seek grants from NSF, NIH, and other agencies will help us to provide excellent training to students in our labs and sustain our ability to conduct world-class research in the years to come. The following trends also ensure that our Cognitive Science Program will thrive:

- Enrollments in COGS courses are high at UC Merced (Section 3.2).
- Nearly 200 new Cognitive Science programs or departments have been established at universities in the past 20 years, including 106 departments and programs in the U.S. alone (e.g., UCSD, MIT, Johns Hopkins, Indiana University, University of Rochester).
- Cognitive Science majors are rapidly increasing at other UC campuses (e.g., there are currently about 350 majors and 30 minors at UCSD).
- More and more cognitive scientists are needed in the work force in the 21st Century, especially those with strengths in computer science and engineering, management, or neurobiology.

Based on the growing popularity of cognitive science as well as hiring trends, we anticipate as many as 240 Cognitive Science majors at UC Merced by 2010. This could mean as many as 100 students in the Cognitive Engineering track (BS), 70 students in the Neuroscience track (BS), and 70 students in the Cognitive Science BA in general. (See Section 3.2 for planned emphases.) And it will also mean new courses and larger enrollments in the courses we already have.

To cover the courses needed by Cognitive Science students and to continue to provide service courses to other groups on the campus, including Biology (e.g., many Biology majors), we will need a total of 12 Cognitive Science faculty.

In addition to administrative funding for faculty lines, we will continue to vigorously pursue extramural funding. Extramural funding will enable the Cognitive Science Program to develop innovative, interdisciplinary projects with colleagues in SSHA, such as Economics or Management, and with colleagues in Engineering or Natural Sciences. Cross-school collaborations have already been established. For instance, Marcelo Kallmann is setting up a motion capture laboratory with Teenie Matlock, Shawn Newsam, Stefano Carpin, and other faculty. The lab will be useful to several other cognitive scientists and engineers at UC Merced, including Michael Spivey and David Noelle. Extramural funding will also help support graduate students so they are not permanent teaching assistants. And it will help provide undergraduate students with research opportunities they need to succeed after graduation. The enhancement of undergraduate training resulting from this research support

will in turn increase enrollment of Cognitive Science majors.

Table 3. Cognitive Science faculty's external funding totals about 9.5 million dollars over the past five years.

David Noelle

2003 –2007	NSF Information Technology Research Grant (co-PI) "A Biologically Inspired Adaptive Working Memory System for Efficient Robot Control and Learning" $1,596,360 ($485,991 as subaward to the University of Missouri at Columbia)
2004 – 2006	NSF Information Technology Research Grant (PI) "A Biologically Inspired Adaptive Working Memory System for Efficient Robot Control and Learning" (Research Experiences for Undergraduates Supplement) $12,000
2004 – 2006	Vanderbilt University Discovery Grant Program (PI) "The Neural Basis of Rule Representations in Category Learning: Using fMRI to Test a Computational Neuroscience Model" $48,902
2005-2008	National Science Foundation (co-PI) " Understanding Conceptual and Cultural Change: The Role of Expertise and Flexibility in Folk Medicine" $618,967
2005-2006	DARPA (co-PI) "Biologically-Inspired Cognitive Architecture" $342,003

Evan Heit

2006-2009	NSF Perception, Action, and Cognition (PI) Identifying Reasoning Processes using Memory Methods $300,000
2006-2010	Australia Research Council (co-PI) The Development of Causal Induction $250,000

2004-2007

Biotechnology and Biological Sciences Research Council (UK) (co-PI) Encoding and retrieval in recognition memory $250,000

Teenie Matlock

2007-2010 NSF Major Research Instrumentation (co-PI)
"Acquisition of Equipment to Establish a Cognitive Sensorium and Visualization Facility at UC Merced"
$250,000

2006-2008 NSF Perception, Action, and Cognition (PI)
"Conference on the Future of Cognitive Science"
$26,174

2007 UCOP Discovery Grant, Digital Media (co-PI w. Kallmann, Engineering)
"Cognitive Animation Workshop"
$14,200

Pending NSF Computer Research Infrastructure (co-PI w. Kallmann &Carpin, Engineering)
"CRI: IAD Immersive Motion Capture for Interaction with Autonomous Virtual Agents"
$296,783 (two years)

Michael Spivey

2007-2010 NSF grant BCS-0721297 (PI) "Action Dynamics as an Index of Learning and Generalization" $141,823

2007 NSF grant BCS-0739708 (co-PI) "Workshop Support: Behavioral and Cognitive Dynamics" $16,775

2006-2008 NIH grant R03 HD051671 (co-PI) "Semantic Valence Tendencies in Sentence Comprehension" $158,000

2006-2009 NIH grant ZRG1H0PU29 (Sponsor) NRSA Pre-doctoral Fellowship "Spatial Cognition and the Bilingual Brain"

2002-2006 NIH grant R01 MH63961 (PI) "Mutual Influences Across Language and Vision" $223,871

2003 NSF grant 0318609 (PI) Workshop: Empirical Methods in Cognitive Linguistics" $35,000

Marcelo Kallmann

Pending NSF Information and Intelligent Systems (PI) "HRI: Teaching Demonstrative Gestures to Interactive Humanlike Virtual Agents" $439,784 (three years)

Pending NSF Computer Research Infrastructure (PI w. Matlock, SSHA)
"CRI: IAD Immersive Motion Capture for Interaction with Autonomous Virtual Agents"
$296,783 (two years)

2005 –2005 US Army grant, via subcontract with USC-ICT
Motion Controllers for Virtual Humans $5,000

Shawn Newsam

Pending:

2008-2010 Microsoft New Faculty Fellowship (PI)
$200,000

Current:

2007-2012 Department of Energy Early Career Scientist and Engineer Award (PI)
$250,000

2007-2008 Center for Information Technology in the Interest of Society (PI) "Terrestrial Remote Sensing for Monitoring Atmospheric Particulates" $99,290

2007-2010 NSF Major Research Instrumentation (co-PI) "Acquisition of Equipment to Establish a Cognitive Sensorium and Visualization Facility at UC Merced" $250,000

ECONOMICS
Strategic Plan

I. Vision
The central vision of the Economics program is to establish UC Merced as a center for high-quality research and teaching in the area of applied microeconomics. We have already established a strong base in the fields of labor economics and economic history and in the coming years we will expand our coverage of applied microeconomic fields with recruitments in public economics, industrial organization, international trade, health economics, and political economy. Because these areas of economics are closely allied with our current strengths, they will allow us to offer a high-quality undergraduate major and graduate program focused on policy-relevant empirical microeconomics.

II. Strengths
a. The Economics program is well positioned to grow and to be successful at UC Merced.
    i. We have a challenging major, as well as minors in economics and services science, with extensive involvement in teaching in the management program.
    ii. There is currently an Economics and Management website active that will position us to attract a large number of high-quality UC Merced students, help with faculty recruiting, and advertise our research to the wider academic community.
    iii. We currently have four assistant professors and one full professor, all with ties to labor studies which in itself sets the Economics program at UC Merced apart, even at our currently small size. We have been very successful at building on this strength by attracting external funding for a conference and seminar series. UC Merced's Economics faculty hosted a conference on "The Causes and Consequences of Increased Earnings Inequality" which was attended by a number of world leading scholars. The Economics group looks forward to future events of this nature to put UC Merced on the map as a center of research and teaching excellent in Economics.
    iv. The research being conducted by the current economics and management faculty all has policy-relevance which positions us well to attract grant and contract support.

III. Weaknesses
a. The lack of resources necessary to fund regular outside speakers to keep up to date on the latest developments in the field. This impacts our ability to deliver cutting-edge material in the classroom, attract leading faculty, and successfully launch our full scale Ph.D. program. Internal support of this type is vital to fully develop UC Merced as the world class center of applied economics research that is well within our grasp.
b. The lack of a large enough faculty base to support a full scale graduate program, which in turn weakens our ability to staff teaching assistant positions, conduct research, and attract high quality faculty.

c. An over weighted share of junior vs. senior faculty.
d. The lack of a lecturer with Permanent Security of Employment to assist with staffing large enrollment lower-division courses.
e. The lack of a research institute to provide administrative support for faculty research, graduate students and external grant application support.

IV. Challenges

a. Attract, hire, and retain an adequate number of high-quality faculty to teach the electives in our major, as well as fulfilling the needs of lower division courses which other majors also require.
b. Obtain the administrative and financial support to leverage our current faculty strengths so that we can achieve prominence in the areas of:
    i. Labor Studies
    ii. Services Science
    iii. Strategy
    iv. Economic History and Political Economy
    v. Public Economics
c. Attract many more undergraduate students to the major while retaining the high quality and analytically challenging programs that the faculty envision.
d. Create a new Ph.D. program in Economics. This effort could prove to be particularly challenging given that there is a great deal of competition from well-established programs nationally and internationally. However, with our goal of creating research excellence in a few areas, we are likely to be well positioned to create niche graduate programs that will attract outstanding students to our programs.
e. The establishment of an Institute for Economic Performance. The IEP research agenda will utilizes tackle questions such as: How does public funding of universities affect local economic growth?, Do job training programs targeting the disadvantaged work?, Do flexible schedules reduce gender inequality? The results of this research will inform policy makers in the valley, state and across the nation. We would like University Relations to begin fund raising for this institute as soon as possible.

V. Goals & Strategy Over a Medium Time Horizon (1-5 years)

a. Research Opportunities and Funding
    i. Seminar Series in Economics Key to our hiring goals and the establishment of UC Merced as a leading research institution is the creation of an active seminar series where visiting researchers present their latest findings. Speakers in this series will not only advance the research goals of the program, they will also provide a valuable opportunity for interaction with other UC Merced programs that share our interest in policy relevant empirical research. These include current and future colleagues in political science, policy, and sociology. We have obtained outside funding from the University of California Contreras Fund for a seminar series for the 2007/2008 and 2008/2009 academic years. However after this time we will require internal funding for a seminar series in Economics.

ii. Part of our grant application to the Contreras Fund is the vision that the funding for a seminar series will act as seed money for a program in Labor Studies, an interdisciplinary program that we plan to establish as a minor at UC Merced and that will eventually become a Center or Institute in the School of Management.

iii. The establishment of an Institute for Economic Performance (IEP). This institute would contain basic social science research concerning the causes and consequences of differences in economic performance across individuals, firms and regions. The IEP research agenda will tackle questions such as: How does public funding of universities affect local economic growth?, Do job training programs targeting the disadvantaged work?, Do flexible schedules reduce gender inequality? The results of this research will inform policy makers in the valley, state and across the nation.

b. Undergraduate Program

i. Economics

1. Attract on average 50 economics majors per graduating class by offering students rigorous applied microeconomic training that will prepare them for law school, policy work, private employment, and graduate school.
2. Establish one or more emphasis tracks within the Economics major, including Strategy and Policy.

ii. Implementation

1. We envision that the Economics major will reach a steady-state population of approximately 500 students. Reaching this objective would require a group of 25 faculty members to maintain a student/faculty ratio of 20:1 in the long-term.
2. In the short term, we anticipate a stock of 180 students by Fall 2008. Given current filled and unfilled faculty lines, that student population translates into a need for 3 additional lines. We request one PSOE lecturer, one senior ladder-rank line and one junior ladder-rank line be allocated to Economics to begin in Fall 2009.

c. Graduate Program

i. In coordination with our goal of becoming a center of excellence in applied microeconomics research, the economics program currently houses two graduate students who have completed their foundational theory and econometric course work at other institutions and are at UC Merced conducting research for their dissertations. We foresee this scale as close to the optimal size for the short term because we do not currently have the faculty resources to be able offer the courses necessary for a full scale

graduate program.

d. Interdisciplinary Opportunities

i. Economics faculty at UC Merced already work with a wide range of different programs and areas within the university. We are working on the seminar series in conjunction with Sociology and hope to continue to deepen our ties and collaboration with current and future Political Science faculty. We are also beginning to plan an interdisciplinary minor in Labor Studies (potentially for Fall 2008) that will incorporate Economics, Sociology, and Cognitive Science. With discussions about a future School of Medicine, there also exists a unique opportunity to incorporate health care management into the future curriculum.

e. Hiring Priorities

i. In Economics, we intend to hire a researcher in health economics. Given that health care consumes one-seventh of gross domestic product and its regulatory environment is extraordinarily complex, developing a research strength in this area is important for a number of reasons. First, health complements the research that is conducted in labor and there are likely many research synergies that can be generated. Second, a health economist would bolster our existing strength in applied microeconomics with an applied, policy-relevant focus. Finally, adding a health economist would enable the Economics and Management programs to contribute to the discussions currently underway regarding a School of Medicine.

GLOBAL ARTS STUDIES PROGRAM (GASP)
Strategic Plan 2008-9

I. Overview

Current trends in arts scholarship are interdisciplinary in scope and approach, drawing from philosophy, sociology, anthropology, economic theory and political science as well as more traditional humanities disciplines such as history and literature. The Global Arts Studies Program (GASP) recognizes these transdisciplinary shifts in structuring the curriculum and setting the program's goals. GASP's emphasis on critical theory and cultural studies also underscores the interdisciplinarity of its program.

The short-term goal of GASP is to strengthen the disciplinary areas currently housed at UCM, namely, art history and music studies. The development of strong emphases is necessary to build a reputation as well as to offer students a coherent curriculum that will translate into graduate school admissions and desirable employment opportunities. The benefit of concentrating on research is the high ratio of benefit to cost in terms of creating, maintaining and supporting a program that fosters innovative curriculum and vanguard scholarship.

UCM will gain national and international recognition as GASP achieves its goal of establishing a high-profile program of arts scholarship by hiring faculty who demonstrate their effectiveness in research, publishing and teaching.

II. Hiring

GASP seeks 2 FTEs for 2008-09: one in art history (from 2007-08), and one in ethnomusicology, in order to provide the minimal number of courses for a GASP Major.

Justifications:

Art history: due to an unsuccessful search in 2007-08, we request to be given the allocated FTE and conduct the search again in 2008-09. We will strive to fill this position by broadening the areas of specialty (art history/visual culture studies) and ranks (both senior and junior levels) in our ad.

Music studies: we seek an ethnomusicology scholar (either junior or senior) who specializes in a musical tradition of Asia or the Middle East and whose work encompasses cultural and/or ethnic studies. This appointment would strengthen GASP's music program by explicitly addressing issues concerning globalization, postcolonialism and gender.

GASP will require, at minimum, 2 FTEs per year for the next three years (2008-9, 2009-10, 2010-11). The student enrollment numbers in our respective areas justify the petition for these hires and we believe our courses will continue to attain desirable student enrollments.

III. Objectives

GASP will implement the following objectives:

. • Hire faculty to strengthen current areas of arts scholarship
. • Hire faculty to broaden the scope of the arts curriculum
. • Build stronger connections within SSHA
. • Build connections to the School of Engineering
. • Heighten the visibility of the program through a series of exhibitions, performances and symposia on the arts
. • Seek extramural funding for research
. • Actively recruit undergraduate and graduate students

IV. Resources

As indicated throughout this document, GASP will focus its energies and resources towards the development of a leading arts scholarship and research program.

Additionally, arts scholarship funding is cost effective because hardware and space requirements are minimal, relative to other disciplines. Even with the purchase of various analog (book, manuscripts, scores, LPs, film) and digital materials (computers, RAID and network systems, software of various kinds, digital cameras), the arts will avoid many of the expenses of traditional arts departments by eschewing traditional practice and technique classes. To this end, arts practice courses have been eliminated from GASP's strategic plans.

MEDIA ARTS TECHNIQUE PROGRAM
Strategic Plan

I. Overview and Rationale for Media Arts Technique Program

UC campuses emphasize undergraduate professional art training. Professional degrees are offered in variety of art forms such as acting, sculpture, music performance, film directing and choreography. Curricula of professional art training programs usually consist of technique courses (commonly enrolled in during the first two years of study, these courses pay special attention to methods of procedure with reference to formal details in rendering an artistic work) and courses whose purpose is to give students the opportunity to put technique into practice. Practice courses tend to stress particular forms of artistic interpretation, usually the one practiced by the instructors. By emphasizing certain forms of artistic interpretation in their advanced practice courses, undergraduate professional art training programs have contributed to perception that the arts are elitist and exclusivist. It can be argued that twentieth century's emphasis on art as an expression of a small elite group of professional people, a concept proliferated by many professional art training programs located in research universities, is becoming invalid. In many ways, digital technology revolution has begun to return the arts to their former ubiquitous role in lives of individuals. In addition, contemporary artists employ multiple art media techniques to create original works aimed at culturally diverse global audience. Digital media have further contributed to integration and cross pollination of art forms and their dissemination throughout the world. The strict division between art disciplines common to all UC campuses represents art education whose goals do not adequately reflect the changing and fluid state of the arts today.

The growth of digital technology has also created an opportunity to bridge the separation between the arts and sciences which grew out of the industrial revolution and increased during last century. The rapid technological development that characterizes our times requires new approach to education which emphasizes adaptability and creativity, as well as integration and inclusivity made possible by digital technology. At the same time professional art training programs at research universities often invest large amount of energy and funding into recreating the "real world". Instead of understanding that a research university's unique mission is to provide ideal conditions for serious, in depth inquiry often not possible in the "real word" due to commercial and cultural pressures, many professional art training programs waste this opportunity by chasing after what's "in" and what "sells".

Media Arts Technique Program plans to function on several levels. The *Program's* proposed curriculum emphasizes the essentially interdisciplinary character of contemporary arts by giving students the opportunity to sample multiple art disciplines and techniques from fine arts to performing arts, from traditional to experimental.

Media Arts Technique Program curriculum will aid students in development of qualities that will allow them to grow and to adjust to new environments and new ideas, ability necessary for success in contemporary world. Access to multiple art techniques also aims to give students tools to create new forms of creative expression, and to develop respect for diverse ways in which art manifests itself. Thus the principal guiding precepts of *Media Arts Technique Program* are inclusion and multiplicity.

II. Media Arts Technique Program Curriculum

Media Arts Technique Program curriculum plans to offer technique courses in the following art forms: Architecture, Digital Media Graphics, Digital Film-Making, Drawing, Music (Voice, Instrumental Music, and Composition), Painting, Performing Arts (Acting, Directing, and Dance/Movement), Photography, Sculpture and Ceramics. The Artist in Residence Program will complement the technique courses by giving students opportunity to study art practice with professional artists. Courses will be offered on both lower and upper division level. Beginner, intermediate and advanced courses will be available in all techniques.

III. Media Arts Technique Major and Minor

Proposal for *Media Arts Technique Program Major* and *Minor* will be submitted to SSHA Curriculum Committee and Undergraduate Council in **fall of 2008.** *Media Arts Technique Program Major* will be individualized. Each student will be able to create his or her own course of study, choosing courses amongst the above mentioned art disciplines. Students enrolled in the major will first have to complete a core curriculum before they will be able to focus on technique, practice being the ultimate educational goal. Individualized major requires self-motivated, energetic and dedicated students and faculty that is made up of artists actively engaged in practicing their art disciplines.

Media Arts Technique Program Major curriculum will include cognitive science requirement to encourage students to explore the growing field of inquiry into the relationship between cognition and creative artistic expression. *Media Arts Technique Program Major* will also require students to enroll in art history and critical studies courses offered in the Global Arts Studies Program curriculum.

IV. Relationship to Existing Programs

A unique feature of *Media Arts Technique Program* is its commitment to offer art technique courses to all UC Merced undergraduate students. The professionalization of art majors at other UC campuses that occurred in relatively recent past has made it difficult for non- majors to enroll in art technique and art practice courses. Professional art training is expensive because it requires small student to professor ratio. This is because art technique and art practice for the most part cannot be taught on professional level to more than, on average, fifteen students at a time (certain techniques allow for larger number of students, for example, dance, while others require smaller numbers, for example, instrumental music.) This is the reason why art technique courses are rarely open to non-majors. Millions of dollars are spent on the education of a few, while many are deprived of the educational benefits of studying multiple art forms.

Media Arts Technique Program curriculum aim is to aid students in integrating specialized art techniques into their chosen fields of study and thus to support the interdisciplinary mission of the university. Students will be able to sample art techniques according to their personal interest, or according to applicability to their major, or in order to gain perspective on their own disciplines.

In addition, enrolling in art technique courses will provide students with opportunity to compare rigorous intellectual understanding required for scholarship with heuristic, and intuitive understanding required for acquisition of art technique.

The ultimate mission of the *Media Arts Technique Program* curriculum is to enhance the educational experience of students enrolled in all UCM programs. Students may choose courses to strengthen their cognitive abilities such as visual cognition, to develop or strengthen creativity, to access intuitive holistic thinking and problem-solving, to increase cultural literacy

and communication skills, to develop empathy, to improve the ability to collaborate and to lead, to gain aesthetic understanding.

The opportunity for all students to enroll in art technique courses of choice as well as to pursue *Media Arts Technique Minor* is unique to UC Merced and should make UCM more competitive with its sister campuses.

As mentioned above *Media Arts Technique Program* aims to enrich the educational experience of all UC Merced students and thus will serve and complement multiple majors and programs in their educational goals. *Media Arts Technique Program* intends to work with faculty members in other disciplines interested in having particular art technique courses available to their majors. In addition, by providing courses *Media Arts Technique Program* will make the UC Merced campus attractive to students who are planning to pursue degrees in disciplines other than the arts but who are seeking to enrich their educational experience by acquiring art techniques.

In summary, four basic goals underlie the structure of *Media Arts Technique Program:*

1. To offer a unique multi-disciplinary and interdisciplinary individualized art major
2. To offer a minor in art technique and practice
3. To make arts technique courses available to all undergraduate students regardless of major or discipline in order to enrich their educational experience
4. To allow maximum flexibility in choice of courses and application of methods
5. To create and maintain an educational environment in which diversity, cross cultural exploration, interdisciplinary collaboration, and inclusiveness of traditional and experimental art techniques and art practices will thrive
6. To help students develop creative intelligence and cognitive abilities

V. Timeline for Implementation and Resource Needs

School of Social Sciences, Humanities and Arts has been offering arts technique courses since fall 2005. Since then an estimated **300 students** have enrolled in arts technique or art practice courses. These courses have been offered without being part of a Major, though students are able to pursue Arts Minor (which requires enrollment in art history and critical studies courses as well as art technique and art practice courses.)

Media Art Technique Program technique courses will be taught by part time and full time lecturers. A large number of art technique courses at other UC campuses are taught by lecturers and adjuncts. This is partly due to the necessity for small professor to student ratio. Full time lecturers teach more than ladder faculty and thus hiring them will provide students with larger array of choices in technique classes. The use of part time lecturers will allow flexibility in course offerings which is very important for development of a new Program.

Art technique courses and art practice courses have been so far primarily taught by a very small number of lecturers, each lecturer teaching one or two courses a semester (most classes are small in size, no more than 15 students, to deliver high quality instruction.) Implementation of *Media Arts Technique Program* and Major will require incremental growth of **lecturer FTE.** For example current proposal is to offer 7 courses (in Voice, Photography, Painting and Sculpture) for fall 2008 (2 ¼ Lecturer FTE) with projected student enrollment of 150 to be increased to 9 courses (in Voice, Photography, Sculpture, Painting, Digital Graphics and Dance) for spring 2009 (3 lecturer FTE) with projected enrollment of 200 students.

Following are the projected long term FTE and instructional resources which when met will allow for the Program to be fully implemented. All space needs are covered by the classrooms and offices planned for the arts in the new SSHA building.

Architecture

Lecturer FTE to cover 5 to 6 courses a year, 20 dedicated computers with specialized software (possibly same as computers used for Digital Media Graphics)

Digital Media Graphics and Digital Film-Making

Lecturer FTE to cover 5 to 6 courses a year for Digital Media Graphics and 4 courses a year for Digital Film-Making, 20 dedicated computers with specialized software, high resolutions printer and scanner for Digital Media Graphics, and 20 digital video cameras, digital audio recorders, lighting equipment, and editing equipment for Digital Film-Making

Drawing and Painting

Lecturer FTE to cover 4 courses a year in painting and 4 courses a year in drawing, budget for live models, model stands and 20 drawing benches

Music (Voice)

Lecturer FTE to cover 6 courses a year and 3-4 Directed Studies, budget for piano accompanist, budget to rent performance space for recitals (on and off campus),

Music (Instrument and Composition)

Lecturer FTE to cover 6 courses a year, 20 dedicated computers with specialized software, recording studio equipment and electronic instruments

Performing Arts (Acting and Directing)

Lecturer FTE to cover 5 to 6 courses a year, budget to rent performance space for play production (on and off campus), budget to pay royalties for performance texts, budget for costumes and props for productions, rehearsal furniture

Performing Arts (Design)

Lecturer FTE to teach one course every other semester

Performing Arts (Dance and Movement)

Lecturer FTE to cover 4 courses a year, budget to rent performance space for recitals (on and off campus), budget for musicians to accompany dance recitals, budget for costumes, budget for lighting

Photography

Lecturer FTE to cover 5-6 courses a year, access to black-and-white darkroom equipment, 20 4x5 analog cameras, studio lighting equipment, 20 dedicated computers with specialized software, high resolution printer and scanner

Sculpture and Ceramics

Lecturer FTE to cover 4 courses a year, access to kiln, slip-casting tank and glaze equipment, potter wheels, access to metal fabricating and welding equipment, woodworking equipment and plaster equipment

There is currently only one full time ladder faculty member (Dunya Ramicova) teaching art technique and art practice courses. In order to provide continuity and focus it will be necessary to hire at least **one full time lecturer in the next one to two years qualified to teach courses** in one of the above mentioned art media. The Artist in Residence FTE supports 4 courses a year in practice of art, not art technique.

PHILOSOPHY

Philosophy at UC Merced is envisioned as a program which emphasizes interdisciplinary and applied research. Some universities specialize in intersections between philosophy and the social sciences[17], or between cognitive science and philosophy[18], but none build their entire program around such linkages. An "applied philosophy" program would be unique in the discipline and consistent with UC Merced's commitment to applied and interdisciplinary research.

As a coupled program, philosophy will focus points of conceptual connection between programs university-wide. It is envisioned that most if not all philosophy hires will be able to contribute to other programs at UC Merced. Building towards a major in 2009, initial hiring will fall into two categories: (1) Applied ethics and political philosophy, and (2) philosophy of cognitive science. Subsequent hires will also emphasize (3) philosophy of art and literature. As a stand-alone program philosophy will offer students training in ethics, philosophy of mind, and aesthetics, which are recognized traditional areas of philosophy associated with the interdisciplinary (and increasingly marketable) applied areas just mentioned[19].

Research and Teaching Collaborations

Philosophers in the envisioned program—with its emphases on applied ethics, cognitive science, social science, and aesthetics—will contribute to current and planned programs campus-wide, both in terms of curricular needs and research collaborations. These collaborations will center on the areas described above: initially applied ethics and

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[17] These include: Oxford University's long-standing program in *Philosophy, Politics, and Economics* (established in 1920); the *Social Philosophy and Policy Center* at Bowling Green State University; the *Values in Society* program at University of Washington; the *Center for Applied Philosophy and Public Ethics* at the Australian National University.

[18] Notably, UC San Diego's joint degree in cognitive science and philosophy, Oxford University's Psychology, Philosophy, and Physiology program, and Washington University in St. Louis' Philosophy Psychology, and Neuroscience Ph.D. program.

[19] All the mentioned areas are included in the Leiter Report's list of 29 recognized areas of specialization in the Field. The Leiter report (http://www.philosophicalgourmet.com) is the standard ranking of philosophy programs in the English-speaking world. Evidence of marketability is provided by Leiter's reports on job placements in the discipline.

philosophy of cognitive science; subsequently (and to some extent, currently), philosophy of art and literature. In every case the hope is to both draw and contribute strength: philosophy is enriched by contact with current work in areas outside of philosophy and those fields are enriched by current research in philosophy.

(1) Applied Ethics and Political Philosophy

Ethicists and political philosophers who do applied research work closely with decision theorists, economists, game theorists, political scientists, and sociologists. They sometimes work in policy centers. They also flourish in environments that specialize in the areas to which they apply philosophical theory. Given UC Merced's early investment in the fields of biomedical science (especially stem cell research), environmental engineering, earth systems science, and management, this will make the campus an attractive location for an applied ethicist. In fact the three major areas of applied ethics are biomedical ethics, environmental ethics, and business ethics, all of which overlap with these areas of specialization at UC Merced. Thus, the program is envisioned as one in which students apply ethical theories and conceptual analyses to real world cases in a manner which is deeply informed by empirical data and research in disciplines outside of philosophy.

In terms of curriculum, faculty in applied ethics and political philosophy could contribute to programs campus-wide; conversely, students in applied ethics and political philosophy would be expected to take courses in related disciplines as part of their degree program. Current or anticipated areas of curricular overlap include the following:

Biological sciences and Bioengineering: Biomedical ethics is a standard component of biological science and bioengineering degree programs. In fact, BIS 185, "Biomedical ethics," is an approved, but as yet untaught, course offering. NIH trainees are required to take a graduate level course, "Responsible Conduct for Research," which addresses ethical issues; this course is currently taught as part of the Quantitative Systems Biology program. Other courses which are currently being taught and which address ethical issues include BIO 130, "Intro to Bioengineering," and ENGR 191, "Professional Seminar." A planned course on tissue engineering will also include discussion of ethics. Finally, BIS 10, "Genetics, Stem Cells, and Development" (currently taught by Provost Alley and Dean Pallavicini) addresses ethical issues relating to embryonic stem cells, genetic testing and genetic engineering. The latter course could be taken by philosophy students working in applied ethics. Finally, it is worth noting that faculty in the schools of Natural Science and Engineering are seeking CIRM (California Institute for Regenerative Medicine) funding for a formal stem cell training program which would need at least one lecture if not a series on "Ethics in Stem Cell Research."

Environmental Engineering and Earth Systems Science: Environmental ethics is an essential component of Environmental Engineering and Earth Systems Science, and has been playing an active role in planning and teaching already. Ethics is a necessary component for engineering degree accreditation, which is currently being addressed via service learning and other courses. Ethics has also been discussed as part of the planned revision of the Earth Systems major (in which it will become a cross-school major). A recent grant proposal

submitted by Earth Systems faculty for a summer undergraduate research program in Yosemite included an environmental ethics component. A graduate course in Philosophy of Environmental Systems was taught in 2004. Philosophy students specializing in environmental ethics would be expected to take courses in both programs, including EnvE 10, "The Environment in Crisis", which can be taken without any prerequisites, as well as ESS1, "Introduction to Earth Systems Science," ESS 40, "Air Quality, Air Resources, and Environmental Health," and ESS 50. " Ecosystems in California."

Within SSHA, there are numerous areas of curricular overlap. *Management*: business ethics is a standard part of the undergraduate curriculum. *Political Science*: political philosophy will satisfy an upper division elective for political science students; conversely, philosophy students will be able to take political science courses (e.g., in game theory) to satisfy an upper division requirement for philosophy students. Cross-listed courses—e.g. one in ethics and politics—are being discussed. *Sociology*: social and political philosophy will fulfill an upper division requirement in sociology, and philosophy students could take upper division sociology courses for credit. It is envisioned that an applied ethicist would collaborate with sociology in developing courses focusing on ethical issues relating to race, class, and gender. *Other areas:* history (in particular, security studies, and area of specialization in the current program), public policy, anthropology, and cognitive science (in particular via decision theory, a hiring priority in cognitive science).

(2) Philosophy of Cognitive Science.

Philosophy is one of the disciplines comprising the interdisciplinary field of cognitive science. Cognitive science studies mental processes from a variety of perspectives, including neuroscience, psychology, and computer science. Philosophers consider conceptual issues relating to these broad interfaces and articulate theoretical frameworks for interpreting relevant empirical data. Among the recommendations made by the advisory board for philosophy established in 2004 was that UC Merced have philosophers represented in its cognitive science program.

In terms of curriculum, PHIL 1, PHIL 5, PHIL 102, PHIL 110, and PHIL 111 all count towards the major in cognitive science; PHIL 1, PHIL 5, and PHIL 110 have been or are slated to be taught. PHIL 110 and PHIL 111 are cross-listed between philosophy and cognitive science, and the intent is to also cross-list them with the graduate program in cognitive science. The current philosophy faculty member has also taught three cognitive science courses (two independent studies and COGS 103, all focused on neural networks), has participated in upper division COGS classes, and is slated to teach a cross-listed graduate course this Spring. It is expected that future philosophy students will be able to take upper division courses in cognitive science towards the major.

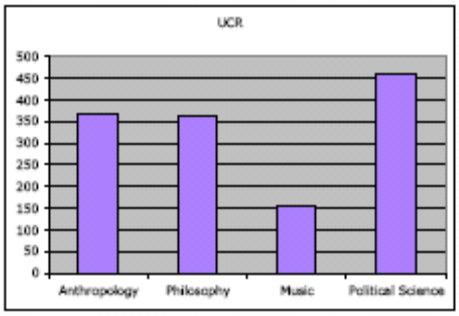
(3) Literature and Arts

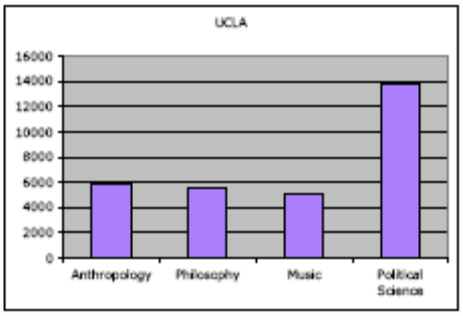
A third area of overlap involves interaction with literature and the arts. Hires in aesthetics and philosophy of art could contribute to the art and literature programs and philosophy students

working in these areas could take courses in art and literature. The current faculty member in philosophy is co-teaching a course in the world cultures and history graduate program (WCH 225—Philosophy and Theory). The senior literature faculty member he is co-teaching the course with does work in reader response theory and literary theory more broadly, and teaches a course on literary theory, LIT 100, which will count towards the philosophy minor and future major. One of the art faculty specializes in music aesthetics and is planning to teach a course on music aesthetics, which will count towards the philosophy minor and major. There are also plans to allow several upper division philosophy courses (e.g. PHIL 150) to count towards the literature major, and possibly towards art or art history. The areas of 19th and 20th century European philosophy— standard areas of expertise in those who specialize in philosophy of art or literature—have broader relevance to a number of disciplines at UC Merced, including anthropology (cf. Paul Rabinow's courses on Foucault at Berkeley), literature (for which Continental philosophy is a central component), history (cf. Martin Jay's courses on the Frankfurt School at Berkeley), and sociology (a course covering Marx, Weber, and Durkheim would be a natural fit for sociology majors).

Teaching Needs and General Education

Philosophy departments typically make substantial contributions to undergraduate teaching, in light of the many general education and major requirements philosophy courses fulfill. Introductory philosophy and logic courses usually fulfill lower division general education and quantitative reasoning requirements, and philosophy courses often fulfill degree requirements in other majors, as noted above. Credit hour data bear this out. Though philosophy tends to graduate fewer majors than other humanities and social science disciplines, it does have comparable enrollments. Shown here are data from the two UC campuses where the credit hour data (for philosophy as compared with music, anthropology, and political science) were most similar in 2005: UC Riverside and UCLA:





Enrollments in philosophy since UC Merced opened in 2005 have been consistently high. Each of the three courses offered thus far has been full or nearly full. Following are past and projected enrollments:

Term	Course	Instructor	Total
Fall 05	PHIL 001	Yoshimi	77
Fall 06	PHIL 001	Johansson	70
Fall 06	PHIL 150	Yoshimi	50
Spring 06	PHIL 005	Johansson	70

Spring 06	PHIL 110	Yoshimi	65
Spring 06	PHIL 103	Johansson	25

In fact, projections indicate that philosophy will have most students per ladder rank faculty within SSHA by July 2007 (see the psychology strategic plan).

Philosophy also makes important contributions to the Core course sequence. Philosophy is the most heavily represented SSHA discipline in the Core course sequence, in terms of number of lectures. There are currently 2.5 philosophy lectures in Core 1 (informal logic, evolution vs. intelligent design / philosophy of science, and ethics) and two lectures in Core 100 (decision making and ethics in policy).

Student Interest

There is evidence of student interest in an expanded philosophy program. In a poll of the Philosophy 1 course offered in Fall 2005, 71% of students (55/77) said they would be interested in a philosophy minor if it were offered. 29% (22/77) expressed an interest in a philosophy major. Anecdotal evidence from students and student advisers suggests that many of these students are looking for a way to supplement their coursework with a broader "college experience" that includes subject matter not available in high school. Further evidence of student interest is provided by the fact that a group of students independently launched a philosophy club (the "nonexistent philosophy club") in 2005 and have continued to maintain it.

Degree programs and Hiring Priorities

The minor in philosophy was launched in 2006. A major program will require two more ladder-rank faculty, and it is hoped that this can be accomplished by 2009. Three year-hiring priorities are as follows:

2008: Applied Ethics or Political Philosophy (Full; search underway)

2009: Applied Ethics or Philosophy of Cognitive Science (Assistant)

2010-11: Aesthetics or Core Philosophy Area (Assistant)

2012: Applied Ethics or Philosophy of Cognitive Science (Full)

POLITICAL SCIENCE
Strategic Plan

1. The Challenges

Political Science faces many challenges:

- A need to hire additional faculty to accommodate the political science major.
- A need to develop research areas of excellence to establish UC Merced political science as an outstanding program in the discipline.
- A need to create awareness of the political science major among current and prospective undergraduates.
- A need to develop a graduate program in political science.
- A need to further integrate the political science program at UC Merced with select disciplines.

2. The Strategy

In order to address these challenges, political science will seek to hire faculty who will contribute to cultivating a reputation for outstanding scholarship and teaching. The faculty we seek to hire will be experts in particular areas of political science (e.g., U.S. foreign policy, Congress), but oriented toward larger theoretical questions involving the study of political behavior and institutions.

2.1 Vision

Political science at UC Merced is positioned to be at the forefront of the discipline in the coming years. Although we acknowledge the ambitious nature of this goal, political science is ideally situated to absorb the myriad ideas, theories, and methods intrinsic to interdisciplinary environments. In contrast to many other disciplines, political science has no core approach. It is a borrowing discipline. Indeed, cutting-edge research in political science often grows from an idea or approach from another discipline, primarily economics and psychology. In an interdisciplinary environment, a political science program with ample resources is poised to bring new ideas and approaches to the discipline, thus cultivating a reputation for innovative and ground-breaking research. If we are able to hire well and fully take advantage of UC Merced's interdisciplinary strengths, we believe we can develop one of the better political science programs in the West. There are a few very strong political science departments or programs on the West Coast. Aside from a handful of standout programs such as UC Berkeley, UC San Diego, UCLA, UC Davis, Stanford, and Caltech, there is a significant step down in quality. With resources and shrewd planning, we should be able to develop into a highly competitive program.

Although political science should thrive in an interdisciplinary environment, it also contributes to other disciplines by providing novel and interesting research questions, alternative approaches grown from within and outside political science, and

opportunities for collaborative research.

Political science aims to be a large major at UC Merced, training students in traditional political science courses while blending elements of other disciplines relevant to the study of politics. It also aims to train graduate students in subfield specialties where coursework in other disciplines will lead to innovate research programs.

2.2 Mission

Political science seeks to make substantial contributions to the discipline of political science through the publication of outstanding scholarly research. It aims to train undergraduate and graduate students how to understand political phenomena using both theoretical and empirical approaches to the study of politics. In conducting research and training students, political science aims to draw on the intellectually rich environment of an interdisciplinary school.

3 Goals and Strategies

Political science needs to do the following:

. • Develop areas of research excellence
. • Develop a graduate research program
. • Build bridges to other disciplines
. • Hire outstanding faculty with broad theoretical interests in political institutions and behavior across the traditional subfields

3.1 Research Opportunities and Funding

As a program not likely to achieve a faculty the size of UC Berkeley in the near future, it is crucial to develop areas of excellence while still providing undergraduates a broad curriculum. To achieve this goal, political science seeks to develop an emphasis on political behavior and institutions, the two organizing principles of the discipline. Within each of these areas, we will likely focus on hiring scholars with broad theoretical interests that bridge other disciplines.

In the area of political behavior, we seek to hire scholars doing research informed by general theories of judgment and decision making. In particular, voting behavior and public opinion research increasingly draws on theories found in cognitive psychology and tests them using experimental methods. Scholars using these theories and approaches are doing innovative research in political behavior and we seek to be a discipline leader in this area. We anticipate that scholars in this area will likely form associations with cognitive science faculty.

In the area of political institutions, we plan to hire scholars with research programs focusing on the selection and ultimate effect of the “rules of the game” governing

political processes. Given that the political science group will not consist of 30 faculty in the foreseeable future, we seek scholars who are general institutionalists, as opposed to area specialists. Such scholars will likely form linkages with economics.

3.2 Teaching opportunities, enrollment

The Political Science undergraduate major was approved last year and since approval it has become the third largest major in SSHA. The size of the major is not all that surprising given that Political Science is a popular major both nationwide and within the UC system. Over the last three decades in the U.S., more students have graduated with a degree in political science than in the related fields of History, Economics, or Sociology (American Political Science Association)[xx]. Political science is also a sought after degree throughout the UC system. For example, political science is the second most popular major at both UC Berkeley and UCLA[xxi]. These data emphasize the high level of student demand for political science, both nationally and in the state of California.

3.3 Interdisciplinary opportunities

Since political science often borrows ideas, theories, and approaches from other disciplines, it is poised to take advantage of interdisciplinary opportunities. In particular, contemporary political scientists often borrow from the fields of economics and cognitive psychology. As such, political science envisions hiring faculty that would be interested in developing programs integrating political science with these disciplines. Recently, political science and cognitive science have begun collaborative efforts in the areas of research, data collection, and curriculum development. We hope to further develop this relationship. In addition, we would like to foster similar relationships with economics.

3.4 Resources

Faculty by area, projections (5 years): Currently, there are two political science faculty (Hansford and Nicholson) who can teach a number of existing political science courses including Introduction to American Politics (POLI 1), Analysis of Political Data (POLI 10), Judicial Politics (POLI 102), Interest Groups and Political Parties (POLI 105), Direct Democracy (109), Governmental Power and the Constitution (POLI 110), Liberty, Equality, and the Constitution (POLI 111), Voting, Campaigns, and Elections (POLI 120), and Public Opinion (POLI 125). Nate Monroe, a recent hire (joining the faculty in July 2008), is able to teach the following courses: Controversies in American Politics (POLI 2), Analysis of Political Data (POLI 10), Congressional Politics (POLI 100), and Theoretical Models of Politics (POLI 170).

[xx] http://www.apsanet.org/section_589.cfm

[xxi] See UC Berkeley's "Assigned Majors by Academic Program" (http://opa.berkeley.edu/AnalysesAndReports/MajorsAndDegreesByAcadProgram.htm) and UCLA's "Undergraduate Profile, Fall 2005" (http://www.aim.ucla.edu/home/Undergraduate_Profile_Fall_2005_viewing.pdf).

To meet the demands of the growing major and develop a graduate track within SCS, Political Science needs more faculty. Political science must be able to offer a variety of courses—and not develop a reputation for limited offerings—if it is to continue on its trajectory of becoming a large major. For this reason, political science should be allocated two to three positions per year over the next five years. New faculty members in all subfields are required to give students a realistic opportunity for completing the major. Specifically, the introductory courses and required courses—not to mention graduate seminars—will quickly deplete the availability of faculty to teach upper division courses. Many of these lines could be at the junior level since both Hansford and Nicholson are advanced assistant professors (see *Faculty development* below). It should be noted that by requiring political science majors to take two upper division courses outside of political science, the major utilizes existing instructional strengths and resources[xxii].

Until these faculty members are hired, political science will continue to need full-time lecturers to cover several courses. We view this as a short-term solution, though. To provide a quality major, we need to rely on ladder-rank faculty in the classroom.

We will continue to focus on hiring faculty with broad theoretical interests in political behavior and institutions. Given our small size, for example, we will avoid hiring political science faculty in Comparative Politics who focus narrowly on a given country. Although we desire to hire faculty who research the politics of specific regions (e.g., European politics), the focus must be sufficiently broad to be of interest to political scientists working in other subfields. Thus, an ideal hire for political science in Comparative Politics would focus on broader questions pertaining to voting behavior, legislatures or political parties within a given country or region. Scholars with broad theoretical interests are also more likely to publish in well-regarded, mainstream political science journals and be able to flourish in an interdisciplinary environment.

Faculty development. Both political science faculty members are advanced assistant professors. Hansford, had he remained at the University of South Carolina, would have gone up for tenure last year and Nicholson, had he remained at Georgia State University, would be a second year Associate Professor. Although Hansford and Nicholson have well established research programs, both require time to do research to assure steady career advancement. Our new faculty hire, Monroe, is a fourth year assistant professor and also needs time to further his research agenda. The hiring of more faculty members within the next five years is essential to giving faculty the opportunity to do research.

Spaces, offices, labs. A primary concern is office and lab space. Assuming we are only allocated three faculty lines over the next three years as mentioned in the Strategic Plan and Academic Resource Plan (2006), political science will need three additional faculty offices. In addition, political science needs laboratory space. Experimental methods are

[xxii] The faculty who teach these non-political science courses have been consulted about the possibility of political science majors taking enrolling in their classes and have not expressed any objections.

becoming increasingly popular in political science and they figure prominently in political science's future plans. For example, political science seeks to hire several faculty that use experimental methods in the coming years. Nicholson increasingly makes use of experimental methods and will require lab space in the near future to successfully conduct his current and future research. In contrast to psychology and cognitive science, however, political science does not require lab space for each faculty member who uses experimental methods. Many political science departments have experimental labs where resources are pooled together. A similar model should be adequate for the needs of political science faculty and graduate students. Given a sufficiently large space, political science faculty might also share lab space with faculty and graduate students from sociology and economics. Lack of laboratory space for political science faculty doing experimental work will harm efforts to recruit and retain faculty.

3.5 Finances

Political science does not have any extramural grants at this time. However, this is not all that surprising given that junior faculty in political science typically do not have extramural grants. Next year, Hansford and Nicholson plan to individually apply for National Science Foundation grants. Political science also hopes to hire senior faculty with a record of obtaining grants and to generally foster an environment that encourages applying for grants.

3.6 The Organization

Political science is committed to an interdisciplinary environment but envisions a much closer association with cognitive science and economics. The overlap in approach and method will benefit a political science program, especially in the areas of graduate student training and faculty research. Political science graduate students trained in the most recent theories of cognitive psychology or economics will be poised to make substantial contributions to the discipline of political science.
Political science faculty collaborating with cognitive scientists and economists will be similarly advantaged.

SOCIOLOGY STRATEGIC PLAN

Introduction

Given UC Merced's unique location in the San Joaquin Valley, and Sociology's traditional emphasis on issues of inequality and power dynamics (particularly regarding class, race/ethnicity and gender), UCM Sociology has the potential to be not only a strong academic unit within SSHA, but a bridge to the other schools on campus and the larger community as well. Given the socioeconomic and demographic changes gripping the Central Valley in particular, and the State of California as a whole, I believe Sociology can serve to attract students at both the Undergraduate and Graduate level interested in studying such issues as:

- The complex issues of race/ethnicity that will emerge as the minority populations in California grow and make the "white" population an ever-smaller percentage of the whole.
- How minority and majority politics adapt to those changes.
- How collective action and social movements rise and fall in concert with the aforementioned demographic and political changes.
- How the dynamics of neighborhood/community change given increasing economic inequalities **and** increasing racial diversity.
- Increasing residential segregation.

Ultimately, I see UCM developing an elite, small Sociology department. Unlike UCLA and Berkley, which have some of the largest departments in the country, I envision UCM developing similar to Stanford, with a few key areas of study, rigorous academic programs, a focus on developing analytical skills, at the cutting edge methodologically, and with connections to the various multi-disciplinary programs throughout the university. The ultimate goal for this department is to be a top 50 department within 20 years and to join our sister schools Berkeley and UCLA in the top-10 in the long term. Though ambitious, I believe by implementing an aggressive hiring strategy combined with logical curriculum development, these goals are attainable.

Hiring/Staffing

Sociology, is one of the most popular majors throughout the UC system, on individual campuses and across the nation (see tables 1 and 2, and figure 1). However, here at UCM, Sociology is under-represented both in relation to its popularity nationally and in the UC system, as there is only one Sociologist on campus. I understand that in a time of limited resources, it is impossible to build every single major that is represented in SSHA. However, given sociology's prominence at the undergraduate level in both the system and nationally, it is important for SSHA to move quickly and aggressively so that a major can be started on campus within the next five years.

Sociology is a discipline with both quantitative and qualitative methodological foci. As a discipline, sociology is focused on the study of society as a whole and not just particular institutions or aspects of society. A successful department will be one that addresses all of these key features of sociology.

Over the next five years, I see Sociology growing along two axes. The first axis is an emphasis on studying traditional sociological issues: power, structure, agency and inequality, with a

particular emphasis on race, class, and gender. The second axis is methodological, with a stress on where the discipline is headed. In particular, I would like to hire individuals whose research uses network analyses, geographic/spatial analyses, hierarchical modeling, new ethno-methodologies, and mixed (quantitative/qualitative) methodologies.

Sociology, as a discipline, is uniquely situated as it can speak to all of the constituent members of SSHA, as well as aid in developing multi-disciplinary programs. In particular, I think Sociology can very quickly assist the growth of the Management Program. Sociology's flexibility and diversity, more so then any discipline aside from economics, can help quickly build the nascent management program. Though high school students, their parents, and some undergraduates may view management programs as the exclusive providence of Economists, the fact is that at the elite Graduate Schools of Management and Business, sociologists play an integral role in a variety of working groups and emphases. In surveying the top 20 business and management schools in the United States, sociologists are part of, but not limited to the following areas of study:

- Behavioral Policy Science
- Technology and Entrepreneurship
- Management Sciences
- Urban Studies/Planning
- Forestry/Natural Resource Planning
- International Business
- Center for Entrepreneurial Studies
- Global Business and Economics
- Social Innovation
- Organizational Behavior
- Strategy
- Economics
- Non-profit Management
- Marketing
- Decision
- Economy and the State
- Industrial Relations

- Management Behavior
- Organizational Dynamics
- Organizations and Markets

Finally, but not any less important, is sociology's potential connection to the humanities. Clearly, connections can be made quite easily with History, as a great deal of sociological work is historical in nature—from analyses of the African-American Civil Rights Movement, to changing gender roles in institutions, to diffusion of cultural norms, they all are based in historical methodologies. Likewise, linkages to literature are quite natural as well. If one looks at works such as Paul Beatty's *White Boy Shuffle*, central to that text are themes of what is "Blackness," how racial and ethnic identities developed, how such identities might be entwined with discussions of class, and what occurs at intersections of race, class, and gender. Another intersection could be if UCM were to hire an applied ethicist, as many of the issues that I envision the department focusing on, issues of race, class, and gender and the power inequalities therein, could be complemented very well by someone that examines the ethical implications of these issues. Moreover, Philosophy interfaces quite well with sociological theory courses. On the one hand, a 19th century philosophy course might include readings by Marx, Weber, and Durkheim, which would be a natural fit for philosophy and sociology majors. In contrast, a contemporary philosophy course might examine Foucault, Althusser, Heidegger and/or Derrida all thinkers with strong ties to sociology.

Given the ability to help the multi-disciplinary program in management and the necessity to grow the core parts of the discipline, I propose a two-pronged approach. I suggest that in the next academic year we hire a sociologists whose emphasis is on social stratification (preferably with an emphasis in Race, Class, or Gender or a topic such as immigration), and then alternate in following years hiring for management (in Sociology) and then for the "core" of the program. Therefore, it helps build both the Sociology program, and the Management Program. To be clear, the sociologists in management would be beholden to the Sociology program for determining their workload in terms of course loads and curriculum, however their courses (say in organizational behavior or network theory) would be able to be listed as upper division Sociology and Management courses, thus adding depth to both Sociology and management. However, their principle and "department of record," for lack of a better phrase, would be management. In the next four hiring cycles (beginning in AY 08/09) the hiring pattern would be:

08/09—1 hire in Stratification
09/10—1 hire, Economic/Organizational
10/11—1 Social Psychology
11/12—1 hire, Economic/Organizational

Each of these hires would not only be supported by the sociologists on campus, but by the faculty in the rest of the school. The economic/organizational hires would have support of management, the Social Psychologist (who I envision as an experimentalist) would have support

from both Psychology and Cognitive Science, and the Stratification faculty from Political Science, History, Economics and Anthropology.

Moreover, Economic/Organizational sociologists tend to use network analyses, as well as hierarchical modeling and those in Stratification use ethnography along with geographic/spatial, hierarchical and other statistical modeling. Moreover, Economic Sociology is the newest and among the fastest growing sub-disciplines. Hiring two sociologists in Economic/Organizational and Stratification will put the department at the forefront of sociological thought. Each year my colleagues and I would aggressively look into the UCOP post-doctoral fellows for a possible fit.

Furthermore, I would advocate a slightly different hiring strategy than is currently being used in SSHA. Given our difficulties in recruiting high caliber senior hires, I would argue that we should target our hires at the assistant and advanced assistant level. The logic here is that though it would not give our Senior Faculty leadership the immediate assistance they need, it does provide a better environment for mentorship and assistance for the "new" junior hires. Looking at Political Science, if all goes well Steve and Tom will both be Associates by end of 07/08 and can effectively mentor any future junior hires in Political Science (or for that matter, Sociology!). This then decreases our need for senior searches, which I believe will be largely unsuccessful in the near term until we can reach "critical mass" on campus, and can offer established faculty research centers, facilities, student populations, etc. that are attractive for them to leave their current institution.

Developing the Major The first step, developing the minor, has been accomplished with the minor currently "on the books." However, I believe that acting strategically, we can have a Sociology major up and running by AY 2010-2011, with a moderately aggressive hiring strategy (see above), and use of existing courses within other disciplines, and strategic use of lecturers. Below is a preliminary list of courses, and distribution. To get the program up and running sooner Political Science 010 could be used instead of Soc 010. With four ladder-rank faculty (myself and 3 new hires), and strategic use of lecturers we can offer the bulk of the courses that I envision being part of the major— particularly the three most important upper division courses: research methods, Sociological theory, and the Senior Capstone. However, if we hire in the areas I specify above we could certainly teach in a three year rotation al of the lower division courses I list (with the exception of Introduction to Crime and Deviance), as well as the bulk of the 15 upper division courses, and perhaps most importantly the research methods, theory and senior capstone course.

The students would be exposed in the lower division courses to three of the major subfields within the discipline, and at the upper division level have a chance to explore how Sociology interfaces with the other disciplines, as well as become immersed in specific issues of interest to them. Finally, the Sociology major will end with a capstone class that will be a yearlong sequence where the first semester will be developing a research question, a research plan, developing the theoretical basis of the final project, and beginning the actual research (be it historical, quantitative, or qualitative). The second semester will be principally for finishing the data collection and performing/writing up the final analyses into a sort of Bachelor's thesis.

Requirements:

Lower Division, 16 Units

Intro to Sociology, (4 units)

Choose 3 from the following 7 courses (12 units):

- Social Stratification (4 units)
- Introduction to the Sociology of Organizations (4 units)
- Introduction to Social Psychology (4 units)
- Introduction to the Sociology of Gender (4 units)
- Introduction to Crime and Deviance (4 units)
- Issues of Race and Ethnicity (4 units)
- Introduction to Political Sociology (4 units)

Upper Division, 38 Units

Research Methods (4 units)

Sociological Theory (4 units)

Senior Capstone I, II (6 units)

Choose 3 from the following 15 courses (12 units):

- Social Movements, Protest and Collective Action (4 units)
- Urban Inequality (4 units)
- Advanced Issues of Gender (4 units)
- Advanced Issues in Race and Ethnicity (4 units)
- Political Sociology (4 units)
- Advanced Organization Behavior (4 units)
- Advanced Social Psychology (4 units)
- Quantitative Methods (4 units)
- Qualitative Methods (4 units)
- Further Issues in Crime and Deviance (4 units)
- Foundations of Social Theory (4 units)
- Contemporary Social Theory (4 units)
- Sociology of Education (4 units)
- Sociology of Religion (4 units)
- Law and Society (4 units)

12 other units from sociology or other related courses from the social sciences (Economics, Public Policy, Psychology, Anthropology,). Humanities courses may be approved on a case-by-case basis

Total Load 54 Units

Table 1. Number of Majors by Year, Across the UC System for Social Sciences, for AY 2000-01 Through 2004-2005.*

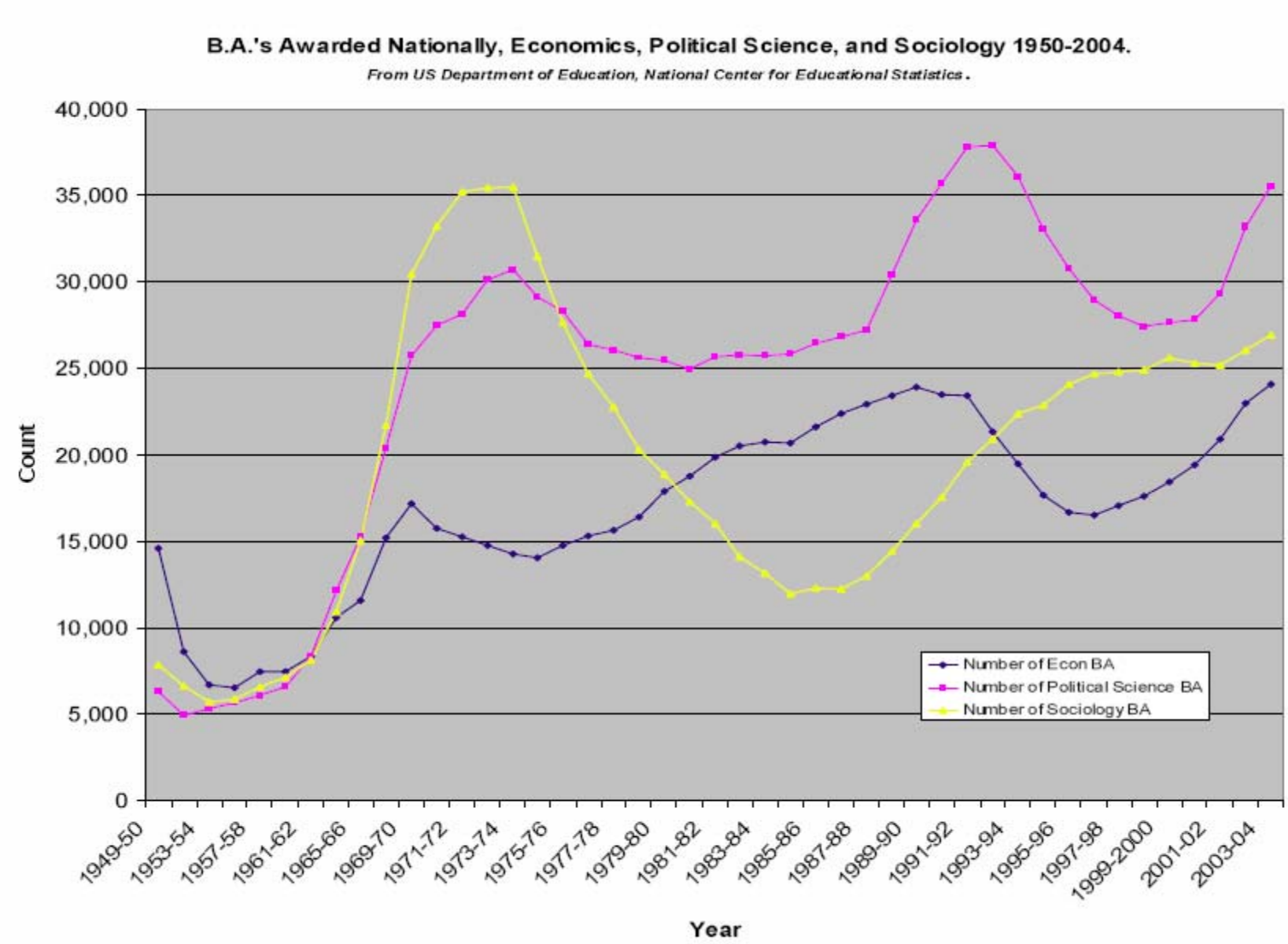
	01	02	03	04	05
Anthropology	611	1038	1027	1097	874
Economics	3862	5124	5920	6069	5290
Political Science	3294	4471	5124	5304	4748
Psychology	3959	5725	5867	6240	5450
Sociology	3094	4554	4920	4935	4591

*Data not available for Santa Cruz or Santa Barbara, and UCLA is missing data for 01 and 05. Data from Institutional Reports for each campus.

Table 2. Number of Majors by Department on UC Each Campus by Year, for AY 2000-01 Through 2004-2005.*

		2001	2002	2003	2004	2005
Berkeley						
	Anthropology	213	239	245	248	240
	Economics	481	529	582	602	555
	Political Science	600	667	863	864	843
	Psychology	476	485	535	562	564
	Sociology	340	441	478	500	450
Davis						
	Anthropology	129	150	145	134	131
	Economics	556	721	950	1040	957
	Political Science	664	685	795	825	830
	Psychology	933	995	1179	1329	1394
	Sociology	417	565	665	673	732
Irvine						
	Anthropology	98	119	124	121	164
	Economics	1088	1190	1169	1145	1152
	Political Science	581	681	779	823	912
	Psychology	735	847	836	794	857
	Sociology	623	732	768	784	803
Los Angeles						
	Anthropology		352	315	379	
	Economics		710	1012	827	
	Political Science		638	759	788	
	Psychology		1235	962	1098	
	Sociology		927	1069	1008	
Riverside						
	Anthropology	88	105	131	137	149
	Economics	309	371	491	629	663
	Political Science	438	636	731	756	780
	Psychology	786	1056	1146	1117	1119
	Sociology	427	555	582	615	605
San Diego						
	Anthropology	83	73	67	78	190
	Economics	1428	1603	1716	1826	1963
	Political Science	1011	1164	1197	1248	1383
	Psychology	1029	1107	1209	1340	1516
	Sociology	1287	1334	1358	1355	1401

*Data not available for Santa Cruz or Santa Barbara, and UCLA is missing data for 01 and 05. Data from Institutional Reports for each campus.


B.A.'s Awarded Nationally, Economics, Political Science, and Sociology 1950-2004.
From US Department of Education, National Center for Educational Statistics.
Count
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1949-50
1953-54
1957-58
1961-62
1965-66
1969-70
1971-72
1973-74
1975-76
1977-78
1979-80
1981-82
1983-84
1985-86
1987-88
1989-90
1991-92
1993-94
1995-96
1997-98
1999-2000
2001-02
2003-04
Year
Number of Econ BA
Number of Political Science BA
Number of Sociology BA

APPENDIX C: PSYCHOLOGY

FTE Request

Developmental	Health	Quantitative
Chouinard	**Wallander**	**Shadish**
Dunham	Current Search	**Current Search**
Current Search	**Position 1**	Position 6
Position 3	Position 2	Position 9
Position 5	**Position 4**	
Position 7	Position 8	

1. In order to remedy the current dramatic understaffing of Psychology proportional to its student FTE credit hour production, we request a special allocation by the Provost of 6 new FTE faculty lines, taken prior to the distribution of FTEs to the Schools so as not to unduly penalize SSHA.
2. In order to reflect normal student FTE credit hours generated by Psychology, we request an additional 3 FTE faculty lines for Fall 2009.
3. We request 7 faculty offices plus 2500-3500 square feet of laboratory space for Fall 2008, assuming that the three current searches are successful.
4. We request 16 faculty offices plus a total 6000-8500 square feet of laboratory space for Fall 2009 to accommodate the needs of the current faculty, those hired in Fall 2008, and the new allocation of faculty lines requested in 1 and 2 above. Space is requested at an average of 400-550 square feet per faculty member.
5. We request continued allocation of Lecturer funds, the amount depending on the allocation of new faculty lines to Psychology.
6. We request an allocation of teaching assistant slots proportional to Psychology student credit hour production.

Summary

Psychology was one of the founding disciplines in the School of Social Sciences, Humanities, and Arts, envisioned to be a high enrollment major that would help the university reach its enrollment goals, and to be a scholarly centerpiece of the university. Psychology has met that expectation through high student enrollment, external grant funding, and scholarly productivity. This strategic plan describes the resource needs of Psychology, especially regarding hiring faculty who can build specialties of excellence in Developmental Psychology, Health Psychology/Behavioral Medicine, and Quantitative Psychology, and regarding building a Psychology graduate program. It also discusses proposed improvements to the undergraduate Psychology major, in particular by providing better opportunities to develop excellence in written communication.

1. The Mission and Challenges

Psychology offers a broad undergraduate curriculum spanning all its subspecialties, and it seeks to develop a graduate program with focused excellence in a limited number of subspecialties. Psychology is also a discipline in an interdisciplinary environment. It must maintain its disciplinary identity in order to attract both faculty and students, but it must simultaneously use the diversity of its subspecialties to establish mutually beneficial collaborative relationships with other disciplines and other Schools at UC Merced.

Psychology faces several challenges in achieving its mission.

- A need for additional faculty lines to teach the high and continually rapidly increasing undergraduate student credit hour production in psychology, to reduce the over-reliance on lecturers and to reduce the unacceptably high student-faculty ratio in psychology.
- A need to develop a formal graduate program proposal.
- A need to increase available laboratory space.

2. The Vision

Psychology aims to be a pivotal discipline in UC Merced's quest to become a premier research university. The role of Psychology will be to create a faculty whose research efforts are recognized in the discipline through excellence in publication and extramural funding, to provide a steady source of high enrollment courses that are taught primarily by ladder rank faculty dedicated to teaching excellence, and to cross disciplinary boundaries by identifying and collaborating in other strategic efforts in the university.

3. The Overall Goals and Strategies

Psychology has made exciting early progress towards the establishment of research and teaching excellence. However, several challenges remain. In particular, psychology needs to work with the administration and the Academic Senate

- To ensure that the allocation of resources to Psychology reflects its student credit hour production.
- To create a graduate program in psychology.
- To ensure that sufficient laboratory space is available for psychology faculty to do their research.

To achieve these goals, psychology must create a vision, mission and strategic plan that are endorsed by Psychology faculty, by the SSHA faculty and Dean, by the Academic Senate, and by the UC Merced administration. The current document describes the strategic directions that Psychology will take, and outlines the tactical actions that are needed to solve the challenges Psychology faces.

4. The Organization and Administration

In Fall 2007, the Psychology Section of SSHA was created, with four ladder rank faculty: Assistant Professor Michelle Chouinard, Assistant Professor Yarrow Dunham, Professor William Shadish (Chair), and Professor Jan Wallander. The Psychology Section held regular faculty meetings during the academic year, and given its small size, it currently functions as a committee of the whole for all decisions.

5. Education

5.1 Emerging Educational Needs

At the undergraduate level, three key needs are emerging. First, Psychology would like to make its undergraduate major writing intensive. The Psychology faculty considers the ability to communicate in writing an important component of a high-quality education. Strong scientific writing is a critical skill in the discipline, foundational to efforts to provide undergraduates with the necessary skills to succeed in professional and post-graduate work. However, providing this training requires a major commitment of teaching resources, specifically in the form of teaching assistant allocations at least proportional to the student FTE's generated by Psychology courses[xxiii]. We will also take advantage of Writing Program courses, for example, by requiring majors to take WRI 117: Writing for the Social Sciences, potentially working with the Writing Program to develop a psychology-specific version of this course. Second, the number of undergraduates requesting to work on the research of Psychology faculty members is increasing beyond the point that the existing faculty can handle. To do so, we need more teaching assistant resources than we have usually been given, an amount at least proportional to the student FTE's generated by Psychology courses[xxiv]. We will also take advantage of Writing Program courses, for example, by requiring majors to take WRI 117: Writing for the Social Sciences. Second, the number of undergraduates requesting to work on the research of Psychology faculty members is increasing far beyond the point that the existing faculty can handle. Hiring more faculty will ease this problem. Third, we were informed by the SSHA Dean's staff in late Fall 2007 that demand for upper division Psychology courses is rapidly increasing, not just from normal enrollment growth, but from the fact that the Schools of Engineering and of Natural Science recently changed their curricula to allow more upper division SSHA courses to meet their requirements. By late December, 2007, 8 of 9 upper division Psychology courses filled very quickly to their enrollment caps of 50-65. This resulted in some Psychology majors being unable to obtain upper division courses they wanted or needed, and in all transfer students being precluded from registering for these courses because they register at the start of the semester when classes have already closed. Here too, additional faculty hires can ease the strain.

At the graduate level, a key need is to develop graduate education in Psychology. Our current graduate education occurs under the auspices of the Individual Graduate Program in Social and Cognitive Sciences, Psychology track. We have a small, basic set of graduate course offerings consisting of a year long Professional Seminar, a methods course, and a few advanced specialty courses (e.g, Developmental Psychology, Measurement Theory and Psychometrics). However, such an unusual degree is not widely marketable, and the sparse curriculum only minimally prepares our graduates adequately for independent research contributions. With more faculty hires in the next three years, we anticipate having the capacity to offer a freestanding Psychology doctoral program, and so are beginning to prepare such a proposal.

[xxiii] The allocation of TAs to Psychology courses in Spring 2008 met this goal, the first time that has been the case since UC Merced opened. We hope this trend continues.

[xxiv] The allocation of TAs to Psychology courses in Spring 2008 met this goal, the first time that has been the case since UC Merced opened. We hope this trend continues.

5.2 Majors

In 2007-8, Psychology has 39.5% (206) of all the 521 declared undergraduate majors in SSHA[xxv]. The ratio of Psychology majors to Psychology ladder rank faculty is over 50:1. No other major in SSHA comes close to this ratio. The ratios for the remaining SSHA majors are 24:1 (Political Science), 11:1 (History), 8:1 (Cognitive Science), 5.25:1 (Literature & Cultures), and 4:1 (Economics). The ratio for Management, which has 122 majors, cannot be computed because Management has no faculty. Majors are an important metric because they consume a disproportionate amount of faculty time compared to other students enrolled in Psychology courses. Majors create demand to work on faculty research projects, request letters of recommendation and similar support, and they are more likely to consult faculty about career development. It is difficult to provide the Psychology major with the faculty consultation and interaction they deserve at a UC campus with a ratio of 50:1.

5.3 Minors (No information on the number of minors is available)

5.4 Enrollment Projections

In 2007-8, Psychology courses generated about 30% of all SSHA student FTE credit hours: 30.2% when counted by discipline of the *course*, and 28.5% when counted by discipline of the *instructor* of record. As with the data on majors, this is far higher than any other discipline in SSHA. As a consequence, the ratio of student FTEs to ladder rank faculty in psychology is at least 80:1, again by far the highest in SSHA. This results in very crowded classes that greatly limit the ability of Psychology to engage students with more time consuming tasks like extensive writing and laboratory components, or to devote much time to individual students during office hours. The high student FTE also results in a larger number of courses being taught by Lecturers than in any other discipline in SSHA. We would rather have ladder rank faculty teaching these courses in order to provide a high quality UC undergraduate education. Throughout the rest of SSHA Sociology (77:1) and Political Science (60:1) both approach the Psychology ratio; but the rest of the SSHA disciplines are far lower (e.g., Economics 25:1, Cognitive Science 35:1, Literature & Cultures 14:1; History 40:1).

Enrollment projections are always difficult to make in a rapidly changing environment. However, all indications are that the demand to enroll in Psychology courses will continue to grow rapidly at UC Merced. This prediction is based on the fact that Psychology courses routinely reach their enrollment caps very early in registration. According to a check of the Registrar's web site on December 29th, 2007, for example, 8 of 9 upper division Psychology courses were closed to further enrollment, despite the fact that their enrollment caps were 50-65. Psychology faculty routinely receive requests from students to add to closed courses; we have had to take a firm stand against this to avoid further class size increases. A negative consequence of this is that transfer students are closed out of these courses because they do not register until the start of classes. Finally, there is no reason to expect that the proportion of incoming students who desire to major in Psychology will change, indicating a continued high future demand for enrollment in Psychology courses. Therefore, if more sections of courses could be offered, enrollment would continue to increase—probably substantially.

At the graduate level, Psychology currently has five graduate students. This is a small number, even relative to the small number of Psychology faculty. In most Psychology graduate programs, each faculty member will have from 2-5 graduate students at a time. This low graduate enrollment is due to the small number of Psychology faculty, the primitive state of the graduate curriculum, and the lack of a presence

[xxv] These and subsequent data exclude Foreign Languages and the Writing Program, both of which are intended to be staffed primarily by lecturers.

in the standard recruitment venues. To remedy the latter, Psychology is currently developing a web page and an additional recruitment brochure, but the former has been slowed because of the minimal assistance given to the project by Information Technology. Psychology also joined the Council of Graduate Departments of Psychology, which will be a venue in which to publicize our program. When a full graduate program is available, we will place that information in standard sources such as the American Psychology Association's *Graduate Study in Psychology* book. Thus we project a slow increase in graduate enrollment at first, but within five years and additional faculty, we expect to enroll 5-10 new students per year, resulting in 30-50 students in the program at any given time.

6. Research

Psychology aims to develop three areas of research excellence—Developmental Psychology, Health Psychology/Behavioral Medicine, and Quantitative Psychology. In addition, psychology will continue to foster interdisciplinary links: with UC Merced's Cognitive Science program by hiring faculty members in these three areas who have overlapping interests in cognition, and with the planned medical school at UC Merced by hiring faculty with health-related interests. The next three paragraphs describe the immediate plans for Developmental, Health, and Quantitative Psychology.

Developmental Psychology at UC Merced currently focuses on childhood and adolescence, with interests in cognitive development, language, and social development. Faculty in this area have strong overlapping interdisciplinary interests with Cognitive Science. Future developmental hires will build on these strengths, but also broaden the breadth of developmental interests at UC Merced into areas like the development of infants and developmental neuropsychology. Reflecting these goals, we are currently pursuing a hire in the area of infant development, though it is too early to say if this effort will be successful. If this position is filled, our next priority is hiring a faculty member with research interests in the area of cognitive development. Such a hire would build on the program's current strengths, and would add to the interdisciplinary potential of the psychology area, due to further potential cross-collaborations with cognitive science. Developmental neuropsychology is our second future hiring priority. A cutting-edge research area, it potentially spans developmental, cognitive, and health psychology, as well as offering cross-disciplinary collaborations with cognitive science and human development/biology.

Health psychology deals with interactions between the behavior and physical health, considering the full dimensions of both of these concepts. At the most general level, health psychology includes research into how behavior affects physical health as well as how physical health affects behavior. To do so, health psychology draws upon multiple knowledge bases of psychology. For example within health psychology, there are social psychologists who study cultural influences on health, cognitive psychologists who study health decision making, developmental psychologists who study family influences on children's health, and physiological psychologists who study behavioral effects on the neural and immunological systems that are often the proximal causes of diseases. Health psychology also includes activities to promote physical health and prevent disease, which is often referred to as behavioral medicine. Such interventions can be applied at different levels, from individuals all the way to the public in general. Examples include psychological interventions that prevent health problems or ameliorate existing health problems, such as the delivery of culturally-appropriate health promotion information, and prevention programs to aid elementary and high school students to avoid unhealthy lifestyle habits (e.g., related to obesity, substance use). Health psychology faculty will bring research and teaching interests that will be highly useful in UC Merced's quest to develop a medical school; and health psychology usually fares extremely well in generating large amounts of extramural research funding. A priority in the near future will be the addition of faculty in health psychology who can contribute to Developmental Psychology by, for example, studying issues pertaining to children's health.

Quantitative Psychology is the study and development of the research designs and statistical methods that are used by psychologists (and other social, behavioral, and biomedical scientists) in their work. Compared to Developmental and Health Psychology, which are envisioned eventually to have large numbers of faculty, Quantitative Psychology will have a proportionally smaller number of full-time faculty compared to the other two areas, while also having enough faculty to offer doctoral training in Quantitative. The rapid addition of such faculty early in program development is essential to the development of a strong psychology program, for several reasons. First, it provides a good means of ensuring competent teaching of crucial graduate level quantitative courses in psychology that are required in every high-quality doctoral Psychology program. Second, it serves as a catalyst for improving the statistical analysis of research data for the two substantive areas of health and developmental psychology, improving the likelihood of successful publication. Third, given that UC Merced does not have a statistics department, unlike most mature universities, quantitative psychology can be a source of faculty who can provide critical statistical consultation on extramural grants. Such consultation is essential for large grant-supported research programs that we hope to encourage in developmental and health psychology. Importantly, this expertise will benefit grant applications outside psychology as well. Fourth, the American Psychological Association has identified quantitative psychology as an area that needs an increased supply of trained faculty members. The web site of the Task Force for Increasing the Number of Quantitative Psychologists http://www.apa.org/science/bsaweb-tfinqp.html states: "Acknowledging the fact that the number of quantitative psychologists is dwindling at the same time that there is a pressing need for training and education in all aspects of quantitative methods, the APA Council of Representatives authorized a special task force in 2006…. The Task Force…was charged with addressing both the pipeline of qualified students and opportunities for training in quantitative psychology (with an emphasis on early undergraduate education through postdoctoral training)." The quantitative psychology program at UC Merced will help respond to that need. We will choose hires in quantitative psychology that complement the needs typical of developmental and health psychology, such as longitudinal data analysis, multilevel modeling, and categorical data analysis.

In the long term, Psychology may expand beyond these three specialties, although such predictions are hard to make at this time. Likely candidates for long term expansion would include any of the physiological specialties in psychology, or social psychology. Much will depend on the mix of interests represented on the faculty at that time. For example, some health psychologists are trained as social psychologists, and they may find it attractive to expand the social psychology offerings.

7. Interdisciplinary opportunities

Psychology currently envisions three primary venues for interdisciplinary collaboration. First, Psychology has a history of support for and collaboration with the UC Merced Cognitive Science program. Psychology played a key role in formulating the original idea to create a Cognitive Science program; supported the move of several existing faculty lines from the teaching of Psychology to the teaching of Cognitive Science; spearheaded the creation of a new senior Cognitive Science position (to be filled by Michael Spivey); wrote a UCOP grant that was funded to support a conference held in May 2005 on the future of Cognitive Science at UC Merced; and wrote the initial draft of a second conference grant to NSF that received a very encouraging review, which was revised and resubmitted by faculty with interests in Cognitive Science. The latter grant was funded, and includes faculty who teach in Psychology as co-PIs. In addition, Psychology has been successful in seeking and hiring faculty who have overlapping interests that can support the Cognitive Science program, such as the recent hire of Yarrow Dunham, a developmental psychologist who has strong cognitive training and interests. The Psychology faculty has recommended hiring two additional faculty from the current searches in Developmental and Quantitative Psychology, both of whom have strong cognitive interests.

Second, faculty who will be hired in Health Psychology will contribute to interdisciplinary collaboration with faculty in the School of Natural Science and the School of Engineering who are involved in the creation of a medical school at UC Merced. The exact form of any research collaboration will depend on the specialties of the faculty who are hired. However, Professors Wallander and Shadish are both currently participating on the committee to plan the physical plant for early medical education at UC Merced; and they will participate in other such endeavors as requested.

Third, faculty who will be hired in Quantitative Psychology will contribute to the need for expert statistical consultation among faculty in the School of Natural Science and the School of Engineering who are involved in the creation of a medical school. For example, at the request of the Dean of Natural Science, Shadish wrote a document describing models for statistical consultation and training that could be used at UC Merced in the short to medium term future.

8. Outreach

Psychology strongly supports efforts to attract a diverse student body at both the undergraduate and graduate levels. Specific figures on the composition of the current student body are not available from SSHA. However, Psychology tends to attract a large proportion of female students, as well as of underrepresented ethnic groups. The composition of our undergraduate research teams, and of our graduate students, also reflects that (specifics available upon request). Finally, Psychology faculty routinely participate in outreach efforts. For example, Dunham is on the SSHA Recruitment and Retention Committee, and he has participated in one recruitment forum for psychology and cognitive science. Similarly, Wallander has served as a faculty speaker for the Transfer Student Recruitment into Psychology, Nov 2007.

9. Resources

9.1. Faculty

Psychology has 4 (13%) of SSHA's 30.5 faculty. If faculty were allocated in proportion to credit hours by either metric currently being used (in the discipline or by instructor of record), Psychology would currently have 9 faculty. If allocated in proportion to the number of majors (39.5%), Psychology would have 12 faculty. If allocated using the rule suggested in the strategic planning master document distributed to SSHA faculty—20 FTE students to one faculty—Psychology would have 16-17 faculty. By any metric, therefore, Psychology is drastically understaffed. The following table lists existing faculty and compares that to an allocation by the most conservative metric, student credit hour production:

Academic Year Beginning	Actual Faculty	Faculty Allocation Given Student Credit Hour Production
Fall 2005	5[1]	4[5]
Fall 2006	2.5[2]	7.5[6]
Fall 2007	4[3]	9
Fall 2008	7[4]	13

[1] Chouinard, Heit, Matlock, Shadish, Woodward
[2] Chouinard, Heit (0.5), Shadish
[3] Chouinard, Dunham, Shadish, Wallander
[4] Chouinard, Dunham, Shadish, Wallander and three positions currently being searched, assuming all searches are successful.

[5] Based on planned allocation determined by the Task Force that created UC Merced, given that disciplinary enrollment was unknown.
[6] Based on data in the 2006-7 strategic plan.

At a minimum, then, if all current searches are successful, Psychology will still be at least 6 faculty short of where any reasonable examination of data indicates it should be in Fall 2008. Therefore, given this significant shortfall in faculty lines in Psychology, our faculty FTE request has two parts:

First, we request that the Provost make a special, one-time-only allocation of 6 FTE faculty lines to Psychology during the current strategic planning process. So as not to unduly penalize the allocation to SSHA in general, we request the allocation be taken first from the overall UC Merced allocation of faculty lines, with the remaining lines then being distributed to the three Schools according to the normal process.

Second, because the current strategic planning process concerns hires who would not be on staff until Fall 2009, we request the usual allocation of FTE faculty lines to Psychology based on planned growth for that year. Assuming SSHA receives about 10 new faculty FTEs per year, Psychology would have at least 3 of them each year by the most conservative metric—percent of student FTE—just to maintain the current (severely understaffed) status in relation to the expected enrollment growth.

Therefore, our overall FTE request is for 9 new faculty lines. The current distribution of Psychology's 7 FTE faculty lines, assuming all current searches are successful, is 3 in Developmental (2 Assistant Professors, 1 Full Professor), 2 in Health (1 Assistant Professor, 1 Full Professor), and 2 in Quantitative (2 Full/Associate Professors). Our plans call for Developmental and Health Psychology to be about equal in size, and Quantitative Psychology to be somewhat smaller. We also wish to staff Psychology with as many tenured faculty as possible to reduce the service workload on our untenured faculty. Therefore, we propose to allocate the 9 new lines as follows, in order of priority:

1. Full Professor in Health Psychology, preferably specializing in child health, cultural influences on health, rural health, or the prevention and treatment of health problems common in the Central Valley such as obesity or poor prenatal care.
2. Assistant Professor in Health Psychology specializing in one of the areas not already hired.
3. Full Professor in Developmental Psychology. The specialty of this hire should be in child and adolescent Development, but otherwise we will seek to hire the best candidate that either complements existing areas (cognitive development, social development), or that introduces new areas such as developmental neuropsychology or personality development.
4. Full Professor in Health Psychology specializing in one of the areas not already hired.
5. Full Professor in Developmental Psychology specializing in one of the areas not already hired.
6. Assistant Professor in Quantitative Psychology specializing in either longitudinal data analysis or multilevel modeling.
7. Assistant Professor in Developmental Psychology specializing in one of the areas not already hired.
8. Assistant Professor in Health Psychology specializing in one of the areas not already hired.
9. Assistant Professor in Quantitative Psychology specializing in one of the areas not already hired.

If the UC administration does not allocate sufficient funds to hire tenured faculty, we would replace the Full Professor lines with lower rank lines. This plan would result in the following allocation of 16 faculty by specialty in Fall 2009 (Full Professor lines in boldface):

Developmental	Health	Quantitative
Chouinard	**Wallander**	**Shadish**
Dunham	Current Search	**Current Search**

Current Search	**Position 1**	Position 6
Position 3	Position 2	Position 9
Position 5	**Position 4**	
Position 7	Position 8	

In subsequent years, Psychology will continue to build these three areas in a manner consistent with the above description, keeping parity between Developmental and Health, with Quantitative having half to two-thirds as many faculty as the larger areas, and ensuring that each area has sufficient faculty to offer doctoral level training in its area. We may choose to cap the size of some areas if lack of student demand suggests doing so; or we may add an area (e.g., social, physiological) if faculty interests move in that direction. However, we assume that the growth of Psychology will slow over time as other majors come on line. We can estimate the eventual size of Psychology as likely to be about 40-45 ladder rank faculty, to judge from the average size of Psychology faculties at other UC academic campuses (estimated from web site directories, the number of ladder rank faculty in Psychology are approximately: UC Berkeley 45; UC Davis 45; UC Irvine 54; UCLA 68; UC Riverside 30; UC San Diego 32; UC Santa Barbara 35; UC Santa Cruz 30).

9.2. Space

Psychologists require one office per faculty member, and laboratory space. Quantitative psychology is probably the least space intensive area, where an allocation of 200-300 square feet of lab space per faculty member will suffice. Health and Developmental are more space intensive, requiring 450-600 square feet of lab space. However, these are averages, and space needs vary within areas. Needs are larger for faculty with active grant funding; and some health and developmental psychologists have fewer space needs. We have been assured by the administration that sufficient space for these labs will be available on campus.

Therefore, for the four *current* Psychology faculty, about 1500-2100 square feet of lab space is needed on campus. If all three current searches are successful, an additional 1100-1500 square feet will be needed by Fall 2008. If Psychology were to be allocated the new lines requested, estimated space needs for those hires in Fall 2009 would be:

1. Full Professor in Health Psychology: 450-600 square feet.
2. Assistant Professor in Health Psychology: 450-600 square feet.
3. Full Professor in Developmental Psychology: 450-600 square feet.
4. Full Professor in Health Psychology: 450-600 square feet.
5. Full Professor in Developmental Psychology: 450-600 square feet.
6. Assistant Professor in Quantitative Psychology: 200-300 square feet.
7. Assistant Professor in Developmental Psychology: 450-600 square feet.
8. Assistant Professor in Health Psychology: 450-600 square feet.
9. Assistant Professor in Quantitative Psychology: 200-300 square feet.

Thus, total space needs for existing and planned hires by Fall 2009 would be approximately 6000-8500 square feet of laboratory space. This is in addition to one office per faculty member. This is only an estimate. In particular, our hiring experience so far is that the Full Professors we interview tend to have large lab spaces at their current universities in part due to having substantial active grants.

We have acquainted the faculty we have interviewed with the shortage of space in SSHA and on campus generally; but conveyed the assurance of the administration that adequate space will be available on campus. In the worst case that adequate space is not available until the new building opens in 2010-11, these faculty have expressed a willingness to work with reduced laboratory space until that time. However, assuming continued growth of Psychology, it is also likely that available laboratory space in

the new building will be quickly consumed. Therefore, we believe that UC Merced capital planning may need to consider proposing a dedicated Psychology building (perhaps shared with Cognitive Science). That building should be planned to meet the office and laboratory needs of at least 45 faculty, and perhaps as many as 60 or more if cognitive science is included. That building could house other disciplines initially, moving them out as Psychology continues to grow to its mature status. The building would probably need about 25,000 to 35,000 square feet of laboratory space.

9.3. Finances

Psychology has the following financial needs:

1. The Psychology Section relies on the resources of the SSHA Dean's office for support staff. This can only continue for a year or two, but as the size of Psychology grows, a dedicated Psychology staff allocation will be needed.
2. Psychology has been allocated the equivalent of two FTE Lecturers this academic year. The need for Lecturers would decrease proportionate to the number of FTE ladder rank faculty allocated to Psychology. However, if UC Merced wishes to maximize its student FTE enrollment, allocation of Lecturers to Psychology may continue be in the University's interests. This should be judged on a semester by semester basis as enrollment caps in different courses and disciplines are apparent.
3. Psychology requires an allocation of teaching assistantships commensurate to its enrollment.

Although these financial needs are funded mostly by the university, Psychology strongly encourages its faculty to obtain extramural grant funding to help meet these needs. Active grants currently include:

1. Shadish, W.R. (Principal Investigator). "Meta-Analysis of Single-Subject Designs". Department of Education, Institute for Educational Sciences, $598,744 total costs (2005-8).
2. Shadish, W.R. (Consultant). "Three Workshops on Quasi-Experimental Design and Analysis", Spencer Foundation, $181,851 total costs (2007-8). Tom Cook, Northwestern University, Principal Investigator.
3. Shadish, W.R. (Consultant). "Improving Better Quasi-Experimental Practice", Institute for Educational Sciences, U.S. Department of Education. $787,612 total costs (2007-2010). Tom Cook, Northwestern University, Principal Investigator.
4. Wallander, J.L. (Co-Investigator). "Brain Research to Ameliorate Impaired Neurodevelopment-Home-based Intervention, " NICHD/NIH. $2,375,000 total costs (2006-20011). Wally Carlo, University of Alabama at Birmingham, Principal Investigator.
5. Wallander, J.L. (Consultant). "Healthy Passages: A longitudinal, community-based study of adolescent health," Centers for Disease Control, $31,000,000 (thus far; renewed yearly with appx. $4,500,000) (1999-open ended). Frank Franklin, University of Alabama at Birmingham, Principal Investigator.

Pending grants include

1. Dunham, Y. (Principal Investigator). "Minimal Groups and the Development of Social Category Knowledge". National Science Foundation, $497,666.
2. Wallander, J.L. (Principal Investigator). "*Longitudinal cohort study of religiosity and health risk behaviors in adolescence"*. NICHD/NIH, $3,882,022 total costs.
3. Wallander, J.L. (Consultant). "*Psychological Tests and Assessment Online Resource."* NICHD/NIH, $750,000 total costs, Tamara Kuhn, Sociometrcis, Principal Investigator.
4. Wallander, J.L., (Consultant). "Promoting Use of Effective Early Intervention Programs." , NICHD/NIH, $745,243 total costs. Holly Kreider, Socimetrics, Principal Investigator.
5. Wallander, J.L. (Consultant). "Effective Treatments for Children's Disruptive Disorders." NIMH/NIH, $666,805 total costs. Holly Kreider, Socimetrics, Principal Investigator.

These grants are particularly helpful to support graduate students in research assistantships.

10. Summary of requests for new resources.

In summary, the Psychology Section requests the following new resources:

7. In order to remedy the current dramatic understaffing of Psychology proportional to its student FTE credit hour production, we request a special allocation by the Provost of 6 new FTE faculty lines, taken prior to the distribution of FTEs to the Schools so as not to unduly penalize SSHA.
8. In order to reflect normal student FTE credit hours generated by Psychology, we request an additional 3 FTE faculty lines for Fall 2009.
9. We request 7 faculty offices plus 2500-3500 square feet of laboratory space for Fall 2008, assuming that the three current searches are successful.
10. We request 16 faculty offices plus a total 6000-8500 square feet of laboratory space for Fall 2009 to accommodate the needs of the current faculty, those hired in Fall 2008, and the new allocation of faculty lines requested in 1 and 2 above. Space is requested at an average of 400-550 square feet per faculty member.
11. We request continued allocation of Lecturer funds, the amount depending on the allocation of new faculty lines to Psychology.
12. We request an allocation of teaching assistant slots proportional to Psychology student credit hour production.

APPENDIX D: THE WRITING PROGRAM

Plan 2008-2009

The Writing Program is staffed by Non-Senate Faculty (NSF) lecturers whose employment is directly tied to undergraduate enrollment. In most respects, our hiring plans are contingent on freshman enrollment in required first-year courses (WRI 1, WRI 10, and Core 1 discussion sections). Increasingly, we must also align projected enrollment in upper-division writing courses with the need for additional hires. For instance, the Writing Program offers 10 sections of WRI 116 (Science Writing in the Natural Sciences) as the main option available to NS students who must fulfill a School requirement in communication. For Spring semester 2008 we are also staffing 10 sections of other upper-division writing courses (WRI 100, 117, 118, 119) as an alternative to Core 100, a required general education course that is not being offered at this time. We anticipate a similar responsibility for staffing Core 100 "equivalent" courses next year (AY2008-2009). Moreover, we have strong enrollment each semester for courses that fulfill the minor in writing.

Currently, the Writing Program employs the equivalent of 25 full-time NSF lecturers (equivalency is based on total number of sections taught by full-time and part-time hires). Next academic year, AY2008-2009, we will need to staff an additional 20% of writing courses to remain steady-state. That increase reflects the adjusted teaching load for writing lecturers in the UC system next academic year that will be reduced from six courses annually to five courses annually. Thus, in a steady-state projection of current hiring needs, we will be requesting a minimum of five more full-time positions, bringing the total number of full-time equivalent Writing Program lecturers to 30.

Those 30 NSF lecturers teach one/third of all courses taken by freshmen their first year. They also currently teach nearly all upper-division requirements for general education, requirements that must be offered in order for students to graduate in four years. In all, the Writing Program annually staffs about 130 – 140 sections of undergraduate courses, generating more than 55% of all FTE for Humanities and World Cultures. This percentage does not include FTE from approximately 40 sections of Core 1 that is also assigned to the Writing Program.

We are also requesting two more NSF appointments to staff a pending writing requirement in psychology (WRI 101) and a pending general education requirement for engineering majors (WRI 102).

Staffing Requests for AY 2008-2009:

1. 32 full-time NSF appointments or approximately $1,440,000 in salary allocations (not including benefits). Specific staffing needs are shown below:

WRI 1: 35-40 sections (700-800 students; about 67% failure rate for the AWPE and about 10% failure rate in Fall semester sections of WRI 1)
WRI 10: 35-40 sections (700-800 students, including those from AY 2007-2008 who deferred taking this course until their sophomore year, as is the policy in the School of Engineering)
WRI 252-3 sections
WRI 301-2 sections
WRI 100 6 sections
WRI 101 (pending) 5 sections [for psychology majors]
WRI 102 (pending) 5 sections [for engineering majors]
WRI 105 2 section

WRI 110	2 sections
WRI 112	(pending) 1 section
WRI 114	(pending) 1 section
WRI 116	10-12 sections
WRI 117	6 sections
WRI 118	1-2 sections
WRI 119	1-2 sections
Core 1:	40 sections (800 students; including about 60-80 who could not take this course their freshman year)
USTU 10	(pending) 1 section
EDUC 10	(pending) 1 section

2. Given the size and complexity of the Writing Program, I am requesting the appointment of a second Assistant Director who will assume responsibility for supervising general education courses (Core 1) and upper-division writing courses (WRI 100, 101 pending, 102 pending, 112 pending, 114 pending, 115, 116, 117, 118, 119, 125, 130, and 131).