Self-Review Report on the General Education Curriculum
Foundations of Scientific Inquiry

Submitted to the Undergraduate Council, Academic Senate
by the General Education Governance Committee
November 2006

UCLA MEMORANDUM

General Education
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November 14, 2006

To: Professor Raymond L. Knapp, Chair
General Education Governance Committee

From: Professor Raymond V. Ingersoll, Chair
Scientific Inquiry Ad Hoc Review Committee

Re: Scientific Inquiry *Ad Hoc* Review Committee's Self-review Report

I am forwarding to you copies of the Scientific Inquiry (SI) *Ad Hoc* Review Committee's self-review report on UCLA's *Foundations of Scientific Inquiry* General Education (GE) curriculum. This report was prepared by members of the General Education administrative team in consultation with me and the other faculty members of the *ad hoc* committee. Information in the report on GE course requirements, departmental offerings, faculty engagement, and student enrollment patterns was provided by the offices of Undergraduate Education Initiatives, the Registrar, and College Academic Counseling.

The *Ad Hoc* SI Review Committee met throughout the winter, spring and summer of 2006, and explored diverse questions and issues relating to the pedagogical aims, course quality, instruction, and student enrollments of the SI foundation area. The attached self-review report summarizes the findings of the committee on these matters. The report is divided into five sections that are designed to provide the reader with information about the SI *Ad Hoc* Committee and its charge; the history of UCLA's GE reform effort, and development of its life and physical science GE foundation area; data on campus-wide SI requirements and course offerings; faculty involvement, and student enrollments; the committee's review of SI curriculum and pedagogy; and recommendations for the further improvement of natural science GE at UCLA.

I trust that this report will be reviewed and endorsed by the GE Governance Committee and forwarded to the Undergraduate Council as it begins work on the second stage of the Academic Senate review process of the SI curriculum. Please feel free to contact me, should you or any of the members of GE Governance and the UgC have questions about the *Ad Hoc* Committee's report.

cc: Vice Provost Judith L. Smith

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Preface

Over the last ten years, all UCLA units responsible for undergraduate education have worked collaboratively to establish a common campus-wide General Education (GE) curriculum and course list based on three foundation areas of knowledge: *Arts and Humanities*, *Society and Culture*, and *Scientific Inquiry*. A General Education Governance Committee was established in 1998-99 to oversee the development of a new GE curriculum and to provide ongoing monitoring, evaluation and improvement of the courses within it. To further maintain and strengthen the quality of UCLA's general-education program, the Vice Provost (VP) for Undergraduate Education and the Undergraduate Council (UgC) worked closely with the GE Governance Committee in 2005-06 to establish a process for the systematic review of the course offerings in each of the new foundation areas of knowledge. As with departments, these GE curricular reviews were slated to take two years to complete and involve a period of self review, as well as a site visit by campus and extramural scholars.

The following self-review report, which has been endorsed by the GE Governance Committee, summarizes the findings of the Scientific Inquiry *Ad Hoc* Review Committee. The report is divided into five sections that are designed to provide the reader with 1) information about the SI *Ad Hoc* Committee and its charge, 2) the history of UCLA's general-education reform effort, and the development of its *Scientific Inquiry* GE foundation area, 3) data on campus-wide SI requirements, course offerings, faculty involvement, and student enrollments, 4) the committee's review of SI curriculum and pedagogy, and 5) recommendations for the further improvement of science GE at UCLA.

The Scientific Inquiry *Ad Hoc* Review Committee and Its Charge

Ad Hoc Committee Membership

In early 2006, the General Education Governance Committee approved the formation of a Scientific Inquiry *Ad Hoc* Review Committee for the purpose of conducting a self-review of the curriculum of the *Scientific Inquiry* GE foundation area. This committee was jointly appointed by the Chair of the GE Governance Committee, Raymond Knapp, and the Vice Provost for Undergraduate Education, Judith L. Smith, and its membership was composed of faculty representatives from the School of Engineering and the natural and social sciences divisions of the College of Letters and Science. The head of the faculty workgroup that reviewed and certified course offerings for the SI curriculum in 2002, Professor Raymond ("Ray") Ingersoll of Earth and Space Sciences served as chair of the *ad hoc* committee. Another member of the 2002 SI workgroup, Professor Sally Gibbons of the Freshman Cluster Program and the Center for Society and Genetics, provided resource support for Ray and played a key role in the preparation of the committee's final report. Further support was provided to the *ad hoc* committee by administrative staff from the GE Governance Committee, the Undergraduate Education Initiatives unit, the Registrar's Office, and College Academic Counseling.

The members of the SI *Ad Hoc* Review Committee and their departmental affiliations are listed below:

- Raymond Ingersoll, Chair (Department of Earth and Space Sciences; Chair of the 2002 workgroup reviewing and recertifying courses for the new *Foundations of Scientific Inquiry* GE)
- Sally Gibbons, Resource Support (Freshman Cluster Program/Society and Genetics; Member of the 2002 workgroup reviewing and recertifying courses for the new *Foundations of Scientific Inquiry* GE)
- Asad Abidi (Department of Electrical Engineering and UgC member 2003-06)
- Robert Fovell (Department of Atmospheric & Oceanic Sciences and member of the 2002 workgroup reviewing and recertifying courses for the new *Foundations of Scientific Inquiry* GE)
- Gail Kennedy (Department of Anthropology)
- Carla Koehler (Department of Chemistry and Biochemistry)
- Jan De Leeuw (Department of Statistics; GE Governance Committee member)

- Mark Morris (Department of Astronomy & Physics; Chair of the faculty-student workgroup that issued the *Proposal for Change* in 1996)
- Theodore Porter (Department of History)
- Ralph Robinson (Department of Microbiology, Immunology and Molecular Genetics)

The Ad Hoc Committee Charge

The *ad hoc* committee was charged by the Vice Provost for Undergraduate Education and the General Education Governance Committee to address a wide range of quantitative and qualitative questions and issues relating to the Foundations of Scientific Inquiry GE curriculum (See Appendix A). Among these were the following:

Pedagogical Issues

The mission statement that was adopted in 2002 for courses carrying GE credit in the *Foundations of Scientific Inquiry* area of knowledge stipulated that the aim of these course offerings was:

> *To ensure that students gain a fundamental understanding of how scientists formulate and answer questions about the operation of both the physical and biological world. These courses also deal with some of the most important issues, developments, and methodologies in contemporary science, addressing such topics as the origin of the universe, environmental degradation, and the decoding of the human genome. Through lectures, laboratory experiences, writing, and intensive discussions students consider the important roles played by the laws of physics and chemistry in society, biology, earth and environmental sciences, and astrophysics and cosmology.*

In light of these aims, the *ad hoc* review committee was asked to review SI courses with the following pedagogical questions in mind:

- Do the current Scientific Inquiry GE courses provide non-science students with a satisfactory introduction to "the most important issues, developments, and methodologies in contemporary science?" Are there other ways of organizing and/or "packaging" these courses so as to insure that their students are able to engage contemporary scientific issues in some depth?
- Are there important scientific topics that are not being addressed by the existing courses in the Scientific Inquiry area, and, if so, how can this situation be rectified by the Physical and Life Sciences?
- Do our existing Scientific Inquiry GE courses provide UCLA students with adequate "laboratory experiences, writing, and intensive discussions" that are capable of conveying to non-science students how scientists discover, create, and evaluate new knowledge in their areas of research?

Departmental Course Offerings

Another key aim of the SI self-review was to determine if UCLA's GE science courses have been conducted in a manner that is consistent with the course proposals that were submitted and approved by the GE Governance Committee and the UgC in 2002 and thereafter. Specifically, the committee was asked to determine if the sponsoring departments or programs have:

- Offered their courses on a regular basis and met projected student enrollment targets;
- Introduced the students taking these courses to the ideas, methods and work of departmental faculty and senior graduate students;
- Provided students with syllabi that describe course subject matter and objectives; outline weekly lecture topics, labs, experiential opportunities, and assignments; include a reading list; and provide some description of the course's grading policy; and
- Insured that their courses continue to achieve their designated general-education aims.

Student Engagement

The committee was also asked to address a number of questions regarding student engagement in the courses that are offered to satisfy general-education requirements in Scientific Inquiry. These were:

- How and when are non-science students satisfying their GE requirements in the Life and Physical Sciences?
- What are the enrollment patterns in the courses that are offered in the Foundations of Scientific Inquiry?
- Are certain classes in Scientific Inquiry over or undersubscribed, and, if so, why is this happening?
- How do non-science students rate the introduction they are receiving through their SI GE courses to important issues, developments, and methodologies in contemporary science?

Historical Background

A Brief History of General Education Reform at UCLA

In 1994, a faculty-student workgroup was organized to examine the General Education curriculum at UCLA. After two years of intensive research and discussion, this group issued a report in June 1997 entitled *General Education at UCLA: A Proposal for Change*. This document called for GE requirements that were "simpler, fewer, more coherent, and clearer in purpose;" a common campus-wide GE curriculum and course list; first year clusters; and a permanent GE oversight authority.

In 1996, Judith L. Smith was appointed Vice Provost (VP) for Undergraduate Education and given authority over general education at UCLA. Vice Provost Smith received permanent money to support curricular initiatives aimed at improving GE from Chancellor Charles E. Young in 1997, and worked with university administrators, Deans, faculty, and Academic Senate committees throughout 1997-98 to draft and implement plans for GE reform. In 1998-99, Vice Provost Smith launched a pilot GE Cluster Program with the aim of developing ten clusters over five years to enroll up to 45% of the incoming freshman class. During the same academic year, UCLA's Undergraduate Council established a GE Governance Committee jointly appointed by the Chair of UgC and the VP for Undergraduate Education.

UCLA's new GE Governance Committee worked with the VP for Undergraduate Education and her staff during the summer and fall of 1998 to develop a proposal for a common campus-wide GE curriculum and course list that would provide lower division students with an ample spectrum of learning in the natural and social sciences, arts, and humanities; introduce them to interdisciplinary approaches to learning; foster responsible citizenship; and strengthen intellectual skills. These deliberations culminated in a formal proposal by the GE Governance Committee in January 2001 to replace the UCLA College's divisional based GE requirements with a 10 course (most with a 5 unit value to reflect the increase in their academic rigor) GE curriculum centered on three foundation areas of knowledge: *Foundations of Arts and Humanities*, *Foundations of Society and Culture*, and *Foundations of Scientific Inquiry*. This GE foundational framework was approved by the College faculty at the end of 2001, and throughout the winter and spring of 2002 three foundation area faculty workgroups evaluated all GE courses, old and new, for certification and inclusion in the new curriculum. This new curriculum was implemented in Fall 2002.

On March 7, 2003, the Undergraduate Council unanimously adopted a proposal by GE Governance for a campus-wide GE framework based on the foundational area of knowledge model with a common GE course list. In 2004, the School of Arts and Architecture and the School of Theater, Film and Television adopted the foundational area framework and course list. The Henry Samueli School of Engineering and Applied Sciences followed suit in the spring of 2005, as did the School of Nursing at the beginning of 2006. As of Fall 2006, all incoming UCLA freshmen will satisfy their GE requirements by taking a requisite number of courses across three foundation areas of knowledge.

2002 Review and Certification of GE Courses in the Foundations of Scientific Inquiry

As noted in the foregoing history of GE reform, throughout the winter and spring of 2002, three faculty workgroups (one associated with each of the three foundation areas) evaluated all GE courses. The workgroup charged with the review of courses submitted for general-education credit in the Foundations of Scientific Inquiry area was guided in its deliberations by the SI foundation mission statement that outlined the pedagogical purpose and goals of UCLA's natural science GE curriculum (See page 2).

The SI workgroup also reviewed proposed SI courses with an eye aimed at determining if their workload merited 4 or 5 units of credit, and if they satisfied one or more principles or aims that the Academic Senate had determined were basic to general education, i.e., familiarizing students with the ways in which scientists create, discover and evaluate knowledge; teaching them to compare and synthesize different disciplinary perspectives; increasing their ethical awareness and cultural sensitivity; and strengthening basic intellectual skills.

The workgroup affirmed that most of the courses that were submitted for inclusion in the *Scientific Inquiry* area were consistent with the SI mission statement and satisfied many of UCLA's general-education goals. There were several issues and questions, however, which arose during the workgroup's deliberations. These were:

- The place of mathematics and statistics in general education. While members of the workgroup agreed that mathematics and statistics provide essential foundational skills and knowledge required in both the physical and life sciences, they were not agreed that course offerings in these areas constituted actual science courses, i.e., science was primarily used in these classes to illustrate math and statistics problems and methods rather than being the focus of the course.
- The need for a separate and stronger Quantitative Reasoning GE requirement.
- The role of rigorous science courses offered as preparation for science majors (e.g., courses in the Life Science Core and most lower-division physics and chemistry courses) in a GE curriculum aimed at non-science majors.

With regard to these issues, the workgroup concluded that:

- Mathematics and statistics courses should not count as GE courses unless they fulfilled the expectations outlined for science courses in the mission statement of the SI foundation area of knowledge.
- The Academic Senate should consider developing a new and more rigorous quantitative reasoning requirement either inside or outside of general education; and
- Pre-major SI foundation courses, such as introductory chemistry, physics and life sciences classes, could carry GE credit because they do familiarize their students with the ways in which scientists discover and evaluate knowledge in their field and they also advance several GE aims, e.g., the development of critical thinking, problem solving, and general knowledge.

For more information on the work of the 2002 Foundations of Scientific Inquiry Workgroup, see Appendix B.

Periodic Review of the General Education Curriculum

At the recommendation of the Vice Provost, the GE Governance Committee and the UgC agreed that there should be some system of periodic programmatic review of the new GE foundation areas. Consequently, in 2002, the UgC approved a proposal by Vice Provost Smith for an eight-year systematic rotation of reviews for several non-departmental programs that report to her, including General Education. Under this proposal, and according to modifications approved in Spring 2006, Vice Provost Smith's staff is slated to work with the GE Governance Committee to conduct a self-review of the three foundation areas over a six-year period as follows:

Table 1. Foundation Area Review Schedule – 2005-06 through 2010-11

Year	Scientific Inquiry	Society and Culture	Arts and Humanities
2005-06	Self-Review		
2006-07	UgC Review		
2007-08		Self-Review	
2008-09		UgC Review	
2009-10			Self-Review
2010-11			UgC Review

The self-review for the *Foundations of Scientific Inquiry* is the first internal review of UCLA's GE curriculum, and it will be followed by a full external review administered by the Undergraduate Council. Both the GE Governance Committee and the UgC see this review of the *Scientific Inquiry* foundation area as a pilot aimed at both identifying the challenges attendant on non-departmental curricular reviews and further refining this curricular review process.

Scientific Inquiry Requirements, Course Offerings, Faculty Engagement, and Student Enrollments

The charge of the *ad hoc* review committee was to provide the Academic Senate with information pertaining to the current state of the *Foundations of Scientific Inquiry* area of UCLA's GE curriculum. Meeting this charge involved addressing a range of quantitative questions about course offerings, faculty engagement, and student enrollments, and qualitative concerns relating to whether or not current SI courses are providing students with a satisfactory introduction to "the most important issues, developments, and methodologies in contemporary science." Detailed in this section is information pertaining to SI requirements across campus; the number of courses carrying SI GE credit and the departments mounting them; the levels of faculty engagement in these classes; and student enrollments in Scientific Inquiry course offerings. Data for this section were provided by the Undergraduate Education Initiatives unit, the Registrar, and the College Academic Counseling Office.

Requirements for Students in Different Academic Units

All UCLA students are required to take *Foundations of Scientific Inquiry* courses, and they select their courses from the course list approved by the GE Governance Committee in two subfields, Life Sciences and Physical Sciences. The number of required courses, however, is not the same, and Table 2 sets out the requirements of each academic unit with an undergraduate population.

Table 2. Course Requirements for Scientific Inquiry by Academic Unit

College/School	Subgroups	Requirement	Effective Date
UCLA College	Life Sciences Physical Sciences	Four courses, two courses from each subgroup. One 5-unit course from each subgroup must include a lab or demonstration or carry Writing II credit. Each of the other two courses may be a 4- unit course.	Fall 2002
School of the Arts and Architecture	Life Sciences Physical Sciences	Two courses from either subgroup. If both courses are selected from the same subgroup, they must be from different departments. No requirement for lab or demonstration course.	Fall 2004
School of Theater, Film and Television	Life Sciences Physical Sciences	Two courses (8 units minimum), one from each subgroup; no requirement for lab or demonstration course.	Fall 2004
Henry Samueli School of Engineering and Applied Science	Life Sciences Physical Sciences	One course (4 units) chosen from the Life Sciences subgroup course list supplemented with additional choices* Note*: Physical science is automatically fulfilled by pre-major requirements for physics*.	Fall 2005
School of Nursing	Life Sciences Physical Sciences	Four courses, two courses from each subgroup; no requirement for lab or demonstration course.	Fall 2006

* Additional choices include: Biomedical Engineering CM145/Chemical and Bio-molecular Engineering CM145, Chemistry and Biochemistry 153A, and Civil and Environmental Engineering M166/Environmental Health Sciences M166.

Beyond utilizing a shared course list, GE science requirements across undergraduate units have a number of other similarities:

- Only students entering UCLA as freshmen must fulfill the GE requirements; transfer students fulfill different requirements set by the statewide Intersegmental General Education Transfer Curriculum (IGETC) requirements.
- AP courses cannot be used as a substitute or "course equivalent" for any GE science course.
- UCLA students may take a science course at a community college during the summer (or when they are not enrolled at UCLA) and the class taken can be used to fulfill UCLA's GE SI requirements if it has been approved as equivalent to a UCLA physical or life science course.
- Because they are regarded as foundational courses, most GE course offerings are lower division and are intended for students in their freshman and sophomore years.

Curriculum Data: Courses, Faculty, and Student Enrollment

Courses

As of the completion of this self-review, 95 courses have been approved as general-education courses in the *Foundations of Scientific Inquiry* area. These courses are summarized by academic unit in Table 3, and a detailed list of these courses is provided in Appendix C. The data in Table 3 reveal the following:

- Sixteen different departments (includes one IDP) and 3 lower division programs offer courses approved for GE credit in the *Foundations of Scientific Inquiry*;
- 42 are approved as life science courses and 46 as physical science courses; in addition, 7 are approved as *either* life *or* physical science courses, depending on the students' choice;
- 13 life science and 22 physical science courses include laboratory or demonstration components.
- 18 life science and 12 physical science courses are designed primarily for non-science students, are not listed as "preparation" for any science major, and do not include laboratory or demonstration components.

- Four departments, two in the Division of Humanities (Linguistics and Philosophy), and two in the Division of Social Sciences (Anthropology and Geography) offer courses approved for GE credit in the *Foundations of Scientific Inquiry*.

The six life science departments (see yellow highlights in Table 3) do not have listings for "Pre-Major Courses" because all of the preparation courses for life science majors are taught through the Life Science Core, an innovative interdepartmental unit. All Life Science departments offer general science courses; most are 4 units, with no laboratory or demonstration component. The six Physical Science departments offer both foundational courses for science and non-science majors.

Table 3. Number of Approved Courses by Program or Department for the Life and Physical Sciences, 2002-05*

Program or Department	General Courses			General w Lab/Dem			Pre-Major Courses			Pre-Major w/ Lab/Dem			Totals		
Programs offering courses															
	LS	**PS**	**Both**	**LS**	**PS**	**Both**	**LS**	**PS**	**Both**	**LS**	**PS**	**Both**	**LS**	**PS**	**Both**
Freshman Clusters	3	1		3	2								6	3	
Honors Collegium	3	2		1									4	2	
CUTF	3	3											3	3	
Subtotal	**9**	**6**		**4**	**2**								**13**	**8**	
Departments offering courses															
A&O Science		1						3			3			7	
Anthropology							2						2		
Astronomy		3	1	1			2						6		1
Chem/Biochem								7			2			9	
E&S Science		2				1	1	3	1	1	2	1	2	7	3
EE Biology	4												4		
Geography										1	1	1	1	1	1
Life Sci Core							1			2			3		
Linguistics							1						1		
MCD Biology	2			1									3		
MIMG	2												2		
Neuroscience	1												1		
Philosophy								1						1	
Physiological Science	1			2									3		
Physics								1			12			13	
Psychology	1												1		
Statistics									2						2
Subtotal	**9**	**6**	**1**	**4**	**2**	**1**	**8**	**15**	**3**	**5**	**20**	**2**	**29**	**38**	**7**
Grand Total	**18**	**12**	**1**	**8**	**5**	**1**	**8**	**15**	**3**	**5**	**20**	**2**	**42**	**46**	**7**
TOTAL NUMBER OF COURSES (Life and Physical Sciences)													**95**		

* See Appendix C for a detailed list of courses.

Life Science departments are highlighted in yellow; these departments typically do not teach preparation courses for pre-majors, as all the pre-major life science courses are offered via the Life Science Core (see text).

Physical Science departments are highlighted in green.

Course Offerings and Their Instructors

During the academic year, *Foundations of Scientific Inquiry* courses are taught by either tenure-track faculty or by lecturers and teaching fellows. Table 4 shows the number of courses offered by departments over the last four years and the percentage of those courses taught by faculty members (For additional information on faculty engagement in SI courses, see Appendix D). Of the 440 courses offered in the last four years, 216 were aimed at non-science students and 224 were preparatory courses for science majors. Of the total, ladder faculty taught 67% of these courses, and, when divided by course type, ladder faculty taught more of the pre-major science courses (70%) than those aimed at non-science majors (64%).

Table 4. Total Course Offerings in the Past Four Years; Percentage Taught by Ladder Faculty: 2002-06

Program or Department	General Science Courses		Pre-Major Science Courses	
	Total Offerings	Percent by Ladder Faculty	Total Offerings	Percent by Ladder Faculty
A&O Science	52	30 (58%)	4	4 (100%)
Anthropology	11	10 (91%)	-	-
Astronomy	30	27 (90%)	2	2 (100%)
Chem/Biochem	2	0 (0%)	38	15 (40%)
E&S Science	6	2 (33%)	39	30 (77%)
EE Biology	7	7 (100%)	-	-
Freshman Clusters (F, W)	32	26 (81%)	-	-
Life Sci Core	10	2 (20%)	20	15 (75%)
Geography	-	-	21	17 (81%)
Linguistics	-	-	10	10 (100%)
MCD Biology	20	6 (30%)	-	-
MIMG	10	4 (40%)	-	-
Neuroscience	1	1 (100%)	-	-
Philosophy	5	4 (80%)	-	-
Physiological Science	10	4 (40%)	-	-
Physics	10	10 (100%)	77	57 (74%)
Psychology	10	6 (60%)	-	-
Statistics	-	-	13	7 (54%)
Total (Average)	**216**	**139 (64%)**	**224**	**157 (70%)**

During UCLA's summer session, Foundations of Scientific Inquiry courses are also taught by ladder and non-ladder faculty. In the past three summers, the percentage of courses taught by ladder faculty has increased from 10% to 25%. Since Summer Sessions is now counted towards workload, it is expected that this percentage will continue to increase with the hope that the percentage will be more similar to that during the academic year. This may be difficult to achieve as many science faculty are fully paid on grant funds and cannot teach.

Student Enrollment

During the first four years of the new general-education curriculum, total student enrollment in the Foundations of Scientific Inquiry courses averaged around 30,000. Of this enrollment, 25% of the students taking the courses were listed as "undeclared", 33% were students working toward a B.A. in the Arts, Humanities, or Social Sciences, and 42% were science students working toward a B.S. These data are summarized in Figure 1.

These percentages differed slightly during the summer session offerings of the same classes. Forty percent of summer session students were B.S. candidates, 23% were working towards a B.A., and 11% were undeclared. Twenty-six percent of these summer session enrollees were non-UCLA students.

Figure 1. Total enrollment in GE Science Classes (Academic Year)

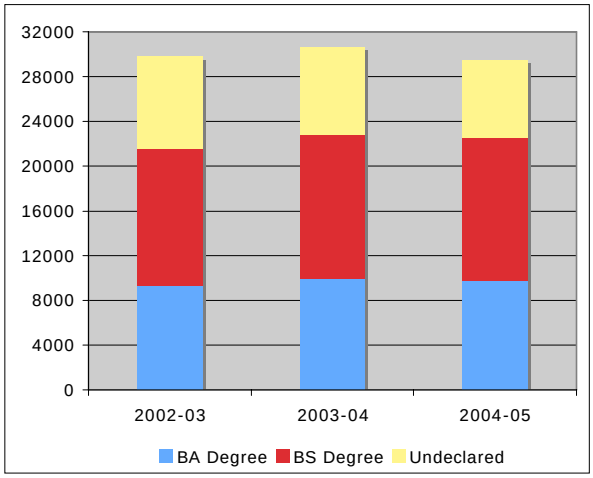
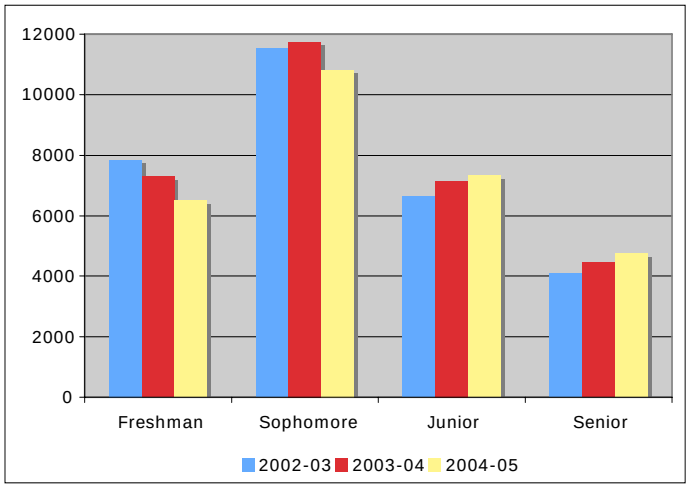


Figure 2. Enrollment in GE Science Classes by Student's Class Standing (Academic Year)



As noted before, all *Foundations of Scientific Inquiry* courses are lower division offerings, and students are expected to complete them during their freshman and sophomore years. When the enrollments in these courses are summarized by class standing, the data reveal that many students take these courses during their junior and senior years (Figure 2). Of the total enrollment (30,000 students) during the academic year, approximately 19,000 (63%) are lower division students. During the summer, these courses are populated more by upper division UCLA students (63%) than lower division UCLA students (33%).

The Summer Sessions data currently available do not allow us to separate, B.S. students from B.A. students. However, since B.S. students must complete most of their introductory science courses before entering the major (which most do at the beginning of their junior year), it is safe to guess that most of the upper-division students taking *Foundations of Scientific Inquiry* course are non-science students.

To determine the courses that non-science majors took most frequently, we revised the percent of students in each class that were working toward a Bachelor's of Science (B.S.) degree and a Bachelor's of Arts (B.A.) degree. In Table 5, we list the 11 general-science courses that had enrollments greater than 2,000 (over four years). Astronomy 3 enrolled 3,844 students; only 11% were B.S. students. A complete listing of the enrollment by course is posted in Appendix E.

Table 5. General Education Science Courses with Enrollment Greater than 2,000: Fall 2002 to Fall 2005*

Department and Course Number ***Course title***	**Total enrollment**	**B.S. students % of total**	**Average class size**	**% taught by ladder faculty**
Astronomy 3 *Nature of the Universe*	3844	11%	384	50%
Physiological Science 5 *Diet and Exercise*	3836	18%	284	40%
Statistics 10 *Statistical Reasoning*	3570	23%	357	70%
MCD Biology 40 *Aids & Sexual Transmit Diseases*	3520	27%	352	0%
Linguistics 1 *Intro to the Study of Language*	3140	24%	314	100%
Anthropology 7 *Human Evolution*	3060	15%	340	85%
Atmospheric & Oceanic Sci 2 *Air Pollution*	2870	10%	287	60%
MCD Biology 30 *Biology of Cancer*	2275	31%	284	85%
Earth and Space Sciences 15 *Intro to Oceanography*	2223	19%	318	90%
Psychology 15 *Intro to Psychobiology*	2125	26%	212	60%
Physics 10 *Intro to Physics*	2008	9%	201	100%

*Courses highlighted in blue have a lab or demo component.

The percentage of science students taking the 11 general science courses listed in Table 5 varies from a low of 9% (Physics 10) to 31% (Biology of Cancer). By and large, the generalist GE life science courses have a higher percentage of B.S. students enrolled than the general GE physical science courses. One possible explanation for this is that most Physical Science undergraduates (B.S. students), except Biochemistry majors, do not have any requirements for life science courses associated with their majors. These students appear to fulfill their Life Science GE requirements by taking general courses, such as Biology of Cancer, Psychobiology, etc). On the other hand, all Life Science students must take pre-major courses in the physical sciences (chemistry and physics); thus, they will be less likely to take additional general physical science courses, such as Astronomy and Air Pollution. As a result, the population of B.S. students in general physical science GE courses (such as Air Pollution, etc) is low.

Table 5 also shows three courses that are most often taken by B.A. students who must complete a course in the life and physical sciences that has a lab or demo component. Astronomy 3 and Physiological Science 5 are the most popular courses, with Earth and Space Sciences 15 also making a strong showing.

None of the courses listed in Table 5 are required for students majoring in life or physical science. Life science students and pre-medical students (regardless of their UCLA majors) will satisfy all of the *Foundations of Scientific Inquiry* requirements by completing preparatory courses in the life sciences, chemistry and/or physics. With the exception of Biochemistry majors, most physical science students usually have no preparation requirements in life sciences, and must satisfy these requirements by enrolling in GE courses aimed at non-science majors. This probably explains why some of the popular life science courses for non-science majors such as Molecular, Cellular, and Developmental Biology 30 and 40, as well as Psychology 15, have more B.S. students than many of the popular physical science courses such as Astronomy 3 and Atmospheric and Oceanic Sciences 2.

Profiles of course selection made by 17 seniors (2005) are posted in Appendix F. A few points are worth noting about this student enrollment information. Geography majors complete their life science

requirement by taking Geography 2 (lab/demo) and Geography 5. Freshmen who complete a cluster sequence may complete up to three of their four requirements for *Foundations of Scientific Inquiry* by enrolling in one of the freshman clusters offering life and/or physical science GE credit, i.e., 70ABCW *Evolution of the Cosmos and Life*, M1ABCW *The Global Environment*, 71ABCW *Biotechnology and Society*, or 80ABCW *Frontiers of Human Aging*. Taken together, these four clusters provided general-education credit for nearly 1,800 freshman, or about 45% of the entering class over the past four years.

Scientific Inquiry Curricular Review

Following its review of *Scientific Inquiry* course requirements, offerings, faculty engagement, and student enrollments, the *ad hoc* review committee addressed the issue of whether or not courses in this foundation area were being taught in a manner that was consistent with the course proposals that were submitted and certified for GE credit in 2002. This involved a series of intensive course and syllabi reviews by members of the committee over the winter and spring quarters of 2006.

Curricular Review Process

Course and Syllabi Reviews

As noted in the previous section, 95 courses are currently approved for GE credit in the *Scientific Inquiry* foundation area. Of these course offerings, the committee decided to look more carefully at a subset of 44 courses. The other 51 courses were eliminated from further consideration because they fell into one or more of the following categories:

- They were required preparation for science majors, rather than GE courses designed for non-majors (e.g., most of the physics and chemistry courses);
- They were new courses, so the committee could not compare them to the original syllabi and course forms approved in the 2002 review and recertification process;
- They have been and will only be offered once or have very small enrollments, e.g., the Collegium University Teaching Fellows (CUTF) seminars, which all bear the course number 98T;
- They are Clusters or Honors courses slated for separate reviews.

Two committee members were assigned to review each of the 44 courses. Assignments were made so that no reviewer reviewed courses in his or her department. Where two courses were linked (e.g., A&O 1 and 1L), the same pair of reviewers reviewed both. Where possible, courses were assigned in fields distant from the reviewers' departments.

Reviewers were asked to answer the following questions during their review of assigned courses:

- Do the originally approved syllabus and the current syllabus describe the same course?
- Do both syllabi satisfy the broad goals of GE courses in this foundational area as described in the mission statement?
- Is the credit assigned to each course appropriate for the workload?
- Do any of these courses warrant a closer review, either because the syllabi do not provide sufficient information to answer the previous questions or because the course raises serious concerns or deserves special attention based on its merits?

During discussion of the 44 courses, several courses were marked as needing further review, when members of the committee believed they either had insufficient information on the syllabi to answer the committee's questions regarding their content and aims, or because of other concerns. A total of 14 courses were identified:

- EE Biology 10
- EE Biology 25
- E&S Science 1
- E&S Science 8
- E&S Science 9
- Chemistry 2
- Geography 1
- Geography 5
- Life Science Core 15
- Linguistics 1
- MCDB 30
- MIMG 12
- Physics 1B
- Physiological Sciences 5

These courses were further reviewed after the relevant departments were contacted and additional information provided. In several cases, courses that had modest syllabi provided significant additional material on their course websites. Only one of these 14 courses (*Physiological Sciences* 5) warranted further review (discussed below).

The three-course in-depth review

In addition to the review of the 44 courses described above, the committee chose to review three courses in much greater depth. These courses were chosen as representative of one of three types of course:

- Physical science courses with a discussion section or lab that had a history of heavy non-science student enrollments;
- Life science courses with a discussion section or lab that had a history of heavy non-science student enrollments; and
- GE courses that were primarily preparation for various science majors.

The courses selected for this further review were Earth & Space Sciences 15 (*Introduction to Oceanography*, 5 units, lab/demo credit), Physiological Sciences 5 (*Issues in Human Physiology: Diet and Exercise*, 5 units, lab/demo credit), and Physics 1B (*Physics for Scientists and Engineers: Oscillations, Waves, Electric and Magnetic Fields*, 5 units, lab/demo credit).

To review these courses, the committee members were divided into small groups and asked to interview the faculty member(s) who normally teach the course. Where feasible, the faculty member also identified a teaching assistant who could discuss the lab component of the course with the committee members. The assignments were as follows:

- *Earth & Space Sciences 15* – Robert Fovell; Mark Morris; Theodore Porter; Department Faculty Representatives – Jon Aurnou and Edwin Schauble;
- *Physiological Science 5* – Jan DeLeeuw; Gail Kennedy; Ralph Robinson; Department Faculty Representative – James Barnard;
- *Physics 1B* – Asad Abidi; Ray Ingersoll; Carla Koehler; Department Faculty Representative – Steve Cowley.

The committee subgroups each met with the instructors of these courses and reported their findings to the full committee.

Curricular Review Findings

Conceptual overview: Three types of GE courses in the Foundations of Scientific Inquiry

The review of the data collected on all GE courses in this foundational area as well as the review of syllabi and the in-depth review of the three individual courses taken together suggest that courses fall into three general categories:

- The so-called “generalist GE” course is geared toward non-science students and conveys to this student population the “how” of knowledge production in the sciences. More specifically, as the mission statement for this foundation area explains, these courses “ensure that students gain a fundamental understanding of how scientists formulate and answer questions about the operation

of both the physical and biological world.…Through lectures, laboratory experiences, writing, and intensive discussions students consider the important roles played by the laws of physics and chemistry, biology, earth and environmental sciences, and astrophysics and cosmology."

Earth & Space Sciences 15, *Introduction to Oceanography* represents one of these "generalist" GE courses. The committee members who reviewed it were impressed with the caliber and thoughtfulness of the instructors, whom they described as enthusiastic and devoted to the course, and its very impressive website. The only aspect of the course that seemed to need improvement was the lab section (labs were described as "stale" and as more illustrative than experimental). The instructors, however, have already formulated ideas to reinvigorate the labs and have submitted a proposal to their department chair to fund this project.

Committee members regularly noted that the Cluster Program's offerings in the sciences best realized the ideal for GE in this foundation area. This is, in part, because Clusters, as interdisciplinary team-taught courses, underscore the way different disciplines approach problems, and thereby help students appreciate the distinctive nature of the scientific enterprise as well as its importance to understanding basic aspects of our world.

- Another common type of GE course in the sciences is the lower-division science course required as preparation for science majors (the so-called "pre-major GE"). Because these courses are not geared toward non-science students and are largely populated by science and engineering majors, they do not fulfill the goal of GE in extending an appreciation of science and scientific method to those who might otherwise avoid, ignore, or even fear it. On the other hand, because these courses clearly give students a "fundamental understanding of how scientists formulate and answer questions about the operation of both the physical and biological world," they meet the main pedagogical aims of the foundational area for those students willing and able to enroll in and appreciate these course offerings.

  In this context, it is interesting to note that Steve Cowley, the instructor for Physics 1B who was interviewed for this review, did not realize that his course even offered GE credit until he was contacted to set up the interview. The committee members who reviewed this course and interviewed Cowley were all impressed with his commitment to the course, including his continual efforts to update and refine it. They also appreciated Cowley's ability to articulate his teaching philosophy for the course and its suitability to the foundation's pedagogical aims. But given the rigorous nature of the course, the committee members and instructor recognized that most non-science majors would be precluded from taking it.

  In some departments (e.g., Chemistry and Biochemistry), the pre-major GE constitutes the only GE or close to the only GE offered. Some departments have sufficient majors that they do not think it necessary to offer GE courses to other student groups. Often they also do not have the resources to offer these additional courses. Some committee members believed that the culture in these larger departments may exhibit a lack of respect for true GE courses and that if that were indeed the case, then faculty teaching those courses would not receive adequate or appropriate recognition for doing so. In any case, this situation contributes to gaps in the GE curriculum for non-science majors.

- The "inadequate GE" course is one that does not successfully meet the criteria outlined in the mission statement. That is, it fails to help students gain a "fundamental understanding of how scientists formulate and answer questions about the operation of both the physical and biological world." This problem can occur because a course overemphasizes the memorization (and perhaps manipulation) of facts with little reflection on how scientists actually come to ascertain these facts, or how hypotheses are formulated and tested. These courses might involve unnecessary busy work or seek more to entertain students than to provide them with an adequate

understanding of the scientific method or of how scientists examine and interpret their data and deal with the inevitable uncertainties they encounter.

Physiological Sciences 5, *Issues in Human Physiology: Diet and Exercise* – another course selected for in-depth review – was deemed to fall into this category. Despite the passion of the instructors and the popularity of the course, committee members noted the absence of attention to scientific method in the course. Overall, it seemed that there was considerable potential for this course, but that opportunities to reinforce the pedagogical aims of courses in scientific inquiry were being missed. The lab was an especially weak component of the course (discussed further below).

Consistency of course offerings since 2002 review and certification

The review of the 44 courses deemed germane to this committee's charge indicated that most of the courses originally certified for the new GE have been taught in a manner consistent with the course proposals that had been submitted and approved in 2002. Only 14 of the 44 courses required scrutiny and of these, only one had significant limitations that the committee thought warranted its being "decertified" (see below). The remainder, on further inspection, turned out to be satisfactory.

Gaps in course offerings

Although the committee did not undertake a systematic analysis of gaps in the GE curriculum in this foundation area, it was noted that departments with many service courses for science majors tend to have few or no "generalist GE" courses. For example, physics and chemistry and biochemistry have several large lower-division courses that offer GE credit, but they have almost no courses geared to the non-science student.[1] The situation in psychology is also notable: this department, despite its large size, has only one four-unit GE course – Psych 15, *Introductory Psychobiology*.

The committee noted that many big departments are contributing to the *Fiat Lux* program, which offers another venue for disseminating insight into science and the scientific method to non-science majors (although students do not get GE credit for enrolling in *Fiat Lux* seminars). The committee recognized that it is easier for faculty to take on a one-unit course as an overload than a four- or five-unit course that, in practice, has to push out one of the department's service classes.

A recent effort by the GE Governance Committee to identify a series of "thematic" GE course lists (See Appendix G) found that students interested in exploring astrobiology, stellar and planetary phenomena, evolution, and environmental questions could select from a reasonably wide range of offerings in the *Scientific Inquiry* foundation area. However, the courses offered in these thematic areas are all taught by relatively small departments (or subfields) – specifically, Anthropology, Astronomy, Atmospheric & Oceanic Sciences, Earth & Space Sciences, Ecology & Evolutionary Biology, Geography and the Life Science Core. Missing from this group are many of the larger departments and subfields, including Psychology, Physics, Chemistry & Biochemistry, Molecular, Cellular, and Developmental Biology and Microbiology, Immunology, and Molecular Genetics. Also missing are relatively new fields that would likely be of interest to students, including genomics and nanotechnology.

Lab/Demo Courses

The committee discerned two problems with GE courses offering lab/demo credit. The first is that there are too few of these to allow students to fulfill this requirement easily, especially in the Life Sciences. There are 32 lab/demo courses overall in the foundation area (not including the Clusters). Of these, 12

[1] We note that physics has the well-attended course, Physics 10. Furthermore, Physics is in the Department of Physics and Astronomy, and Astronomy offers several popular GE courses, so if there is a perceived shortfall, it is not at the department level in this case.

are in the Life Science section. Three of these Life Science offerings can alternatively be counted for lab/demo credit in Physical Science.

The second issue is that not all courses offering lab/demo credit are genuinely providing students with the experience this credit is meant to reflect. Specifically, the review of Physiological Sciences 5 indicated that some assignments merely require students to amass and manipulate data, which the committee deemed insufficient to confer lab/demo credit. It was the committee's strong opinion that this credit must only be awarded when a sustained activity beyond the lecture allows students to gain insight into how scientists look at and ask questions about findings within their field. This must be a hands-on or otherwise direct experience illustrating how scientists examine and interpret their data and employ the scientific method, preferably occurring over the length of the quarter rather than over the course of one week.

In Physiological Science 5, the measurement of various aspects of one's diet, exercise and physiology in connection with the use of software to manipulate these data served as the lab component of the course. The committee unanimously agreed that these activities did not fulfill minimal criteria for the lab component of a GE class in *Foundations of Scientific Inquiry*.

Recommendations

The Self Review Committee developed three categories of recommendations for creating and sustaining high-quality GE course offerings in the *Foundations of Scientific Inquiry* area:

Quality Control

Several recommendations address the need to develop methods for ensuring that courses meet (and continue to meet) criteria for inclusion in this GE foundation area. These include:

- Requiring *better developed and standardized syllabi* that demonstrate the way the course fulfills the aims of this GE foundation area. This requirement includes ensuring that all syllabi have well developed explanations of the course aims and objectives. In addition, the committee believed that instructors should provide a brief account of how the course fulfills the various GE principles it claims to address. Especially important would be an indication of how the course helps students understand the process of scientific inquiry.
- In order to achieve the first goal, the committee recommends *further elaboration of the criteria for inclusion* in the Scientific Inquiry area. In particular, *specific standards and principles for lab/demo credit* were deemed especially important. Committee members want to ensure that courses earning this credit emphasize the methods by which scientists go about their work. Specifically, the lab/demo component of the course should provide hands-on or some other direct experience with important course concepts, emphasizing the ways scientists gather, examine, and interpret data, illustrating how scientists grapple with uncertainty, and how scientists formulate and test hypotheses.
- The committee encourages *monitoring course content* via the electronic syllabus abstract system (currently being developed). The electronic syllabus abstract project should provide a means for tracking syllabi and ensuring that they have the depth and standardization required.
- The committee recommends *reviewing 20% of the course offerings annually*, so that the whole course list in this foundation area would be reviewed every five years.
- The committee recommends establishing *a process for "decertifying"* GE courses. The review of Physiological Science 5 indicates that courses can evolve to the point that they no longer meet the standards of an acceptable GE course. The committee believes there should be a process by which such courses are removed from the GE curriculum.

Student Access to Course Information

Committee members regularly noted that students rarely have any clear sense of the course content and aims prior to enrolling in the courses. It is recommended that students be provided with access to the (improved) syllabi supplied to the electronic-syllabus-abstract project.[2]

Course Development

The Self Review Committee makes several recommendations aimed at encouraging development of new courses in this foundation area. Given the small number of GE courses bearing lab/demo credit, the recommendations focus especially on addressing this problem. The recommendations are:

- The Deans of Life and Physical Sciences should
  - provide incentives for faculty to develop and teach GE courses;
  - provide additional faculty FTE for that purpose;
  - identify funds for GE lab courses;
  - make lab space available for GE lab courses;
- The Vice Provost should encourage and facilitate the development of additional cluster courses in the sciences;
- Department Chairs should work with their faculties to enhance current GE courses by including a discussion section or lab. Given that the mission statement for this foundation area specifies that students should learn about scientific inquiry not merely through lecture but also through "laboratory experiences, writing, and intensive discussions," the committee wants to ensure that students are provided with the opportunity to reinforce and explore lecture material in section or lab. This requires departments to make TAs available for GE lecture courses, which also requires that Deans provide TA support to departments.
- The Vice Provost and Deans should develop new models for increasing and enhancing GE offerings by considering creative ways to develop new courses. One example would be to create GE seminars by attaching them to currently offered lecture courses, such as the new Sophomore Seminar Sequence program that has been established by the Vice Provost working with the Deans of Humanities and Social Sciences. Another model would be to offer stand-alone one-unit labs for currently offered four-unit GE courses so that students could have more choice between five-unit lab courses or four-unit non-lab courses. One suggestion (a suggestion that could only be realized in the event of another overhaul of the GE curriculum) would be to offer two-unit GE courses. This approach was advocated by committee members who believe that current GE courses give too much detail, and that non-science students would benefit from knowing less detail about a broader range of topics, giving them more of what one might reasonably expect them to retain and less of the detail that is likely to be lost.
- Investigate further the problem of gaps in the curriculum. The committee encourages GE Governance to initiate a more systematic analysis of where these gaps exist and how best to fill them. The two general areas requiring investigation are: (a) curriculum gaps in various departments or new interdisciplinary areas, including but not limited to, Chemistry, Psychology, Nanotechnology and Genetics; and (b) the dearth of lab/demo courses, especially in the Life Sciences; and (c) a lack of health related courses that might be offered by faculty in Public Health, as well as Medicine, Dentistry and Nursing.

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[2] This view was contested by at least one committee member who believes that students have a very efficient word-of-mouth network and that freshmen have enrollment counselors to provide suggestions and disseminate conventional wisdom. It might be helpful to get more complete information regarding students' knowledge. Having detailed syllabi online is of course desirable in any case.

APPENDIX A

- Scientific Inquiry Ad Hoc Review Committee Charge Letter
- Scientific Inquiry Review Proposal

MEMORANDUM

General Education
A265 Murphy Hall
157101

January 3, 2006

Theodore Porter (Department of History)
Robert Fovell (Department of Atmospheric and Oceanic Sciences)
Raymond Ingersoll, *Chair* (Department of Earth and Space Sciences)
Gail Kennedy (Department of Anthropology)
Carla Koehler (Department of Chemistry and Biochemistry)
Jan De Leeuw (Department of Statistics)
Mark Morris (Department of Astronomy and Physics)
Ralph Robinson (Department of Microbiology, Immunology and Molecular Genetics)

Dear Colleagues:

We write to welcome you as members of the special Ad Hoc Committee for the review of UCLA's Foundations of Scientific Inquiry (SI) General Education (GE) curriculum, and to thank you for your willingness to participate in this critically important academic workgroup. This committee is jointly appointed by the Chair of the General Education Governance Committee and the Vice Provost for Undergraduate Education, and its charge is to conduct a self-review of the university's GE offerings in the life and physical sciences, to be completed by September 2006. During this review, the Ad Hoc Committee is expected to explore a range of issues and questions relating to the Scientific Inquiry foundation area's pedagogical aims, course quality, and student enrollments (See the attached Review of General Education Curriculum: Foundations of Scientific Inquiry).

The head of the faculty workgroup that reviewed and certified course offerings for the Scientific Inquiry curriculum in 2002, Professor Raymond ("Ray") Ingersoll of Earth and Space Sciences has agreed to serve as the chair of the Ad Hoc Committee. Another member of the 2002 workgroup, Professor Sally Gibbons, Coordinator of the Biotechnology and Society freshman cluster and Associate Director of the Center for Society and Genetics, has agreed to provide resource support for both Ray and the committee. To further assist the ad hoc workgroup in its review of the Foundations of Scientific Inquiry, the administrative support team of the General Education Governance Committee will provide you with information on the development and implementation of the Foundations of Scientific Inquiry GE curriculum; SI course offerings; the SI instructional cohort; and SI student demographics, enrollment patterns, and course evaluations. This information will be provided to you at the first meeting of the committee in late January 2006.

The Ad Hoc Committee's work will take place during the winter and spring quarters of 2006 and involve four, perhaps five, meetings. During the summer, the committee will prepare a final report for the General Education Governance Committee and the Undergraduate Council that addresses its findings with regard to the pedagogy, course quality, and student engagement in the Scientific Inquiry GE curriculum. This report will be followed by an external review of the SI curriculum by the Undergraduate Council during the 2006-07 Academic Year. To give you a better idea of the committee's charge and timeline see the attached Review document.

Administrative support staff for the General Education Governance Committee will be contacting you regarding your availability for meetings in the upcoming academic year. If you have any questions, please contact Ray Knapp (knapp@humnet.ucla.edu), Ray Ingersoll

(ingersoll@ess.ucla.edu), or the faculty liaison to the GE Governance Committee, Greg Kendrick (gregk@college.ucla.edu).

Thank you in advance for your commitment to support the important work of this committee. The efforts of this group will further strengthen our campus' GE offerings in the natural sciences, and will also provide the university with a useful model for North Campus faculty as they move ahead over the next few years to review the Arts and Humanities and Society and Culture GE foundation areas.

Sincerely,

Raymond Knapp
Chair, General Education Governance Committee

Judith L. Smith
Vice Provost for Undergraduate Education

Review of General Education Curriculum
Foundations of Scientific Inquiry

I. Background

In 2002, the College of Letters and Science adopted a 10-course (48 unit) General Education (GE) curriculum centered on three foundation areas of knowledge—*Arts and Humanities*; *Society and Culture*; and *Scientific Inquiry*—with a number of sub-categories in each area, e.g., *Social Analysis* and *Historical Analysis* in the *Foundations of Society and Culture*. That same year, the GE Governance Committee, College Faculty Executive Committee (FEC), and the Undergraduate Council (UgC) reviewed and certified course offerings that were submitted by departments and interdepartmental programs across campus for inclusion in this new GE curriculum. As of Spring 2005, the Schools of Arts and Architecture; Theater, Film, and Television; and Engineering and Applied Science have joined with the College in adopting both this foundational GE framework and a common list of courses approved for GE credit in the foundation areas of knowledge and their sub-categories.

During the process of revising the university's GE curriculum, the GE Governance Committee and the UgC decided that there should be some system of periodic programmatic review of the new General Education curriculum with the aim of evaluating:

- How effectively GE courses were meeting the pedagogical aims of their foundation areas;
- How successful departments were in offering their GE offerings and sustaining their quality; and
- How students were fulfilling their GE requirements; and
- How students evaluated their educational experience in this area.

On May 17, 2002, the UgC approved a proposal by Vice Provost for Undergraduate Education, Judith L. Smith, for an eight-year systematic rotation of reviews for several non-departmental programs that report to her, including General Education. Under this proposal, Vice Provost Smith's staff will work with the GE Governance Committee and the UgC to conduct a self-review of the three foundation areas over a four-year period as follows:

Year	Scientific Inquiry	Society and Culture	Arts and Humanities
2005-06	Self-Review		
2006-07	UgC Review	Self-Review	
2007-08		UgC Review	Self-Review
2008-09			UgC Review

In light of the fact that the programmatic review of the GE offerings in the Foundations of Scientific Inquiry is scheduled to begin in the 2005-06 Academic Year, it is necessary for the GE Governance Committee and the UgC to select a Scientific Inquiry (SI) ad hoc review committee; to determine the scope and review process this committee will follow in its evaluation of the SI curriculum; and to establish a timetable for both the self and external reviews of this foundation area. The following proposal seeks to establish these review guidelines.

II. Scope and Review Process

In keeping with the Academic Senate's expectations for the periodic review of the three foundation areas of knowledge in UCLA's General Education curriculum, the committee charged with the self and external

reviews of the Foundations of Scientific Inquiry will be expected to explore a range of issues and questions relating to this foundational area's pedagogical aims, course quality, and student enrollments. To successfully complete this review process, the committee will also require information on the development and implementation of the Foundations of Scientific Inquiry GE curriculum; SI course offerings; the SI instructional cohort; and SI student demographics, enrollment patterns, and course evaluations. The following sections address in more detail both the scope of this foundational area review and the data that will be provided to the committee that is appointed to oversee that evaluative process.

Pedagogical Issues

The mission statement for courses carrying GE credit in the Foundations of Scientific Inquiry area of knowledge is as follows:

The aim of courses in this area is to ensure that students gain a fundamental understanding of how scientists formulate and answer questions about the operation of both the physical and biological world. These courses also deal with some of the most important issues, developments, and methodologies in contemporary science, addressing such topics as the origin of the universe, environmental degradation, and the decoding of the human genome. Through lectures, laboratory experiences, writing, and intensive discussions students consider the important roles played by the laws of physics and chemistry in society, biology, earth and environmental sciences, and astrophysics and cosmology.

Given these aims, both the self and external review committees will need to review course offerings in this foundational area of knowledge with the following pedagogical questions in mind:

- Do the current Scientific Inquiry GE courses provide non-science students with a satisfactory introduction to "the most important issues, developments, and methodologies in contemporary science?" Are there other ways of organizing and/or "packaging" these courses so as to insure that their students are able to engage contemporary scientific issues in some depth?

- Are there important scientific topics that are not being addressed by the existing courses in the Scientific Inquiry area, and, if so, how can this situation be rectified by the Physical and Life Sciences?

- Do our existing Scientific Inquiry GE courses provide UCLA students with adequate "laboratory experiences, writing, and intensive discussions" that are capable of conveying to non-science students how scientists discover, create, and evaluate new knowledge in their areas of research?

Departmental Course Offerings

Another key aim of this foundational area review is to determine if Scientific Inquiry GE courses have been conducted in a manner that is consistent with the course proposals that were submitted and approved by the GE Governance Committee and the UgC in 2002 and thereafter. Specifically, the committee charged with the review of this area will need to determine if the sponsoring departments or programs have:

- Offered their courses on a regular basis and met projected student enrollment targets;
- Introduced the students taking these courses to the ideas, methods and work of departmental faculty and senior graduate students;

- Provided students with syllabi that describe course subject matter and objectives; outline weekly lecture topics, labs, experiential opportunities, and assignments; include a reading list; and provide some description of the course's grading policy; and
- Insured that their courses continue to achieve their designated general education aims.

Student Engagement

The review of the Foundations of Scientific Inquiry also needs to address student engagement in the courses being offered to satisfy their general education requirements in this area of knowledge. Given the fact that these natural science GE courses are primarily directed at a non-science student audience, the committee will need to address the following questions:

- How and when are non-science students satisfying their GE requirements in the Life and Physical Sciences?
- What are the enrollment patterns in the courses that are offered in the Foundations of Scientific Inquiry?
- Are certain classes in Scientific Inquiry over or undersubscribed, and, if so, why is this happening?
- How do non-science students rate the introduction they are receiving through their SI GE courses to important issues, developments, and methodologies in contemporary science?

Information Requirements

To assist the committee in its review of the Foundations of Scientific Inquiry, the following kinds of information will be made available:

Pedagogy

- Letter of transmittal and guidelines for the new general education requirements at UCLA from 2002.
- Final foundation area report of the Workgroup for Scientific Inquiry from 2002.
- Current approved course lists for the Foundations of Scientific Inquiry area of knowledge.
- Overview of natural science GE requirements throughout the UC system.

Course Offerings

- Current syllabi of courses in the Foundations of Scientific Inquiry. Each syllabus should also include a statement addressing the general education principles that are served by the course.
- Data indicating when courses in Scientific Inquiry have been offered, their student enrollments and instructors of record.

Student Engagement

- Data pertaining to non-science enrollment patterns in Scientific Inquiry GE courses.
- Data pertaining to when and how (i.e., through UCLA, transfer, and/or summer session courses) non-science students are satisfying their natural science GE requirements at UCLA.
- Student evaluation of courses in the Scientific Inquiry foundation area.

III. Review Timetable

The review of the Foundations of Scientific Inquiry curriculum will be completed in the following manner:

2005-2006 Self-Review

Fall 2005
November 4: Adoption of a proposal for the review of the Foundations of Scientific Inquiry area of the General Education curriculum by the GE Governance Committee, with recommendations for a Self-Review Ad Hoc Committee comprised of six to eight faculty members (with at least one lecturer) drawn from GE Governance membership, as well as North and South campus departments and programs.

December 1: Approval of GE Governance proposal and ad hoc self-review committee by the Undergraduate Council.

Winter and Spring 2006
January: Meeting of self-review committee to address its charge and draw up an agenda for action during the winter and spring quarters.

Meet periodically over the winter and spring quarters to address pedagogical aims, course quality, and student engagement in the Foundations of Scientific Inquiry curriculum.

Summer 2006
Prepare final report of the self-review committee for the UgC.

2006-07 UgC Review

Fall 2006
September: Self-review report formally submitted to the Undergraduate Council with recommendations for external reviewers.

UGC selects external reviewers and sets date for two-day external review.

Winter 2007
External reviewers conduct two-day site visit for the purposes of evaluating the Foundations of Scientific Inquiry curriculum.

Spring 2007
External review report and recommendations are presented to the GE Governance Committee, the College FECs, and the UgC.

APPENDIX B

Final Report of 2002 Foundations of Scientific Inquiry Workgroup

MEMORANDUM

General Education
College of Letters and Science
A265 Murphy Hall
157101

1 May 2002

To: Raymond Knapp, Chair, Undergraduate Council

From: Ray Ingersoll (Chair) and Sally Gibbons (Resource staff person), Foundations of Scientific Inquiry Workgroup

Re: Course approvals for the College's new General Education curriculum for Fall, 2002.

This document summarizes the following:

(1) the process the Workgroup used to review courses;
(2) criteria used to evaluate proposals and determine their appropriateness to this foundational area;
(3) issues and questions emerging from the review process;
(4) courses approved for GE credit in Foundations of Scientific Inquiry.

Introduction to the process used to review courses

The following members of the Foundation of Scientific Inquiry Workgroup participated in the course proposal review process:

Ray Ingersoll (Earth and Space Sciences) – *Chair*
Theo Apostal (Undergraduate Representative)[1]
Scott Chandler (Neuoscience/ Physiological Science)
Douglas Durian (Physics and Astronomy) – FEC
Robert Fovell, (Atmospheric Sciences)
Ted Gamelin (Mathematics) - UgC and UgCC
Elma Gonzalez (OBEE)
Andrea Liu (Chemistry/Biochemistry)
John Merriam (MCD Biology)
Rick Paik Schoenberg (Statistics)
Resource Staff: Sally Gibbons (GE Office)

[1] We would like to express our appreciation to Theo Apostol, the student representative on the workgroup, for his thoughtful and active participation in this process. His willingness to think broadly about GE curriculum reform in the sciences and to share the student perspective, as he understands it, contributed an important dimension to our discussions and decision-making process.

Jack Beatty (Psychology) and Bob Goldberg (MCD Biology and GE Governance Committee) were members of the workgroup who were both interested in participating in the process but were unable to attend any of the meetings.

The Workgroup met four times to conduct the course review. In the first meeting, the group was introduced by David Rodes to the intent of the GE reform and to the administrative process used to ensure that the proposals submitted meet the criteria for certification under the new GE. The Workgroup members received and reviewed the materials sent to departments for the submission of course proposals, including a copy of the new GE requirements and guidelines for certifying courses. Taken together, these discussions and materials introduced members to their charge in implementing the new GE requirements.

In the second meeting, the group as a whole reviewed four proposals selected by the Workgroup Chair as presenting issues he anticipated would be common among the proposals. The aim of this review was to calibrate the group's evaluations in order to ensure that the group agreed on: (1) criteria that course proposals should meet in order to be approved for GE credit; (2) what defects in a proposal warranted requesting modification of the course by the department submitting it; and (3) what defects warranted rejecting it.

Each of the four proposals possessed unique features. The courses included one Physical Science course, one Life Science course, one Humanities course seeking Life Science credit, and one Social Science course seeking Life Science credit. One was a 4-unit course remaining 4 units; two were 4-to-5-unit conversions; and one involved a 4- or 6-unit option. The four proposals were also highly variable in the quantity and quality of materials provided. The group's assessments of the four proposals are recorded in the attached minutes for the 14 April meeting.

The remaining proposals were each reviewed by three Workgroup members, as assigned by the Chair. Faculty members from the life sciences were generally selected to review proposals in the physical sciences, and faculty members from the physical sciences were generally selected to review courses in the life sciences. The rationale was that scientists from outside the field should be able to ascertain the merits of the courses if they were to be appropriate to GE. A spreadsheet indicating the readers for each proposal is attached.

The final two meetings were devoted to collecting the "votes" of the Workgroup members charged with reviewing the proposals. Each proposal could receive an "A" for approve, "M" for modify, or "R" for reject. Proposals approved by all three reviewers were accepted, to be sent to the UgC without further discussion. Proposals that did not receive three identical votes were discussed by the group. If agreement could not be reached following the discussion, a vote of all members was taken.

Criteria used to evaluate proposals and determine their appropriateness to this foundational area

The Workgroup referred regularly to the language adopted in the GE reform legislation for guidance regarding criteria for assessing which courses are appropriate to Foundations of Scientific Inquiry. That language states:

> *Foundations of Scientific Inquiry (4 courses, 18 units)*
> The aim of courses in this area is to ensure that students gain a fundamental understanding of how scientists formulate and answer questions about the operation of both the physical and biological world. These courses also deal with some of the most important issues, developments, and methodologies in contemporary science, addressing such topics as the origin of the universe, environmental degradation, and the decoding of the human genome. Through lectures, laboratory experiences, writing, and intensive discussions students consider the important roles played by the laws of physics and chemistry in society, biology, earth and environmental sciences, and astrophysics and cosmology.

In addition, the Workgroup appealed to GE principles and guidelines for proposal submission to ascertain the intent of the legislation.

➢ *Courses from departments outside the sciences*

One issue that emerged was how to evaluate courses from departments outside life or physical sciences requesting GE credit in this foundational area. In cases in which a course included both science and nonscience content and methods, the Workgroup sought to ensure that the science material was adequate to earn 4 or 5 units of credit in this area. Some Workgroup members argued that even if only half of the material was science material (as opposed to material providing a nonscience approach to the course topic), that fact shouldn't be interpreted as meaning that this is only "half" a course in the sciences, since the *integration* of these discourses could weave the approaches together in a way that GE should seek to achieve, unifying scientific, social and humanistic material. It was also suggested that GE should endorse diverse approaches to science, and that students who were threatened by science might find a more congenial introduction to science by seeing the connections among humanistic, social and scientific concerns. Decisions as to whether a "mixed" course contained enough science were made on a case-by-case basis.

Courses on the history or philosophy of science were generally accepted, as long as there was sufficient science content. The Workgroup felt that learning the history and philosophy of science bears directly on how science is practiced. On the other hand, courses that discussed science (e.g., evolution) from a nonscientific perspective (e.g., cultural anthropology) were not accepted. In these cases, it seemed that the courses did not help students "gain an understanding of how scientists formulate and answer questions about the operation of both the physical and biological world."

➢ *Courses requesting reuniting*

Not all courses submitted to this foundational area requested reuniting from 4 to 5 units. Those that did, however, were expected to provide sufficient documentation to warrant the additional unit. Some departments simply completed the reuniting worksheet (resulting in the total student hours adding up to at least 15), without providing much further evidence that the workload was indeed equivalent to 15 hrs/week. This was not deemed a problem in cases where significant additional work (e.g., a lab) was added. The doubts emerged for courses where the department simply stated that although the course had been at 4 units, the workload warranted the increase to 5.

Some Workgroup members felt that we should avoid micromanaging and trust the faculty when they assert that the extra unit is deserved. Ted Gamelin and Ray Knapp, speaking on behalf of the UgC, countered that the UgC takes reuniting very seriously and would feel that they have to review this Workgroup's approval of reuniting much more carefully if the issue of reuniting was not addressed. The suggestion was made that, in cases where the reuniting wasn't clearly supported, the submitting department should provide further documentation to justify the increase, alerting them to the fact that the UgC curriculum committee will be looking closely at this issue. In some cases, the Workgroup took this approach. In others, the group approved the course at 4, rather than 5 units, and alerted the department to this fact.

➢ *Rigorous science courses as GE offerings*

Some Workgroup members questioned the propriety of having certain rigorous courses in physics, chemistry, and biology, for example, being treated as General Education courses. It was thought that these might not reflect the intent of GE to introduce nonscience students to the field in a broad way that the students could integrate into the rest of their studies and their lives. On the other hand, the Workgroup agreed that nonscience students should be rewarded if they meet their GE requirement by taking these challenging classes. Also, it was agreed that these classes clearly meet the aims of this foundational area as articulated by the legislation (see above), as well as advancing several of the GE principles (e.g., critical thinking, problem solving, and general knowledge) identified in the guidelines. The group decided to accept these courses as appropriate to the new GE curriculum, while also acknowledging that few nonscience students would use them to fulfill their GE requirements.

Issues and questions arising from the review process

Not all course proposals lent themselves to clear-cut inclusion or exclusion from this foundation area. Courses in mathematics and statistics raised several questions. These departments are housed in, and are considered part of, the physical sciences, and they have requested physical science GE credit for their course offerings. Although everyone agreed that mathematics and statistics provide essential foundational skills and knowledge required in both the physical and life sciences, they were not all agreed that the courses actually constitute physical-science courses. Ted Gamelin noted that many of the applications provided as examples in the mathematics courses are drawn from the sciences. The same is true in some of the statistics courses. On the other hand, the examples are meant only

to illustrate the math and statistics problems and methods, rather than being the focus of the course.

Although the discussion of statistics had much in common with that of math (given that both are core skills used in science, but are, arguably, not themselves physical or life sciences), the statistics courses raised slightly different issues. As the statistics department noted on their GE course information sheet, basic scientific methods are taught and applied in these courses (e.g., experimental design, hypothesis testing, causation and correlation). This focus lends a scientific quality to the courses. Nevertheless, many Workgroup members felt that statistics courses are skills courses, which, however valuable, aren't in themselves courses in physical or life sciences.

In the end, the group felt that it did not have sufficient guidance from the GE Governance Committee (and the FEC?) to determine how to handle the mathematics and statistics offerings. The group chose not to act on these courses, instead referring them back to these committees for further discussion. In addition, the Workgroup suggests to these committees that they consider developing a stronger Quantitative Reasoning GE requirement. If that were to happen, students would receive the higher-level mathematics and statistics training that everyone agreed should be a part of their general education.

One suggestion, that did not receive thorough discussion by the Workgroup, since it was not part of the Workgroup's charge, was that all UCLA undergraduates should be required to take at least one course in Statistics as part of their Quantitative Reasoning requirement. This suggestion should be discussed by the GE Governance Committee.

Courses approved for GE credit in Foundations of Scientific Inquiry

71 courses were approved for GE credit in Foundations of Scientific Inquiry. These included 44 courses in the physical sciences, 24 in the life sciences, and 3 that could be counted in either life or physical sciences. The list of courses is appended.

GE Course Proposals Approved by the
Foundations of Scientific Inquiry Workgroup
18 April 2002

Anthropology
2 Life Science courses:
Anthro 7 **(5 units)** (Human Evolution)
Anthro 12 **(5 units)** (Principles of Human Evolution: Comparative Basis)

Atmospheric Sciences
7 Physical Science courses:
AS 1 **(4 units)** and 1L **(5units)** (Climate Change: From Puzzles to Policy);
AS 2 **(4 units)** and 2L **(5 units)** (Air Pollution);
AS 3 **(4 units)** and 3L **(5 units)** (Intro to the Atmospheric Environment);
AS 5 **(4 units)** (Climates of Other Worlds);

Chemistry & Biochemistry
9 Physical Science courses:
Chem 2 **(4 units)** (Intro to Chemistry);
Chem 14 A **(4 units)** (Chemical Structures and Equilibria);
Chem 14B **(4 units)** and BL **(3 units)** (Thermodynamics, Kinetics, Organic Structures, and Spectroscopy);
Chem 20 A **(4 units)**, AH **(4 units)** (Chemical Structure);
Chem 20 B **(4 units)**, BH **(4 units)**, and BL **(3 units)** (Chemical Energetics and Change)

Earth & Space Sciences
5 Physical Science courses:
ESS 1 **(4 units)** and 1F **(5 units)** (Intro to Earth Science, with or without fieldwork);
ESS 5 **(4 units)** (Environmental Geology of LA);
ESS 8 **(5 units)** (Earthquakes);
ESS 9 **(4 units)** (Solar System and Planets)

2 Life Science courses:
ESS 16 **(5 units)** (Major Events in History of Life);
ESS 17 **(5 units)** (Dinosaurs)

2 Physical OR Life Science courses:
ESS 15 **(5 units)** (Intro to Oceanography);
ESS 20 **(5 units)** (Nat. History of So. Cal.)

Geography
1 Life Science course:
Geog 2 **(5 units)** (Biodiversity in a Changing World)

1 Physical Science course:
Geog 1 **(5 units)** (Earth's Physical Environment)

1 Life Science OR Physical Science course:
Geog 5 **(5 units)** (People and the Earth's Ecosystems)

Honors Collegium
1 Physical Science course:
HC 20 **(5 units)** (What Is This Thing Called Science)

Life Science Core Curriculum
4 Life Science courses:
LS 1 **(5 units)** (Evolution, Ecology, and Biodiversity);
LS 2 **(5 units)** and 2W **(6 units)** (Cells, Tissues, and Organs);
LS 15 **(5 units)** (Life: Concepts and Issues)

Linguistics
1 Life Science course
Ling 1 **(5 units)** (Intro to the Study of Language)

Microbiology, Immunology & Molecular Genetics
3 Life Science courses
Micro 6 **(4 units)** (Intro to Microbiology);
Micro 7 **(4 units)** (Developments in Biotechnology) - LAB;
Micro 12 **(4 units)** (Biological Threats to Society)

Molecular, Cell & Developmental Biology
3 Life Science courses
MCDB 30 **(5 units)** (Biology of Cancer);
MCDB 40 **(5 units)** (AIDS and other STDs);
MCDB 80 **(4 units)** (The Green World)

OBEE
4 Life Science courses:
OBEE 10 **(4 units)** (Plants and Civilization);
OBEE 11 **(5 units)** (Biomedical Research Issues in Minority Communities);
OBEE 13 **(4 units)** (Evolution of Life);
OBEE 25 **(5 units)** (Marine Biology)

Philosophy
1 Physical Science course
Philosophy 8 **(5 units)** (Intro to Philosophy of Science)

Physics & Astronomy
20 Physical Science courses:

Physics 1A & 1AH-honors **(5 units)** (Physics for Scientists and Engineers: Mechanics)
Physics 1B & 1BH-honors **(5 units)** (Physics for Scientists and Engineers: Oscillations, Waves, and Electric and Magnetic Fields)
Physics 1C & 1CH-honors **(5 units)** (Physics for Scientists and Engineers: Electrodynamics, Optics, and Special Relativity)
Physics 6 A & 6AH-honors **(5 units)** (Physics for Life Science Majors: Mechanics)
Physics 6B & 6BH-honors **(5 units)** (Physics for Life Science Majors: Oscillations, Waves, and Electric and Magnetic Fields)
Physics 6C & 6CH-honors **(5 units)** (Physics for Life Science Majors: Electrodynamics, Optics, and Special Relativity)
Physics 10 **(4 units)** (Physics)
Astronomy 3 **(5 units)** (Nature of the Universe),
Astronomy 4 **(4 units)** (Universe of Stars and Stellar Systems)
Astronomy 5 **(4 units)** (Life in the Universe)
Astronomy 6 **(4 units)** (Cosmology: Our Changing Concepts of the Universe)
Astronomy 7 **(4 units)** (Astronomy and the Media)
Astronomy 8 A, B **(5 units)** (Astronomy with Physics)

Physiological Science
3 Life Science courses
PhySci 3 **(4 units)** (Intro to Human Physiology);
PhySci 5 **(4 units)** (Issues in Human Physiology);
PhySci 13 **(5 units)** (Intro to Human Anatomy)

Psychology
1 Life Science course:
Psych 15 **(4 units)** (Intro Psychobiology)

APPENDIX C

Approved *Foundations of Scientific Inquiry* General Education Courses

Scientific Inquiry Courses

Life Science

Subject Area ANTHRO

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
7	HUMAN EVOLUTION			
12	HMN EVLTN-COMP ANLY			

Subject Area ASTR

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
5	LIFE IN THE UNIVERS	Yes		

Subject Area E&S SCI

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
3	ASTROBIOLOGY	Yes		
15	INTROD-	Yes	Yes	
16	MJR EVNTS-HIST LIFE			
17	DINOSAURS&RELATIVES		Yes	
20	NAT HST-SOUTHRN CAL	Yes	Yes	

Subject Area EE BIOL

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
10	PLANTS&CIVILIZATION			
11	BIOMED RSRCH-MINRTY			
13	EVOLUTION OF LIFE			
25	MARINE BIOLOGY			

Subject Area ENVIRON

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
1A M	GLOBAL ENVIRONMNT 1	Yes	Yes	Yes
1B M	GLOBAL ENVIRONMNT 2	Yes	Yes	Yes
1CWM	GLOBAL ENVIRON-TPCS	Yes	Yes	Yes

Subject Area GE CLST

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
1A M	GLOBAL ENVIRONMNT 1	Yes	Yes	Yes
1B M	GLOBAL ENVIRONMNT 2	Yes	Yes	Yes
1CWM	GLOBAL ENVIRON-TPCS	Yes	Yes	Yes
70A	COSMOS AND LIFE	Yes	Yes	Yes
70B	COSMOS AND LIFE	Yes	Yes	Yes
70CW	COSMOS AND LIFE		Yes	Yes
71A	BIOTECHNLGY&SOCIETY	Yes	Yes	Yes
71B	BIOTECHNLGY&SOCIETY	Yes	Yes	Yes
71CW	BIOTECHNLGY&SOCIETY	Yes	Yes	Yes
80A	FRONTRS-HUMAN AGING	Yes		Yes
80B	FRONTRS-HUMAN AGING	Yes		Yes
80CW	FRONTRS-HUMAN AGING	Yes		Yes

Subject Area GEOG

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
2	BIODIVR-CHNGNG WRLD		Yes	
5	PEOPLE&EARTH ECOSYS	Yes	Yes	

Subject Area HNRS

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
8	COMMUNICATN-			Yes
14	SCIENCE AND SOCIETY			Yes
64	ART AND AESTHETICS			Yes
70A	GEN ENGR-MED&AG&LAW		Yes	

Subject Area LIFESCI

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
1	EVOLUTN&ECOL&BIODIV		Yes	
2	CELLS&TISSUES&ORGNS		Yes	
15	LIFE-CONCPTS&ISSUES			

Subject Area LING

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
1	INTR-STUDY-LANGUAGE	Yes		

Subject Area MCD BIO

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
30	BIOLOGY OF CANCER			
40	AIDS&SEXUAL TRANSMT			
80	PLANT BIO-NOW&FUTUR		Yes	

Subject Area MIMG

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
6	INTRO MICROBIOLOGY			
7	DEVELOPMNTS-BIOTECH			
12	BIOTERRORISM			

Subject Area PHY SCI

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
3	INTRO-HUMAN PHYSIOL		Yes	
5	HMN PHYS-DIET&EXRCS		Yes	
13	INTRO-HUMAN		Yes	

Subject Area PSYCH

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
15	INTRO PSYCHOBIOLOGY			

Subject Area STATS

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
10	INTRO-STAT REASON	Yes		

Physical Science

Subject Area A&O SCI

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
1	CLIMATE CHANGE			
1L	CLIMATE CHANGE LAB		Yes	
2	AIR POLLUTION			
2L	AIR POLLUTION LAB		Yes	
3	INTR-ATMOS ENVIRMNT			
3L	INTR-ATMOS ENVR LAB		Yes	
5	CLIMATS-OTHR WORLDS			

Subject Area ASTR

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
3	NATURE OF UNIVERSE		Yes	
4	BLACK HOLES			
5	LIFE IN THE UNIVERS	Yes		
6	CHANG CNCPT-UNIVERS			
7	ASTRONOMY AND MEDIA			

Subject Area CHEM

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
2	INTRODUCTORY CHEM			
14A	STRUCTRS&EQUILIBRIA			
14B	THERMODNMCS&KINETC			
14BL	GEN&ORGN CHEM LAB 1		Yes	
20A	CHEMICAL STRUCTURE			
20AH	CHEM STRUCTURE-HNRS			
20B	ENERGETICS&CHANGE			
20BH	ENRGTCS&CHANGE-			
20L	GENRL CHEMISTRY LAB		Yes	

Subject Area E&S SCI

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
1	INTRO TO EARTH SCI			
1F	EARTH SCI-FIELDWORK		Yes	
3	ASTROBIOLOGY	Yes		
5	ENVIRON GEOLOGY-L A			
7	SPACE WEATHER			
8	EARTHQUAKES		Yes	
9	SOLAR SYSTM&PLANETS			
10	EXPLORING MARS			
15	INTROD-	Yes	Yes	
20	NAT HST-SOUTHRN CAL	Yes	Yes	

Subject Area ENVIRON

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
1A M	GLOBAL ENVIRONMNT 1	Yes	Yes	Yes
1B M	GLOBAL ENVIRONMNT 2	Yes	Yes	Yes
1CWM	GLOBAL ENVIRON-TPCS	Yes	Yes	Yes

Subject Area GE CLST

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
1A M	GLOBAL ENVIRONMNT 1	Yes	Yes	Yes
1B M	GLOBAL ENVIRONMNT 2	Yes	Yes	Yes
1CWM	GLOBAL ENVIRON-TPCS	Yes	Yes	Yes
70A	COSMOS AND LIFE	Yes	Yes	Yes
70B	COSMOS AND LIFE	Yes	Yes	Yes
70DW	COSMOS AND LIFE		Yes	Yes

Subject Area GEOG

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
1	EARTH PHYS ENVIRONM		Yes	
5	PEOPLE&EARTH ECOSYS	Yes	Yes	

Subject Area HNRS

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
20	NATURE-MODERN SCI	Yes		
28	SPACE WEATHER			Yes

Subject Area PHILOS

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
8	INTRO-PHILOS OF SCI	Yes		

Subject Area PHYSICS

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
1A	MECHANICS		Yes	
1AH	MECHANICS-HONORS		Yes	
1B	OSCILTNS&WAVES&FLDS		Yes	
1BH	OSCLTN&WAV&FLD-		Yes	
1C	ELECTRODYNMC&OPTICS		Yes	
1CH	ELECDYNM&OPTCS-		Yes	
6A	PHYSIC-LIFE SCI MAJ		Yes	
6AH	STATICS & DYNAMICS		Yes	
6B	PHYSIC-LIFE SCI MAJ		Yes	
6BH	SOUND&LIGHT&HYDRDYN		Yes	
6C	PHYSIC-LIFE SCI MAJ		Yes	
6CH	ELCTRC&MAGNT&TRNSP		Yes	
10	PHYSICS			

Subject Area STATS

Catalog Number	Short Title	Multiple GE Groups	Lab/Demo Credit	Seminar/Writing_II Credit
10	INTRO-STAT REASON	Yes		

APPENDIX D

Ladder vs. Non-Ladder by Scientific Inquiry Course, 2002-2005

Ladder vs Non Ladder by Scientific Inquiry Course - From Fall 2002 through Fall 2005

Note: If at least one section was taught by a ladder faculty member, it was counted as a Yes

SUBJECT AREA	Course #	Number of AY Terms Offered	Quarters Taught by Ladder	Quarters taught by Non Ladder
A&O SCI	1	6	6	
A&O SCI	2	10	4	6
A&O SCI	3	10	5	5
A&O SCI	5	4	4	
A&O SCI	1L	6	6	
A&O SCI	2L	10	4	6
A&O SCI	3L	10	5	5
ANTHRO	7	9	8	1
ANTHRO	12	2	2	
ASTR	3	10	9	1
ASTR	4	5	5	
ASTR	5	7	6	1
ASTR	6	6	6	
ASTR	7	2	1	1
ASTR	8A	1	1	
ASTR	8B	1	1	
CHEM	2	2		2
CHEM	14A	9		9
CHEM	14B	8		8
CHEM	14BL	10		10
CHEM	20A	7	5	2
CHEM	20AH	4	4	
CHEM	20B	7	5	2
CHEM	20BH	3	1	2
CHEM	20L	10		10
CHEM	98T	1		1
DENT	98B	2		2
E&S SCI	1	7	7	
E&S SCI	3	3	3	
E&S SCI	5	3	2	1
E&S SCI	7	1	1	
E&S SCI	8	10	7	3
E&S SCI	9	9	7	2
E&S SCI	10	2	1	1
E&S SCI	15	7	6	1
E&S SCI	16	3	3	
E&S SCI	17	3		3
E&S SCI	20	3		3
E&S SCI	1F	7	7	
EE BIOL	10	2	2	
EE BIOL	11	1	1	
EE BIOL	13	1	1	
EE BIOL	25	3	2	1
EE BIOL	98T	1		1
GE CLST	1A M	4	4	
GE CLST	1B M	3	3	
GE CLST	1CWM	3	3	
GE CLST	70A	4	4	

SUBJECT AREA	Course #	Number of AY Terms Offered	Quarters Taught by Ladder	Quarters taught by Non Ladder
GE CLST	70B	3	3	
GE CLST	70CW	3	2	1
GE CLST	70DW	2	1	1
GE CLST	71A	4		4
GE CLST	71B	3		3
GE CLST	71CW	3	3	
GE CLST	80A	4	2	2
GE CLST	80B	3	2	1
GE CLST	80CW	3	2	1
GEOG	1	6	6	
GEOG	2	7	6	1
GEOG	5	8	5	3
HNRS	8	2		2
HNRS	14	3	3	
HNRS	20	3		3
HNRS	28	1	1	
HNRS	64	3		3
HNRS	70A	3	3	
LIFESCI	1	10	7	3
LIFESCI	2	10	8	2
LIFESCI	15	10	2	8
LING	1	10	10	
MATH	98T	2	1	1
MCD BIO	30	8		8
MCD BIO	40	10		10
MCD BIO	80	2	2	
MIMG	6	7	4	3
MIMG	12	3		3
NEUROSC	10	1		1
PHILOS	8	5	4	1
PHY SCI	5	10	4	6
PHYSICS	10	10	10	
PHYSICS	06CH	3	2	1
PHYSICS	1A	10	6	4
PHYSICS	1AH	4	4	
PHYSICS	1B	10	8	2
PHYSICS	1BH	3	3	
PHYSICS	1C	10	8	2
PHYSICS	1CH	3	1	2
PHYSICS	6A	10	8	2
PHYSICS	6AH	4	4	
PHYSICS	6B	10	7	3
PHYSICS	6BH	3	3	
PHYSICS	6C	10	5	5
PSYCH	15	10	6	4
PSYCH	98TB	1	1	
STATS	10	10	7	3
STATS	10A	3		3

APPENDIX E

Enrollment in Scientific Inquiry Courses Fall 2002 to Fall 2005

Enrollment in Scientific Inquiry Courses and Degree Objectives by Course
Fall Quarter 2002 to Fall Quarter 2005

Highlighted courses do not apply to prep for any major.

			Enrollments			Degree Objective (as a % of Total Enrollment)		
Subject Area	Course No.	Short Title	Number of Qtrs. Offered	Total Enrollment	Regular Quarter Average	Bachelor of Science	Bachelor of Arts	Undeclared
A&O SCI	1	CLIMATE CHANGE	6	517	86	15%	56%	29%
A&O SCI	1L	CLIMATE CHANGE LAB	6	141	24	13%	52%	35%
A&O SCI	2	AIR POLLUTION	10	2870	287	10%	57%	33%
A&O SCI	2L	AIR POLLUTION LAB	10	830	83	8%	55%	37%
A&O SCI	3	INTR-ATMOS ENVIRMNT	10	1942	194	13%	56%	31%
A&O SCI	3L	INTR-ATMOS ENVR LAB	10	474	47	13%	49%	38%
A&O SCI	5	CLIMATS-OTHR WORLDS	4	141	35	16%	60%	25%
ANTHRO	7	HUMAN EVOLUTION	9	3060	340	15%	62%	22%
ANTHRO	12	HMN EVLTN-COMP ANLY	2	312	156	10%	67%	23%
ASTR	3	NATURE OF UNIVERSE	10	3844	384	11%	51%	37%
ASTR	4	BLACK HOLES/STARS&STELLR SYSTMS	5	199	40	12%	63%	25%
ASTR	5	LIFE IN THE UNIVERS	7	486	69	15%	59%	26%
ASTR	6	CHANG CNCPT-UNIVERS	6	260	43	11%	68%	20%
ASTR	7	ASTRONOMY AND MEDIA	2	83	42	2%	89%	8%
ASTR	8A	ASTRNMY WITH PHYSCS	1	22	22	14%	27%	59%
ASTR	8B	ASTRNMY WITH PHYSCS	1	18	18	11%	39%	50%
CHEM	2	INTRODUCTORY CHEM	2	64	32	6%	81%	13%
CHEM	14A	STRUCTRS&EQUILIBRIA	9	4211	468	52%	15%	32%
CHEM	14B	THERMODNMCS&KINETCS	8	2835	354	61%	11%	27%
CHEM	14BL	GEN&ORGN CHEM LAB 1	10	2561	256	66%	11%	23%
CHEM	20A	CHEMICAL STRUCTURE	7	3576	511	73%	4%	22%
CHEM	20AH	CHEM STRUCTURE-HNRS	4	165	41	76%	1%	22%
CHEM	20B	ENERGETICS&CHANGE	7	2285	326	76%	4%	19%
CHEM	20BH	ENRGTCS&CHANGE-HNRS	3	105	35	79%	0%	21%
CHEM	20L	GENRL CHEMISTRY LAB	10	2141	214	79%	3%	18%
CHEM	98T	APPLICATNS-ENZYMES	1	13	13	23%	77%	0%
DENT	98B	PSYCHOLOGY OF FEAR	2	28	14	7%	68%	25%
E&S SCI	1	INTRO TO EARTH SCI	7	470	67	15%	56%	29%
E&S SCI	1F	EARTH SCI-FIELDWORK	7	127	18	21%	50%	29%
E&S SCI	3	ASTROBIOLOGY	3	116	39	25%	46%	29%
E&S SCI	5	ENVIRON GEOLOGY-L A	3	130	43	15%	55%	31%
E&S SCI	7	SPACE WEATHER	1	84	84	17%	49%	35%
E&S SCI	8	EARTHQUAKES	10	1016	102	7%	64%	29%
E&S SCI	9	SOLAR SYSTM&PLANETS	9	519	58	12%	56%	31%
E&S SCI	10	EXPLORING MARS	2	215	108	13%	65%	22%
E&S SCI	15	INTROD-OCEANOGRAPHY	7	2223	318	19%	49%	32%
E&S SCI	16	MJR EVNTS-HIST LIFE	3	296	99	21%	54%	25%
E&S SCI	17	DINOSAURS&RELATIVES	3	867	289	23%	54%	23%
E&S SCI	20	NAT HST-SOUTHRN CAL	3	44	15	14%	59%	25%
EE BIOL	10	PLANTS&CIVILIZATION	2	267	134	20%	57%	23%
EE BIOL	11	BIOMED RSRCH-MINRTY	1	20	20	10%	55%	35%
EE BIOL	13	EVOLUTION OF LIFE	1	29	29	14%	72%	14%
EE BIOL	25	MARINE BIOLOGY	3	100	33	24%	46%	29%
EE BIOL	98T	MARINE MAMMALS	1	8	8	75%	13%	13%
GE CLST	M1A	GLOBAL ENVIRONMNT 1	4	657	164	7%	44%	49%
GE CLST	M1B	GLOBAL ENVIRONMNT 2	3	448	149	5%	45%	50%
GE CLST	M1CW	GLOBAL ENVIRON-TPCS	3	435	145	5%	47%	48%
GE CLST	70A	COSMOS AND LIFE	4	676	169	10%	49%	41%
GE CLST	70B	COSMOS AND LIFE	3	444	148	7%	53%	39%
GE CLST	70CW	COSMOS AND LIFE	3	332	111	8%	55%	38%
GE CLST	70DW	COSMOS AND LIFE	2	90	45	9%	56%	36%
GE CLST	71A	BIOTECHNLGY&SOCIETY	4	541	135	16%	35%	50%
GE CLST	71B	BIOTECHNLGY&SOCIETY	3	364	121	13%	38%	48%
GE CLST	71CW	BIOTECHNLGY&SOCIETY	3	354	118	15%	40%	45%

Enrollment in Scientific Inquiry Courses and Degree Objectives by Course
Fall Quarter 2002 to Fall Quarter 2005

Highlighted courses do not apply to prep for any major.			Enrollments			Degree Objective (as a % of Total Enrollment)		
Subject Area	Course No.	Short Title	Number of Qtrs. Offered	Total Enrollment	Regular Quarter Average	Bachelor of Science	Bachelor of Arts	Undeclared
GE CLST	80A	FRONTRS-HUMAN AGING	4	550	138	33%	25%	42%
GE CLST	80B	FRONTRS-HUMAN AGING	3	358	119	32%	27%	41%
GE CLST	80CW	FRONTRS-HUMAN AGING	3	346	115	34%	28%	38%
GEOG	1	EARTH PHYS ENVIRONM	6	345	58	7%	67%	27%
GEOG	2	BIODIVR-CHNGNG WRLD	7	687	98	12%	62%	26%
GEOG	5	PEOPLE&EARTH ECOSYS	8	1620	203	9%	60%	31%
HNRS	8	COMMUNICATN-ORGNSMS	2	44	22	39%	55%	7%
HNRS	14	SCIENCE AND SOCIETY	3	54	18	57%	37%	6%
HNRS	20	NATURE-MODERN SCI	3	83	28	29%	53%	18%
HNRS	28	SPACE WEATHER	1	17	17	47%	47%	6%
HNRS	64	ART AND AESTHETICS	3	66	22	39%	56%	5%
HNRS	70A	GEN ENGR-MED&AG&LAW	3	121	40	31%	41%	28%
LIFESCI	1	EVOLUTN&ECOL&BIODIV	10	5550	555	56%	18%	26%
LIFESCI	2	CELLS&TISSUES&ORGNS	10	5016	502	69%	10%	21%
LIFESCI	15	LIFE-CONCPTS&ISSUES	10	1717	172	12%	67%	21%
LING	1	INTR-STUDY-LANGUAGE	10	3140	314	24%	41%	35%
MATH	98T	COVERUP&CONTR&CONFL	1	5	5	80%	0%	20%
MATH	98T	GRAPH THEORY	1	10	10	50%	40%	10%
MCD BIO	30	BIOLOGY OF CANCER	8	2275	284	31%	49%	20%
MCD BIO	40	AIDS&SEXUAL TRANSMT	10	3520	352	27%	46%	27%
MCD BIO	80	PLANT BIO-NOW&FUTUR	2	78	39	15%	68%	17%
MIMG	6	INTRO MICROBIOLOGY	7	470	67	30%	43%	26%
MIMG	12	BIOTERRORISM	3	746	249	22%	52%	25%
NEUROSC	10	NEUROSCI-21ST CENT	1	57	57	23%	54%	23%
PHILOS	8	INTRO-PHILOS OF SCI	5	925	185	33%	41%	26%
PHY SCI	3	INTRO-HUMAN PHYSIOL	Offered in Summer Only					
PHY SCI	5	HMN PHYS-DIET&EXRCS	10	3836	384	18%	53%	29%
PHY SCI	13	INTRO-HUMAN ANATOMY	Offered in Summer Only					
PHYSICS	10	PHYSICS	10	2008	201	9%	69%	22%
PHYSICS	1A	MECHANICS	10	2114	211	76%	5%	19%
PHYSICS	1AH	MECHANICS-HONORS	4	103	26	72%	1%	27%
PHYSICS	1B	OSCILTNS&WAVES&FLDS	10	1920	192	85%	2%	13%
PHYSICS	1BH	OSCLTN&WAV&FLD-HNRS	3	88	29	69%	2%	28%
PHYSICS	1C	ELECTRODYNMC&OPTICS	10	1384	138	85%	2%	13%
PHYSICS	1CH	ELECDYNM&OPTCS-HNRS	3	81	27	74%	0%	26%
PHYSICS	6A	PHYSIC-LIFE SCI MAJ	10	3858	386	74%	9%	16%
PHYSICS	6AH	STATICS & DYNAMICS	4	348	87	78%	7%	16%
PHYSICS	6B	PHYSIC-LIFE SCI MAJ/ SOUND&LIGHT&HYDRDYN	10	3510	351	82%	8%	10%
PHYSICS	6BH	SOUND&LIGHT&HYDRDYN	3	321	107	83%	10%	7%
PHYSICS	6C	ELCTRC&MAGNT&TRNSPT/ELCT RC&MAGNT&TRNSPT	10	3482	348	88%	7%	5%
PHYSICS	6CH	ELCTRC&MAGNT&TRNSPT	3	257	86	87%	10%	3%
PSYCH	15	INTRO PSYCHOBIOLOGY	10	2124	212	26%	42%	32%
PSYCH	98TB	CLIN-PSYCH-PERFRMNC	1	20	20	10%	85%	5%
STATS	10	STATISTCL REASONING	10	3570	357	23%	48%	29%
STATS	10A	INTRO-STAT REASON	3	264	88	25%	47%	28%
Grand Totals			**508**	**101143**	**199**	**42%**	**32%**	**25%**

APPENDIX F

Quick Facts Re: Student Enrollment Patterns for Scientific Inquiry Review.

QUICK FACTS RE: STUDENT ENROLLMENT PATTERNS FOR SCIENTIFIC INQUIRY REVIEW

In reviewing a total of 137 Degree Progress Reports randomly selected from the Fall 02 Cohort Group, the breakdown is as follows:

- 91 students are non-science majors
- 46 students are science majors
- Science majors satisfy the majority of their scientific inquiry requirements with prep for the major coursework
- Of the 91 non-science majors, 27 students used science cluster courses to satisfy some of their scientific inquiry requirements (GE M1,70, 71, 80 series)
- Of the 64 remaining non-science majors, no discernable pattern emerged in their course choices among all available scientific inquiry course offerings, with one exception (see point below)
- Some majors (e.g. Psychology, Geography, Anthropology) tend to choose courses from the scientific inquiry course list that will meet both GE and prep for the major

PROFILES OF COURSEWORK SELECTION

MCD Biology Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ

PHYSICS 6A	03F	B	5.0	

An additional Physical Science course

PHYSICS 6B	04W	B+	5.0	

One Life Science course - Lab/Demo/Writ

LIFESCI 1	03S	C	5.0	

An additional Life Science course

LIFESCI 2	03F	B	5.0	G

Minimum of 17.5 units in Scientific Inq.

LIFESCI 1	03S	C	5.0	
LIFESCI 2	03F	B	5.0	G
PHYSICS 6A	03F	B	5.0	
PHYSICS 6B	04W	B+	5.0	

- Completed -

Chemistry Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ

PHYSICS 1A	03W	A	5.0

An additional Physical Science course

PHYSICS 1B	03S	A	5.0

One Life Science course - Lab/Demo/Writ

LIFESCI 1	04F	A	5.0

An additional Life Science course

PHY SCI 3	041	A	5.0

Minimum of 17.5 units in Scientific Inq.

LIFESCI 1	04F	A	5.0
PHY SCI 3	041	A	5.0
PHYSICS 1A	03W	A	5.0
PHYSICS 1B	03S	A	5.0

- Completed -

Psychology Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ				
E&S SCI 15	06W	IP	5.0	
An additional Physical Science course				
PHYSICS 10	04W	C+	4.0	
One Life Science course - Lab/Demo/Writ				
GEOG 5	03S	C+	5.0	
An additional Life Science course				
LIFESCI 15	03F	B	5.0	
Minimum of 17.5 units in Scientific Inq.				
E&S SCI 15	06W	IP	5.0	
GEOG 5	03S	C+	5.0	
LIFESCI 15	03F	B	5.0	
PHYSICS 10	04W	C+	4.0	

- Completed -

Political Science Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ				
ASTR 3	03S	C	5.0	
additional Physical Science course				
OSCI 2	03F	C	4.0	
One Life Science course - Lab/Demo/Writ				
LIFESCI 1	05W	D	5.0	
An additional Life Science course				
ANTHRO 7	04S	C+	5.0	GD
Minimum of 17.5 units in Scientific Inq.				
ANTHRO 7	04S	C+	5.0	GD
ASTR 3	03S	C	5.0	
ATMOSCI 2	03F	C	4.0	
LIFESCI 1	05W	D	5.0	

- Completed -

Economics Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ			
ASTR 3	03F	B+	5.0
An additional Physical Science course			
ATMOSCI 2	02F	C+	4.0
One Life Science course - Lab/Demo/Writ			
GEOG 5	03S	A-	5.0
An additional Life Science course			
MCD BIO 40	03W	A-	5.0
Minimum of 17.5 units in Scientific Inq.			
ASTR 3	03F	B+	5.0
ATMOSCI 2	02F	C+	4.0
GEOG 5	03S	A-	5.0
MCD BIO 40	03W	A-	5.0

- Completed -

Geography Major

One Physical Science crs - Lab/Demo/Writ			
E&S SCI 15	02F	B	5.0
An additional Physical Science course			
ATMOSCI 2	03S	B	4.0
One Life Science course - Lab/Demo/Writ			
GEOG 2	05W	A-	5.0
An additional Life Science course			
GEOG 5	04F	A-	5.0
Minimum of 17.5 units in Scientific Inq.			
ATMOSCI 2	03S	B	4.0
E&S SCI 15	02F	B	5.0
GEOG 2	05W	A-	5.0
GEOG 5	04F	A-	5.0

in dept

- Completed -

English Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ			
ASTR 3	03W	A	5.0
An additional Physical Science course			
E&S SCI 15	03S	A-	5.0
One Life Science course - Lab/Demo/Writ			
GEOG 5	03W	A-	5.0
An additional Life Science course			
PSYCH 15	02F	A	4.0
Minimum of 17.5 units in Scientific Inq.			
ASTR 3	03W	A	5.0
E&S SCI 15	03S	A-	5.0
GEOG 5	03W	A-	5.0
PSYCH 15	02F	A	4.0

- Completed -

Sociology Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ			
ASTR 3	02F	A-	5.0
An additional Physical Science course			
ATMOSCI 2	03S	A	4.0
One Life Science course - Lab/Demo/Writ			
GEOG 5	04F	A	5.0
An additional Life Science course			
PHY SCI 5	02F	B-	4.0
Minimum of 17.5 units in Scientific Inq.			
ASTR 3	02F	A-	5.0
ATMOSCI 2	03S	A	4.0
GEOG 5	04F	A	5.0
PHY SCI 5	02F	B-	4.0

- Completed -

American Lit and Culture Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ			
ASTR 8B	03W	B-	5.0
Course substitution applied			
CIS 102803 RWK			
An additional Physical Science course			
ASTR 3	05S	B+	5.0
One Life Science course - Lab/Demo/Writ			
GEOG 5	03F	C	5.0
An additional Life Science course			
E&S SCI 17	03S	B	4.0
Minimum of 17.5 units in Scientific Inq.			
ASTR 3	05S	B+	5.0
ASTR 8B	03W	B-	5.0
E&S SCI 17	03S	B	4.0
GEOG 5	03F	C	5.0

- Completed -

Italian Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ			
ASTR 3	02F	C+	5.0
An additional Physical Science course			
GEOG 5	03W	D+	5.0
One Life Science course - Lab/Demo/Writ			
PHY SCI 5	02F	C	4.0
An additional Life Science course			
MCD BIO 30	03S	A-	5.0
Minimum of 17.5 units in Scientific Inq.			
ASTR 3	02F	C+	5.0
GEOG 5	03W	D+	5.0
MCD BIO 30	03S	A-	5.0
PHY SCI 5	02F	C	4.0

Philosophy Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ			
ASTR 3	04W	B	5.0
An additional Physical Science course			
PHILOS 8	04S	B-	5.0
One Life Science course - Lab/Demo/Writ			
PHY SCI 5	04W	B	5.0
An additional Life Science course			
LIFESCI 15	03F	A	5.0
Minimum of 17.5 units in Scientific Inq.			
ASTR 3	04W	B	5.0
LIFESCI 15	03F	A	5.0
PHILOS 8	04S	B-	5.0
PHY SCI 5	04W	B	5.0

- Completed -

Chinese Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ			
ASTR 3	03F		4.5
An additional Physical Science course			
E&S SCI 9	04W	C+	4.0
One Life Science course - Lab/Demo/Writ			
GEOG 5	04F	B-	5.0
An additional Life Science course			
E&S SCI 17	04S	C+	4.0
Minimum of 17.5 units in Scientific Inq.			
ASTR 3	03F		4.5 - cc
E&S SCI 9	04W	C+	4.0
E&S SCI 17	04S	C+	4.0
GEOG 5	04F	B-	5.0

- Completed -

Art History Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ			
ASTR 3	02F		4.5
An additional Physical Science course			
E&S SCI 15	02F	B+	5.0
One Life Science course - Lab/Demo/Writ			
GEOG 2	04W	B+	5.0
An additional Life Science course			
PSYCH 15	03S	C+	4.0
Minimum of 17.5 units in Scientific Inq.			
ASTR 3	02F		4.5 - ec
E&S SCI 15	02F	B+	5.0
GEOG 2	04W	B+	5.0
PSYCH 15	03S	C+	4.0

- Completed -

History Major

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ			
ASTR 3	02F	A	5.0
An additional Physical Science course			
PHYSICS 10	02F		6.0
One Life Science course - Lab/Demo/Writ			
Exemption petition applied			
HNRS 01/05 CNV/NKM 4.0 unts ok			
PHY SCI 5	02F	A	4.0
An additional Life Science course			
MCD BIO 30	03W	A	5.0
Minimum of 17.5 units in Scientific Inq.			
ASTR 3	02F	A	5.0
MCD BIO 30	03W	A	5.0
PHY SCI 5	02F	A	4.0
PHYSICS 10	02F		6.0 → outside area

- Completed -

Non-science Majors with a GE Cluster

Global Environment

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ

ASTR	3	04W	A	5.0

An additional Physical Science course

GE CLST	M1B	03W	A-	5.0

One Life Science course - Lab/Demo/Writ

GE CLST	M1A	02F	A	5.0

An additional Life Science course

MCD BIO	30	03S	A	5.0

Minimum of 17.5 units in Scientific Inq.

ASTR	3	04W	A	5.0
GE CLST	M1A	02F	A	5.0
GE CLST	M1B	03W	A-	5.0
MCD BIO	30	03S	A	5.0

- Completed -

Evolution of Cosmos & Life

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ

GE CLST	70B	03W	A-	5.0	G

An additional Physical Science course

GE CLST	70CW	03S	B+	5.0	G

Course substitution applied
CIS 102403 RWK GE CLUSTER

One Life Science course - Lab/Demo/Writ

GE CLST	70A	02F	B+	5.0	G

An additional Life Science course

ANTHRO	7	04S	A	5.0

Minimum of 17.5 units in Scientific Inq.

ANTHRO	7	04S	A	5.0	
GE CLST	70A	02F	B+	5.0	G
GE CLST	70B	03W	A-	5.0	G
GE CLST	70CW	03S	B+	5.0	G

- Completed -

Biotechnology & Society

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ

ASTR	3	02F		4.5

An additional Physical Science course

ASTR	6	04S	B+	4.0

One Life Science course - Lab/Demo/Writ

GE CLST	71A	02F	A-	5.0	G

An additional Life Science course

GE CLST	71CW	03S	A-	5.0	G

Minimum of 17.5 units in Scientific Inq.

ASTR	3	02F		4.5	
ASTR	6	04S	B+	4.0	
GE CLST	71A	02F	A-	5.0	G
GE CLST	71CW	03S	A-	5.0	G

- Completed -

Frontiers in Human Aging

Foundation Area: Scientific Inquiry

One Physical Science crs - Lab/Demo/Writ

ASTR	3	02F	B	5.0

An additional Physical Science course

PHYSICS	10	03S	B-	4.0

One Life Science course - Lab/Demo/Writ

E&S SCI	15	06W	IP	5.0	PN

An additional Life Science course

GE CLST	80A	02F	B+	5.0	G

Minimum of 17.5 units in Scientific Inq.

ASTR	3	02F	B	5.0	
E&S SCI	15	06W	IP	5.0	PN
GE CLST	80A	02F	B+	5.0	G
PHYSICS	10	03S	B-	4.0	

- Completed -

Appendix G

GE Thematic Course Lists in the Sciences.

Cultures and Identities: Exploring Racial, Ethnic, and Sexual Difference in America

Foundations of Arts and Humanities

1. Literary and Cultural Analysis

Chicana and Chicano Studies

*10A. Introduction to Chicana/Chicano Studies: History and Culture (Crosslisted in Philosophical and Linguistic Analysis, Visual Arts and Performing Arts Analysis and Practice)

Honors Collegium

85. Mestizaje and Memory in Americas

Lesbian, Gay, Bisexual, and Transgender Studies/Women's Studies

*M114. Introduction to Lesbian, Gay, Bisexual, and Transgender Studies (Same as Women's Studies M114 & also listed in Social Analysis)

2. Philosophical and Linguistic Analysis

Chicana and Chicano Studies

*10A. Introduction to Chicana/Chicano Studies: History and Culture (Crosslisted in Literary and Cultural Analysis, Visual Arts and Performing Arts Analysis and Practice, Historical Analysis, and Social Analysis)

3. Visual and Performance Arts Analysis and Practice

Chicana and Chicano Studies

*10A. Introduction to Chicana/Chicano Studies: History and Culture (Crosslisted in Literary and Cultural Analysis, Philosophical and Linguistic Analysis, Historical Analysis, and Social Analysis

Lesbian, Gay, Bisexual, and Transgender Studies/Music History

*M137. Gay and Lesbian Perspectives in Pop Music (Same as Music History M137 and cross listed in Historical Analysis).

Music History (Musicology)

60. American Musical

64. Motown and Soul: African American Popular Music of 1960s.

Music History/Women's Studies

*M136. Music and Gender (Same as Women's Studies M136

Foundations of Society and Culture

1. Historical Analysis

Afro-American Studies/Sociology

*M5. Social Organization of Black Communities (Same as Sociology M5 & also listed in Social Analysis)

Asian American Studies

10. History of Asian Americans

10W. History of Asian Americans (Writing II course)

Chicana and Chicano Studies

*10B. Introduction to Chicana/Chicano Studies: Social Structure and Contemporary Conditions (Cross listed in Social Analysis)

History
13A. History of the U.S. and Its Colonial Origins and First Nation Building Acts
13B. History of the U.S. and Its Colonial Origins: 19th Century
13C. History of the U.S. and Its Colonial Origins: 20th Century

Lesbian, Gay, Bisexual, and Transgender Studies/Music History
*M137. Gay and Lesbian Perspectives in Pop Music (Same as Music History M137 and cross listed in Visual and Performing Arts Analysis and Practice and Social Analysis).

2. Social Analysis

Afro-American Studies/Sociology
*M5. Social Organization of Black Communities (Same as Sociology M5 & also listed in Historical Analysis)

American Indian Studies/World Arts and Cultures
M10. Introduction to American Indian Studies (Same as World Arts and Cultures M23)

Asian American Studies
20. Contemporary Asian American Communities

Chicana and Chicano Studies
*10B. Introduction to Chicana/Chicano Studies: Social Structure and Contemporary Conditions (Cross listed in Historical Analysis)

Lesbian, Gay, Bisexual, and Transgender Studies/Women's Studies/Music History
*M114. Introduction to Lesbian, Gay, Bisexual, and Transgender Studies (Same as Women's Studies M114 & also listed in Literary and Cultural Analysis)
*M137. Gay and Lesbian Perspectives in Pop Music (Same as Music History M137 and cross listed in Visual and Performing Arts Analysis and Practice and Historical Analysis).

Women's Studies
10. Introduction to Women's Studies: Feminist Perspectives on Women and Society

Foundations of Scientific Inquiry
1. Life Sciences
Ecology and Evolutionary Biology
11. Biomedical Research Issues in Minority Communities—5 units (Lab)

Are We Alone? The Search for Life in the Universe

Foundations of Scientific Inquiry

1. Life Sciences

Astronomy (Physics and Astronomy)

*5. Life in the Universe—4 units (Cross listed in Physical Sciences)

Earth and Space Sciences

*3. Astrobiology—5 units (Cross listed in Physical Sciences)

Ecology and Evolutionary Biology

13. Evolution of Life—4 units

Life Sciences

15. Life, Concepts, and Issues—5 units

2. Physical Sciences

Astronomy (Physics and Astronomy)

4. Universe of Stars and Stellar Systems—4 units
*5. Life in the Universe—4 units (Cross listed in Life Sciences)

Atmospheric and Oceanic Sciences

5. Climates of Other Worlds—4 units

Earth and Space Sciences

*3. Astrobiology—5 units (Cross listed in Life Sciences)
7. Perils of Space: Introduction to Space Weather—4 units
9. Solar System and Planets—4 units
10. Exploring Mars, the Red Planet—4 units

Honors Collegium

28. Perils of Living in Space: Introduction to Space Weather—4 units (Seminar)

Unraveling the Mysteries of the Cosmos and Life: Evolutionary Theory and Practice

Foundations of Society and Culture

1. Historical Analysis
History
3A. Introduction to History of Science: Scientific Revolution
3B. Introduction to History of Science: History of Science from Newton to Darwin
3C. Introduction to History of Modern Science: Relativity to DNA
3CH. Introduction to History of Modern Science: Relativity to DNA (Honors)

Foundations of Scientific Inquiry

1. Life Sciences
Anthropology
7. Human Evolution (5 units)
12. Principles of Human Evolution: Comparative Analysis (5 units)

Astronomy
*5. Life in the Universe (4 units) (Cross listed in Physical Sciences)

Earth and Space Sciences
*3. Astrobiology (4 units) (Cross listed in Physical Sciences)
16. Major Events in History of Life (5 units)
17. Dinosaurs and Their Relatives (4 units)
*20. Natural History of Southern California (5 units) **(L/D)** (Cross listed in Physical Sciences)

Ecology and Evolutionary Biology
13. Evolution of Life (4 units)

Life Sciences
1. Evolution, Ecology, and Biodiversity (5 units) **(L/D)**
15. Life: Concepts and Issues (5 units)

2. Physical Sciences
Astronomy
3. Nature of the Universe (5 units) **(L/D)**
*5. Life in the Universe (4 units) (Cross listed in Life Sciences)

Earth and Space Sciences
1. Introduction to Earth Science (4 units)
1F. Earth Science with Fieldwork (5 units) **(L/D)**
*3. Astrobiology (4 units) (Cross listed in Life Sciences)
9. Solar System and Planets (4 units)
*20. Natural History of Southern California (5 units) **(L/D)** (Cross listed in Life Sciences)

Uneasy Bedfellows: Human Society and the Natural Environment

Foundations of Scientific Inquiry

1. Life Sciences

Earth and Space Sciences

*20. Natural History of Southern California (5 units) (**L/D**) (Cross listed in Physical Sciences)

Ecology and Evolutionary Biology

10. Plants and Civilization (4 units)

Geography

2. Biodiversity in a Changing World (5 units) (**L/D**)

*5. People and the Earth's Ecosystems (5units) (**L/D**) (Cross listed in Physical Sciences)

Life Sciences

1. Evolution, Ecology, and Biodiversity (5 units) (**L/D**)

Molecular, Cell, and Developmental Biology

80. The Green World: Plant Biology for Now and the Future (5 units) (**L/D**)

2. Physical Sciences

Atmospheric and Oceanic Sciences

1. Climate Change: From Puzzles to Policy (4 units)

1L. Climate Change: From Puzzles to Policy—Laboratory (1 unit) (**L/D**)

2. Air Pollution (4 units)

2L. Air Pollution Laboratory (1 unit) (**L/D**)

3. Introduction to Atmospheric Environment (3 units)

3L. Introduction to Atmospheric Environment Laboratory (1 unit) (**L/D**)

Earth and Space Sciences

5. Environmental Geology of Los Angeles (4 units)

*20. Natural History of Southern California (5 units) (**L/D**) (Cross listed in Life Sciences)

Geography

1. Earth's Physical environment (5 units) (**L/D**)

*5. People and the Earth's Ecosystems (5units) (**L/D**) (Cross listed in Life Sciences)

Exploring Questions of Authority, Freedom, and Morality

Foundations of Arts and Sciences

1. Literary and Cultural Analysis

Afrikaans (Germanic Languages)

40. From Oppressed to Oppressor and Beyond: Literature in Afrikaans from Preapartheid to Postapartheid Era, in English Translation.

German (Germanic Languages)

*58. Holocaust in Film and Literature (Cross listed in Philosophical and Linguistic Analysis)
*100C. War, Politics, Art (Cross listed in Historical and Social Analysis)

Honors

83W. Politics and Rhetoric of Literature (Writing II course)

2. Philosophical and Linguistic Analysis

German (Germanic Languages)

*58. Holocaust in Film and Literature (Cross listed in Literary and Cultural Analysis)

Honors Collegium

18. Trial of Socrates (Seminar)
*76. Thinking about Rights (Cross listed in Historical and Social Analysis)

Philosophy

*6. Introduction to Political Philosophy (Cross listed in Social Analysis)
22. Introduction to Ethical Theory
22W. Introduction to Ethical Theory (Writing II course)

3. Visual and Performing Arts Analysis and Practice

Film and Television (Film, Television, and Digital Media)

112. Film and Social Change

Foundations of Society and Culture

1. Historical Analysis

German (Germanic Languages)

*100C. War, Politics, Art (Cross listed in Literary and Cultural Analysis and Social Analysis)

History

*2B. Social Knowledge and Social Power (Cross listed in Social Analysis)

Honors Collegium

58. Slavery and Freedom in Greco-Roman Antiquity (Seminar)
*76. Thinking about Rights (Cross listed in Philosophical and Linguistic Analysis and Social Analysis)

2. Social Analysis

German (Germanic Languages)

*100C. War, Politics, Art (Cross listed in Literary and Cultural Analysis and Historicall Analysis)

History

*2B. Social Knowledge and Social Power (Cross listed in Historical Analysis)

Honors Collegium
*76. Thinking about Rights (Cross listed in Philosophical and Linguistic Analysis and Historical Analysis)

Philosophy
*6. Introduction to Political Philosophy (Cross listed in Philosophical and Linguistic Analysis)

Political Science
10. Introduction to Political Theory
20. World Politics
40. Introduction to American Politics
50. Introduction to Comparative Politics

Foundations of Scientific Inquiry
1. Life Sciences
Ecology and Evolutionary Biology
11. Biomedical Research Issues in Minority Communities—5 units

Honors Collegium
70A. Genetic Engineering in Medicine, Agriculture, and Law—5 units

2. Physical Sciences
Astronomy (Physics and Astronomy)
7. Astronomy and the Media (4 units)