

INSTITUTIONAL PROPOSAL

to the
Western Association of Schools and Colleges

by the
California Institute of Technology



Revised
September 2006



Institutional Proposal to the Western Association of Schools and Colleges

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Proposal to WASC by the California Institute of Technology (Caltech)

Caltech hereby proposes to do a theme-based self study for upcoming renewal of its accreditation. The themes it proposes to study are:

1. Undergraduate education
2. The Honor Code
3. Undergraduate research.

SETTING THE INSTITUTIONAL CONTEXT AND RELATING THE PROPOSAL TO THE STANDARDS

The Institutional Context

Since 1921, when the Trustees set out Caltech's mission "to train the creative type of scientist or engineer urgently needed in our educational, governmental, and industrial development," the Institute's core educational and research objectives have been integrally intertwined. In 2001, the Institute updated its mission statement to reaffirm the enduring values of our past and affirm the broader goals of the present: Caltech's mission is "to expand human knowledge and benefit society through research integrated with education. We investigate the most challenging, fundamental problems in science and technology in a singularly collegial, interdisciplinary atmosphere, while educating outstanding students to become creative members of society." This is achieved by conducting instruction in an atmosphere of research, accomplished by the close contacts between a relatively small group of students (approximately 900 undergraduate and 1,200 graduate students) and the members of a relatively large faculty (approximately 280 professorial faculty, 620 research faculty, and 570 postdoctoral scholars). Course work is rigorous, anchored for undergraduates by an extensive core curriculum in the sciences and humanities and an intensive, cumulative program of study in their disciplines of interest, with all students highly encouraged to participate in research. Undergraduate education is thus designed to provide an in-depth exposure to a wide spectrum of intellectual pursuits, and to actively combine learning inside and outside the classroom.

This WASC reaccreditation comes at a very timely juncture for Caltech, as a new president, Dr. Jean-Lou Chameau, arrives to lead the Institute. Moreover, our students, faculty, and administrators have been increasingly focused on student education, student life, the Honor Code, and broader learning opportunities on campus over the past years, especially at the undergraduate level. Since the last WASC accreditation, Caltech has created the Council for Undergraduate Education (CUE), a new campus body charged with overall responsibility for the education of undergraduates at Caltech, hired its first full-time Vice President for Student Affairs, and undertaken new initiatives to support student success, retention, education, and diversity. The CUE, led by the Vice Provost, consists of the chairs of all the faculty committees concerned with undergraduate education, student representatives, the Dean of Students, Master of Student Houses, Vice President of Student Affairs, and other Student Affairs' representatives.

For our last reaccreditation, Caltech chose three primary areas for our review: Undergraduate research, the Honor Code, and graduate education. With the increased attention in recent years given to both undergraduate education and the state and applicability of the Honor Code, the Institute has chosen to renew the themes of undergraduate research and the Honor Code, as well as add the specific theme of undergraduate education, as will be discussed below.

The WASC team made several recommendations that directly affect the undergraduate program. The issue of diversity (of both the faculty and the student body) was identified as a challenge, and this continues to present a challenge for Caltech. After an initial increase, the number of women in the undergraduate body has flattened out at approximately 30% . The number of underrepresented minority undergraduate students remains very low and is a great concern for the Institute. In the past two years, the Institute has revamped its entire admissions office and recruitment processes to improve our recruitment of all students, and in particular, female and underrepresented minority students. There has been significant progress in the recruiting and retention of women and minority faculty, and this provides a somewhat better situation for recruiting students. More generally, the 1998 WASC Visiting Committee encouraged Caltech to continue its active recruiting through faculty involvement and competitive financial aid packages.

With regard to graduate education, the WASC team made several recommendations including the goals to increase diversity of the student body. Since 1998, the Institute has increased the applicant pools and the matriculation rates of women and minorities. In 2005-2006, female graduate students accounted for 30% of the graduate population, up from 23% in 1997-98, and underrepresented students accounted for five percent of the graduate population, up from four percent in 1997-1998. In addition, the Institute has initiated and expanded several graduate recruitment and retention programs for underrepresented students, including a graduate preview program and the MURF (minority summer research fellowship) program. We have allocated funds for targeted graduate fellowships. Other programs specifically support graduate women, including the Women Mentoring Women program, which pairs female graduate students and postdoctoral scholars in a mentoring program.

The WASC team encouraged the Institute to improve the ability of international graduate students working with undergraduates to communicate adequately in English. Since 1998, students and administrators created the Caltech Project on Effective Teaching, the TA Handbook now features sections for international TAs, and the Hixon Writing Center has also initiated programs for international students/ESL participants. WASC also recommended that the Institute improve the tracking of graduate students following graduation from Caltech. Since 1998, the Caltech Alumni Association has initiated some surveys of alumni, and in 2005-2006, the Institute initiated its first full exit survey of undergraduate and graduate students. Apart from the primary topics, the WASC committee also recommended that the Institute continue to support the postdoctoral populations. Since 1998, the Institute has provided additional infrastructural support to postdoctoral scholars through the Human Resources office and the Career Development

Center, and the Caltech Postdoctoral Association continues to partner with offices across the campus. Finally, the WASC committee recommended that we review the humanities and social science curriculum. The HSS division has conducted a comprehensive review, which has resulted in numerous changes to better focus the curriculum, highlight research areas, and serve undergraduate needs, including the addition of minors in select areas.

The Themes and WASC Standards: Meeting our Educational Mission

The three themes, which have been selected for our current reaccreditation, are at the core of Caltech's undergraduate educational mission.

The common core curriculum and intensive course of study within the options (majors), characterized by the close interaction of faculty and students and the low faculty to student ratio, along with the undergraduate research enterprise, are primary avenues by which Caltech ensures that it is meeting its educational objectives. We believe that most students learn best when they *do* science or engineering and also study it in the classroom, when they can apply what they learn in the classroom to real-world research questions. In the first year of study, students are assigned faculty advisors based on their very rough areas of interest (engineering, physics, etc). Near the end of the first year, students select an option, and during the second year they begin to specialize. Each student is then assigned a faculty advisor, within the option that they select. This is normally done without regard to a student's special interests (beyond the option specialization), but students can request a change of advisor if they desire. Although the average advising load across Caltech is approximately 3-4 students per faculty member, in some of the more popular options the advising load can be as high as 10-12 students per faculty member (excluding freshmen advisees).

Teaching assignments, course evaluations, and the content of option requirements are the responsibility of the individual divisions at Caltech. Most divisions delegate the responsibility for teaching assignments to the Executive Officer for each option, who is the faculty member responsible for the undergraduate (and also graduate) degree program in a given area. Teaching evaluations are handed out in all undergraduate courses and are returned to the Division Chair, who is responsible for faculty evaluation and raises. A new online course survey is currently being developed for courses that are part of the core curriculum, which provides more detailed feedback to instructors. Option requirements are established by the faculty responsible for the given degree program and consist of a set of required courses as well as recommended courses. Each course at the Institute is assigned a number of units corresponding to the total number of hours per week devoted to that subject, including class work, laboratory, and the normal outside preparation. We will use the WASC review as an opportunity to strengthen the quality of undergraduate teaching at Caltech, and to assess the substance and impact of the undergraduate workload on the educational experience, linking both objectives to the desired learning outcomes we anticipate for our students.

Caltech is uniquely positioned to offer students excellent research opportunities and classroom experiences that promote the integration of education and research. The Institute advertises the availability of research opportunities to prospective students, and most students choose to matriculate at Caltech, in part, because of the chance to do

undergraduate research. In fact, by the time they graduate, most students have had a research experience.

Most students gain research experiences through the Summer Undergraduate Research Fellowships (SURF) program, which serves continuing undergraduate students. The program is modeled on the grant-seeking process that includes collaboration between students and mentors prior to the students writing and submitting research proposals as part of their applications. A faculty committee reviews the proposals, and awards are made on the basis of reviewer recommendation and available funding. About 80% of proposals submitted are accepted. Students carry out the work over a 10-week period, and at the conclusion, they submit a technical paper and give an oral presentation at SURF Seminar Day, a symposium modeled on a professional technical meeting. The benchmark for SURF projects is the potential for publication in the refereed literature, and about 20% of SURF students become co-authors of articles, contribute to significant reports, or present their projects at conferences. Each year more than 250 Caltech students are awarded SURF fellowships, about 35% of the eligible student body, with about 65-70% of students having done at least one SURF project by the time they graduate. As with any fellowship, students receive wages for the ten-week period; in 2006 the payment was \$5,000.

This program, along with several other undergraduate research programs with similar requirements, is administered by the Student-Faculty Programs Office (SFPO), and with the establishment of this office, undergraduate research has been institutionalized as one of Caltech's core functions. The last WASC review team noted that "the SURF program is an essential part of the Caltech undergraduate research experience and therefore its future must be assured." The report recommended that "efforts be continued to increase the endowment of the SURF program." (WASC report p 7). In response, the Institute has made the SURF program one of the priorities in the current capital campaign with a goal of increasing the SURF endowment by \$10 million. At this time, we have achieved 72% of the goal with the objective of completing the SURF endowment by December 2007. This fundraising effort, together with the stability provided by the SFPO, provides resources and structures for sustainability of the undergraduate research enterprise at Caltech.

Caltech also provides several other avenues for research experiences that are integrated within option offerings. Of the 27 majors offered to students, 18 offer academic credit for undergraduate research, and 19 offer senior thesis options. Students majoring (or double majoring) in English, History, and History and Philosophy of Science are required to do academic year research, and students in the History and Philosophy of Science and in Philosophy are required to do senior theses. While no other options require either research or a senior thesis, the expectation is that most Caltech undergraduates will have participated in independent research activities before graduation. We will use the WASC review as an opportunity to review undergraduate research in the context of the questions formulated after extensive discussions (see the last section). Through the WASC process, we believe that we will strengthen and better assess the impact of undergraduate research on student learning outcomes at Caltech.

Through close collaboration with students, faculty, and administrators, Caltech also aims to create more broadly an intellectually stimulating and emotionally supportive learning environment for students. Caltech offices, Faculty Board committees, which include faculty, students, and staff, periodic faculty-student conferences, and student exit surveys provide input, oversight, and assessment of the quality and impact of the undergraduate educational experience. Caltech offices provide co-curricular and extra-curricular opportunities, including participation in arts, athletics, internships, fellowships, community service, study abroad, and other learning and developmental opportunities outside the classroom, for students to develop skills for academic, professional, and personal success at and beyond Caltech. Three terms of physical education are required, and intercollegiate and intramural sports are encouraged as well as participation in the creative and performing arts. In short, every effort is made to provide undergraduate students with well-rounded, integrated programs that will not only give them sound training in their professional fields, but that will also develop character, intellectual breadth, and physical well-being. Key to these aims is Caltech's Honor Code.

For almost 100 years, the Honor Code has been central to undergraduate student life at Caltech. Now summarized in the statement "No member of the Caltech community shall take unfair advantage of any other member of the Caltech community," this code is cherished by our undergraduates. It allows for a great deal of student freedom and has been taken very seriously throughout Caltech's history. Alumni report that the Honor Code was one of the most valued aspects of their undergraduate experience.

Because it takes for granted that students trust each other and are to be trusted by other members of the community, the Honor Code has a broad influence on academic life. For instance, faculty are not permitted to proctor examinations. Students take most quizzes and exams in their campus residences or in the library, and are expected to follow the time limits established by the professor. Often students turn in their exams, and the exams of friends, in open boxes outside professors' offices. Students are encouraged to collaborate on homework and yet are trusted to turn in their own work.

The Honor Code handbook emphasizes that in addition to covering students' academic behavior, the Honor Code is binding on students in "their non-academic relations with any member of the community." The Honor Code's prohibition on taking unfair advantage of others thus governs almost all of a student's relations with others at Caltech; hence its centrality to student life and consciousness.

Since the last WASC review, violations of the Honor Code now are handled by two separate groups. Academic violations are dealt with by the Board of Control, a student group that makes recommendations to the Dean of Students. The Conduct Review Committee, a group of students, faculty, and administrators, handles non-academic violations of the honor system as well as policy violations. The Deans also adjudicate matters related to Honor Code violations.

Because the code is so valued by our undergraduates and has such a fundamental influence on life at Caltech, it is essential that it be examined regularly. We will use the WASC review as an opportunity to examine how well the code is working today, and to determine whether there are ways we could improve the current system, and perhaps expand its functioning.

Process of Proposal Development

This proposal was developed after deliberations by the Council for Undergraduate Education and other bodies. While the CUE made the final decision on the accreditation topics, these choices for study reflect the key agenda items identified and discussed at Student-Faculty Conferences held over the last several years, relate to priorities identified by standing Faculty Board committee discussions and reports, and address our systems of course evaluations and teaching assignments. Undergraduate research, the Honor Code, and undergraduate education, with a specific focus on the educational effectiveness and quality of undergraduate teaching, are topics that are highly salient to all Caltech constituencies, and are defining features of a Caltech education. As outlined above, they are all closely related to the educational outcomes we hope our students will leave Caltech with.

FRAMING THE REVIEW PROCESS TO CONNECT THE CPR AND EER

Overview and Goals for the Accreditation Review Process

The three topics for study in this review were chosen out of a long list of potential topics by the Council for Undergraduate Education (CUE). While two of the three topics chosen are the same as those in the last WASC review, we believe we will benefit greatly in deepening and extending our focus, with attention to institutional capacity, resources, and assessment mechanisms, as well as to educational outcomes and effectiveness.

The WASC Committee on Undergraduate Education, with membership of six faculty and three undergraduate students, is chaired by Professor Richard Murray, former Division Chair (dean) of Engineering and Applied Science. The faculty representatives are recognized by both the students and the administration for their teaching abilities and commitment to undergraduate education. The undergraduates on the committee are members of the Academic Research Committee (ARC).

The ARC is a committee established by the student body to help improve education and research opportunities for Caltech. ARC is also responsible for organizing the bi-annual Student-Faculty Conference, which will be an integral part of the data collection and decision making process.

The WASC Undergraduate Research Committee is chaired by Carolyn Ash, Director of Student-Faculty Programs. Other members include four faculty who are active undergraduate research mentors and who represent faculty committees concerned with undergraduate research and education. Four students, members of ARC and SURF program participants, also serve.

Barbara Green, Associate Dean of Students, chairs the WASC Honor Code Committee comprised of two faculty members, including a former Vice President for Student Affairs, and three student leaders.

The committees have identified important questions and issues most salient to Caltech's institutional goals for the academic experiences of our students. These questions will provide the basis for our self assessment, determine the goals of our accreditation process, and project the expected outcomes.

The Capacity and Preparatory Review (CPR) will be done in Fall 2008, and the Educational Effectiveness Review (EER) in Spring, 2010. The final report will be written under the guidance of the CUE and the chairs of the three subcommittees.

APPROACH FOR THE CAPACITY AND PREPARATORY REVIEW

In preparation for the CPR, we will present summaries of data gathered from our self-study, the analysis of those data, and our recommendations for improvements. The data will include the results of surveys with key indicators as listed in the descriptions below of the individual topics. As discussed in more detail below, we will make use of a variety of data gathering and analysis systems already available at Caltech, as well as develop and implement new ideas for collecting data and providing feedback to the campus community. We anticipate that our initial recommendations will include new processes, incentives, and analysis tools that can be implemented and tested during the Education Effectiveness Review. The data, records, and reports developed throughout the process, and constituted as parts of a comprehensive portfolio, will provide evidence of our efforts and will build the foundation for continuing improvements in these areas.

The self-study will be carried out in three phases.

Phase I: (October 2006 to March 2007) – Data Collection

Caltech employs several mechanisms for feedback on its education and research program, including ABET accreditation for its engineering curriculum, external visiting committees for each division, and bi-annual Student-Faculty Conferences. In many cases, information on undergraduate education has been collected and discussed in these forums, and we will make use of this collective wisdom.

Caltech surveys incoming freshmen and outgoing seniors each year. The surveys for 2006 have been updated to include questions on some of the issues raised by the WASC Undergraduate Education Committee, and will be amended for 2007 and 2008 to include additional questions that arise in the WASC UEC as the self-study progresses and also questions raised by the Undergraduate Research Committee and the Honor Code Committee.

In addition to surveys of an entire undergraduate class, Caltech also uses course evaluations for individual classes. A new online course evaluation is being used for the core curriculum, and this can be used to collect data regarding to those specific courses. Data from both the online surveys and the paper surveys will be available to the committee. We will use the courses in our core curriculum to evaluate the development and assessment of learning outcomes that are tied to Institutional objectives.

The Honor Code and Undergraduate Research Committees will administer targeted surveys to undergraduates that include questions about the specific topics. (The Honor Code survey has already been prepared by the current Board of Control secretary, one of the members of the Honor Code Committee.)

We will gather data from the Registrar to help understand student workload issues, course scheduling, and related issues to analyze the courses, including academic year research courses taken for credit, taken by Caltech undergraduates over the past several years. We will also be able to determine whether students are doing research in their majors (or not), and whether there is correlation between research and academic achievement. We will review academic year course load and research credit against leaves of absence to determine burnout effects.

We plan to hold a series of focus groups of students and faculty on the topics of the Honor Code and Undergraduate Research. We aim to determine student expectations for their research experiences and whether those expectations are being met. We also plan to talk with students who have not done research to determine whether they chose not to do research (why not?) or whether opportunities were not available to them. The Honor Code Committee aims to solicit thoughts about the issues raised by that committee through its early discussions.

The three WASC committees will communicate with other comparable institutions to benchmark strengths and weaknesses in each area. In particular, the Honor Code Committee will compare the wording, application, and functioning of other codes with our own to generate ideas to strengthen and broaden the Honor Code's effectiveness. This committee is particularly interested to know how well the codes of other schools apply in non-academic as opposed to academic matters.

Phase II: (April 2007 to December 2007) – Campus Discussion

The bi-annual Student-Faculty Conference to be held in spring 2007 is a key element of the campus discussion phase for all three themes. This conference is organized by the students and generates substantive discussion and debate. The output of the conference is a report that includes recommendations of areas for further improvement, which will be incorporated into our self-study findings and recommendations.

Further broad institutional discussion will occur as the WASC UE and UR committees discuss data analysis and preliminary findings with several other groups on campus, including:

Academic Policies Committee - The Academic Policies Committee is responsible for making a continuous study of the Institute's academic policies. It is not to be limited in any way concerning the subjects that it may take under consideration for discussion and recommendation to the Faculty Board.

Academics and Research Committee - This undergraduate committee serves as an objective liason between students and faculty, to facilitate effective communication, and improve the quality of learning at Caltech.

Core Curriculum Steering Committee (CCSC) - The CCSC coordinates and supervises content and teaching of the Core Curriculum. The committee also monitors the performance of the Core Curriculum courses and devises improvements in the core. Any proposed change in Core Curriculum courses must be reviewed and approved by the the CCSC before it is considered by the Curriculum Committee and the Faculty Board.

Curriculum Committee - The Curriculum Committee is responsible for general supervision over the undergraduate curriculum. All proposed changes in the undergraduate program and all proposed changes in courses, including the presentation of new courses that undergraduate students will normally take, are considered by this committee for recommendation to the Faculty Board.

Institute Academic Coordinating Council (IACC) - The IACC consists of the Division Chairs of Caltech's six academic divisions along with the President and Provost. This committee is ultimately responsible for adminisitering all teaching activities at Caltech.

Undergraduate Academic Standards and Honors (UASH) Committee - This faculty committee is responsible for awarding a variety of academic honors and for ensuring that a consistent set of standards and rules is applied in academic matters involving undergraduates.

Recommendations coming from these committees will be reported to the Faculty Board, and may result in a faculty discussion or become an agenda item for a separate all-faculty meeting.

Phase III: (January 2008 to June 2008) – Findings and Recommendations

Based on the data collected in Phase I and the discussions with the various committees and campus constituencies in Phase II, the final phase of our self-study will be to formulate findings and recommendations. These findings and recommendations will be provided to the Caltech administration and the Faculty Board for discussion and development of implementation strategies. The timing of this phase is chosen to allow ample discussion during the academic year, so that recommendations can be acted upon in the 2008-09 academic year.

Summaries of the data collected in Phase I, the analysis and discussions of the data in Phase II, and the recommendations developed in Phase III will serve as the basis for our Preparatory Review.

Outcomes from the CPR:

- Identify root causes for the high undergraduate workload of many Caltech students.
- Based on these root causes, implement new methods for providing advice to students as well as improved processes for scheduling academic work that address the issues listed above.
- Implement processes to monitor undergraduate workload on a continuing basis to allow periodic evaluation of student workload and refinement of advising, scheduling, and student health programs.
- Determine optimal amount of undergraduate research within the curriculum.
- Determine correlations between undergraduate research and academic achievement, retention, development of curiosity/creativity, burnout rate, and overall student satisfaction.
- Develop a clear picture of the ways in which the Honor Code influences and affects student academic and social interactions.
- Identify the core values of the campus in general and the students in particular around the Honor Code.
- Determine whether the structures in place to support and implement the Honor Code are effective.

PREPARATION FOR THE EDUCATIONAL EFFECTIVENESS REVIEW

Implementation (Spring 2008 to Fall 2009)

Through the CPR process we will have gathered extensive data and information about Caltech in general and the three themes in particular following broad campus discussions involving all constituencies. The data, reports, and discussion notes will provide the base for the recommendations and strategic decisions for improvements to the undergraduate experience. The WASC capacity review will also provide important feedback to deepen our focus as we begin implementing the recommendations in preparation for the EER to be held in the spring 2010.

We will use this evidence base to assess the foregoing process and to develop tools and instruments to continue an evaluative process through the EER preparation and beyond the EER into the future of the Institute.

We expect the following outcomes from the EER:

- Establish new processes and tools for providing feedback to instructors to improve their teaching effectiveness and enhance learning outcomes.
- Recommend and implement incentive structures that reward effective teaching.
- Identify and establish one or more new mechanisms for teaching methods to be disseminated to Caltech faculty. Closely tie these methods to specific learning outcomes that are identified by the faculty and students.
- Build on the strengths of Caltech's undergraduate research programs to deepen the experiences toward the broader integration of research and education.

- Implement mechanisms to strengthen mentoring of students as part of the research experiences, and more broadly.
- Campus-wide understanding regarding the Honor Code's application to non-academic matters and the way we treat each other.
- Effective education and communication about the Honor Code to all campus constituencies.
- Increased adherence to the Honor Code.

Implementation will be accomplished by the appropriate constituencies, including faculty, students, and staff, following the strategies developed.

The remainder of the proposal elaborates on the questions to be investigated under each of our three chosen themes. The questions posed for each of the topics have arisen periodically over the past years, and they will be addressed systemically through the data gathering and capacity review, and subsequent recommendations for change will be structured to enable assessment through the educational effectiveness review.

Undergraduate Education

Teaching Quality

While there are many excellent teachers at Caltech, there are also examples of courses that are poorly taught, and instructors who could do a much better job in their teaching performance and in the articulation of the expected learning outcomes. At the present time, there are relatively few resources available for Caltech faculty who want to improve their teaching and limited feedback mechanisms for improving teaching effectiveness. We have identified several aspects of teaching quality that we believe should be further studied:

Course Feedback - How do faculty get feedback on their courses and discover whether they have achieved their desired learning outcomes, both during the term and after the term? Can course surveys, web sites, student lunches, and other mechanisms be used to provide instructors more information about whether the students are understanding the material and whether the teaching methods are effective?

Teacher Training - How can Caltech usefully provide information to teachers about best practices for effective teaching, available resources and technologies, and integration of the honor system into their courses?

Faculty Incentives - Traditional teaching incentives (awards, salary increases) typically reward the best teachers but may not influence the bulk distribution of teaching. Are there incentives that can be provided to increase the average quality of teaching across the campus? Are there disincentives that can be provided to motivate those faculty that intentionally neglect their teaching responsibilities? How can faculty be assigned to the types of courses that best fit their style and abilities?

Learning Outcomes - How might Caltech explore new methods of teaching, such as active learning, lecture-less classes and project-based courses - that improve teaching effectiveness and enhance specific learning outcomes? How can we demonstrate expected learning outcomes? What new technologies might we consider for incorporation into courses and how do we provide information about these technologies to interested faculty?

Undergraduate Workload

Another common area of concern at Caltech is the workload of the undergraduates. On the one hand, many Caltech courses are notorious for requiring more work than the number of units would indicate. At the same time, some Caltech undergraduates take a large number of units each term, creating a situation in which they have little time to integrate the material they are learning or pursue activities outside of class (including research opportunities at Caltech). Some possible aspects for further study are:

Course Underunitting - How can the number of units required for a course be accurately determined and assigned to each course? Will students be able to finish their graduation requirements if the units are increased appropriately?

Work Schedule - The timing of homework, labs, exams, and courses can often lead to situations in which students must choose between completing their work and attending classes and labs. Can methods for resolving these timing conflicts be identified and implemented?

Class Attendance - In some courses, the attendance in class is lower than 50%. Are there reasons for this lack of attendance and should lectures be restructured to encourage greater attendance?

Student Health - How is the Caltech workload affecting student health (mental and physical)? Are there changes that could be made that would provide less stress on students while maintaining Caltech's rigorous educational program?

Undergraduate Research

Are we delivering to students what they hoped to get when they accepted their admission to Caltech? In particular, do those students who wanted to participate in research when they came to Caltech have the opportunities they expected?

Caltech is unique in that we have essentially one PhD-holding individual, including faculty, research staff, and postdoctoral scholars, for every undergraduate student, which should allow any student who wants to do research to find an experienced mentor. However opportunities for research are limited in some departments, especially in engineering, the major that attracts almost half of our undergraduates.

Specific questions that may help us to address this issue are: How do/can we provide good research opportunities for all our students? How many students seek opportunities

in departments outside their majors because of limited opportunities in their majors? How many students who want to do research are unable to find good opportunities? In what ways do divisions advertise their academic year research opportunities? How many students do research for credit? Senior thesis?

Should we provide opportunities for students to do more research during the academic year? Would it be possible given faculty commitments and the tight academic curriculum?

Is the present system what we want for our students? Could summer research (SURF) be integrated into the academic program? Is research during the academic year feasible for most of our undergraduates? Should the formal required courses take precedence, or could research be substituted for required courses during the academic year? Should research be a requirement for graduation? Do we have the facilities and human resources to supervise research for a larger fraction of our students than we now supervise? Is there an advantage to standardizing the way options handle research opportunities? Is standardization even possible?

Is there causality between undergraduate research and academic success? How do we know? What elements contribute to the integration of research and education?

Past exit surveys have raised concerns that Caltech students leave the Institute feeling less academically self-confident than when they arrived, an unsatisfactory outcome if it adversely affects our mission to produce the next generation of leading creative scientists and engineers. This suggests that we should look at approaches that catalyze students' intellectual curiosity and engagement, elements that would balance the occasionally demoralizing effect of class assignments that sometimes require more brute force than creativity.

Research both at Caltech and nationally has shown a positive correlation between students doing research and academic success. At the 2005 Caltech commencement, 79% of the students receiving honors and 89% of the students receiving prizes at graduation had done SURF projects. The average GPA of SURF students is greater than 3.5. However, from the studies in this area, it is usually not clear whether research improved academic success or whether high achieving students self-select into research opportunities. A recent study of academic achievement of underrepresented students at Caltech suggests that early exposure to a research experience contributes to student persistence in the field, and to academic success more broadly defined (e.g., retention and engagement, rather than an increase in GPA).

Attentive mentoring is a key element in undergraduate research, and has also been identified as a critical factor in student success. How can students identify those mentors who can/will help them develop intellectual maturity and unlock creativity? Can we provide training and support for mentors to help them better integrate undergraduates into the community of scholars and researchers?

Is there a correlation between doing research and increasing students' intellectual creativity and curiosity? Does research help unlock creativity?

Honor Code

How effective is the honor system in guiding behavior in academic matters?

What percentage of students, faculty, etc., follows the Honor Code on academic matters? How do individuals perceive their peers following the Honor Code? What are the main ways students violate the Honor Code, when they do? What is the incidence of plagiarism, over-collaboration, and copying? How can enforcement of the Honor Code be enhanced? What procedural changes would improve the BOC and the CRC? What kinds of assessment mechanisms are appropriate ways to review the educational effectiveness of the honor system in the academic and non-academic realm?

How does the Honor Code influence student behavior in the non-academic realm?

Do students consider the principle of the Honor Code as they interact with their peers? Is it followed in activities such as room picks, house elections? Is it considered when students relate to others from different cultural backgrounds? Is there anything besides refraining from "taking unfair advantage" that guides the way we treat each other?

What are the obligations of all members of the Caltech community under the honor system?

How should the various segments of campus treat each other? How can we get campus constituencies besides students to understand how the honor system applies to them and to how they treat others?

How can we improve communication about and trust in the honor system by all those who study and work at Caltech?

What is the perception of the BOC and CRC? What kind of education and communication would be most effective in creating a broader understanding and acceptance of the Honor Code throughout campus? How is the honor system linked to the learning outcomes we expect of our students?

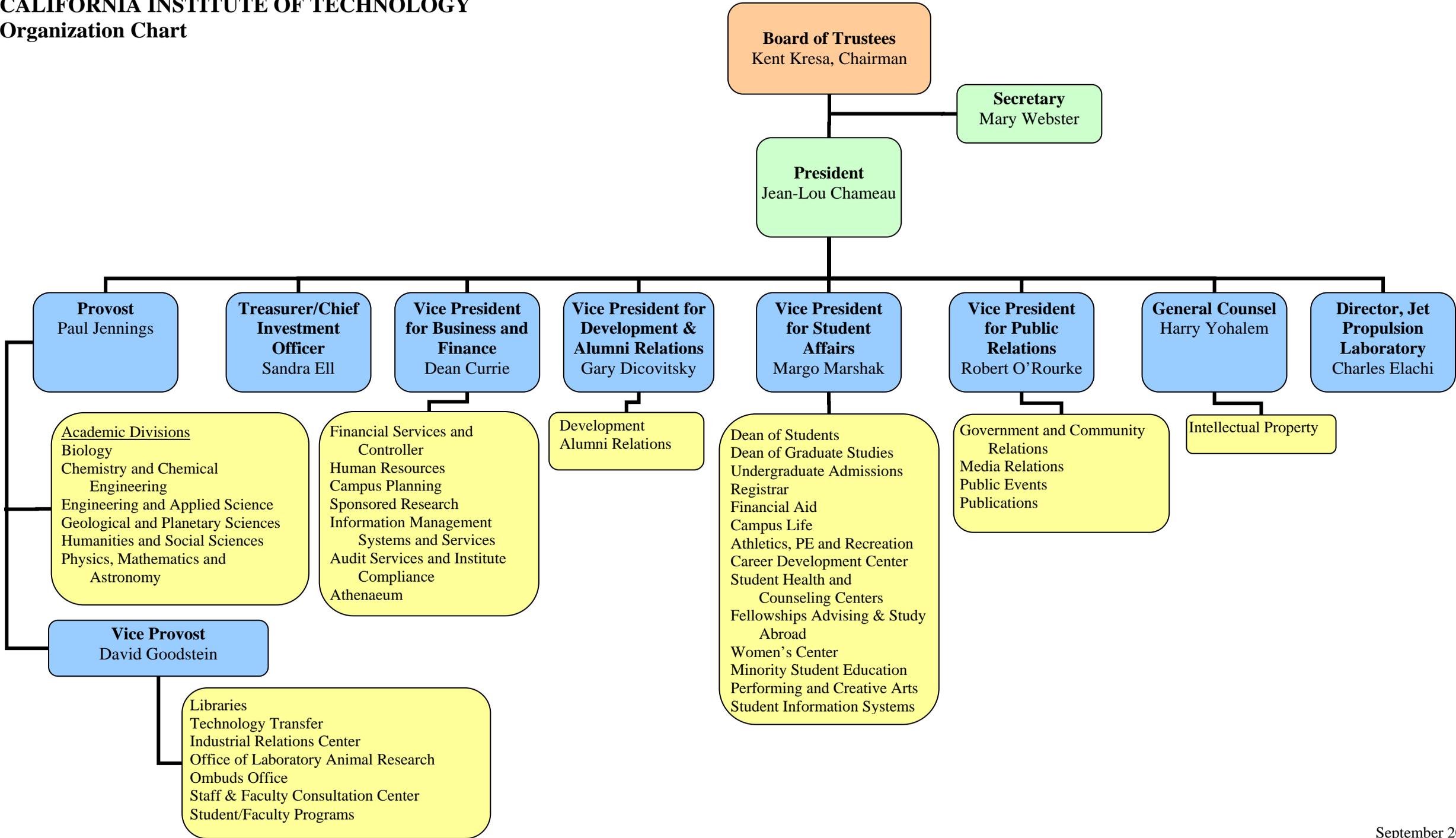
Conclusion: Next Steps towards the Engagement of Key Constituencies

We look forward to commencing the reaccreditation process on our campus. The effort will lead us through a significant process of exploration, consultation, self-evaluation, and campus discussions that will strengthen and improve the undergraduate experience. We are guided in this process by the Institute's commitment to engage all key Caltech constituencies in the review phases. Our next steps are to continue the engagement of key constituencies at multiple levels, including the senior Institute leadership, faculty, students, administrators, and alumni. The CPR and EER processes, as we have outlined them above, will create opportunities for campus-wide coalitions of all constituencies, and ensure feedback, assessment, and integration of new initiatives. As part of these processes, and to assure the visibility of these efforts, we will place many of our materials for the WASC process as well as our progress on reaching our goals on the Caltech

website, CUE and the WASC committees will issue progress reports and updates to the Caltech community, and the Institute's senior leadership will communicate periodically to the community on our goals and progress as well.

We expect this focused and structured work will contribute to the achievement of our desired educational and learning outcomes for our students. As a research Institute, we are highly committed to the core values of premier teaching in the context of research, educating and welcoming our talented students to the community of scholars and researchers as colleagues, and fostering and deepening the culture of respect and honesty throughout Caltech. Through this WASC reaccreditation process, we anticipate strengthening our capacity and ability to support these activities, promoting a rich and dynamic academic and research culture, and enabling our students to flourish here at Caltech and beyond.

CALIFORNIA INSTITUTE OF TECHNOLOGY
Organization Chart



California Institute of Technology

Report on Audited Financial Statements

For the Years Ended September 30, 2005 and 2004

Available online at <http://finance.caltech.edu/FS_04_05.pdf>

SUMMARY DATA FORM

- 1. Year founded: 1891
- 2. Calendar Plan: Quarter
- 3. Degree levels offered: Bachelors, Masters, Engineer, Doctorate
- 4. Sponsorship & control: Caltech is a privately supported research institution and university located in Pasadena, California. The Institute is governed by a self-perpetuating Board of Trustees comprised of 46 elected Trustees (including the President as ex officio Trustee) and a variable number of Senior Trustees.

5. Last reported IPEDS data for enrollment by ethnicity and gender

IPEDS definitions used for students. Data reported as of

| Enrollment by Category | Total FTE of Students | Total Headcount of Students | Non-Resident Alien Headcount | Black, Non-Hispanic Headcount | Am Indian/Alaska Native Headcount | Asian/Pacific Islander Headcount | Hispanic/Latino Headcount | White/Non-Hispanic Headcount | Ethnicity Unknown Headcount | Total Male Headcount | Total Female Headcount |
|------------------------|-----------------------|-----------------------------|------------------------------|-------------------------------|-----------------------------------|----------------------------------|---------------------------|------------------------------|-----------------------------|----------------------|------------------------|
| Undergraduate | 913 | 913 | 64 | 7 | 4 | 301 | 61 | 452 | 24 | 636 | 277 |
| Graduate | 1,256 | 1,256 | 475 | 14 | 2 | 113 | 39 | 591 | 22 | 887 | 369 |
| Non-degree | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 2,169 | 2,169 | 539 | 21 | 6 | 414 | 100 | 1,043 | 46 | 1,523 | 646 |

Note: No part-time or non-degree students.

6. Last 3 years IPEDS data for 6-year cohort graduation rate by ethnicity & gender

Data provided below are for freshmen and transfer students combined. Separate analysis is not available for transfer students.

| Freshman Cohort Year (Entering Fall) | Graduation Year | Overall Graduation Percentage | Non-Resident Alien % | Black, Non-Hispanic % | Am Indian/Alaska Native % | Asian/Pacific Islander % | Hispanic/Latino % | White/Non-Hispanic % | Ethnicity Unknown % | Male % | Female % |
|--------------------------------------|-----------------|-------------------------------|----------------------|-----------------------|---------------------------|--------------------------|-------------------|----------------------|---------------------|-----------|-----------|
| 1999 | 2005 | 90 | 100 | N/A | N/A | 93 | 64 | 91 | N/A | 91 | 89 |
| 1998 | 2004 | 89 | 73 | 100 | 50 | 95 | 91 | 89 | 67 | 90 | 86 |
| 1997 | 2003 | 88 | 85 | 50 | 0 | 91 | 86 | 91 | 0 | 89 | 86 |
| Averages | | 89 | 86 | 75 | 25 | 93 | 80 | 90 | 33 | 90 | 87 |

7. N/A

8. Current faculty * Total FTE of faculty: 390 as of November 1, 2005, as reported to IPEDS (Human Resources)

| | | | | | | | |
|-----------------------------|-----|-----------------|-----|--------|-----|----------|-----|
| Full-time faculty headcount | 368 | % Non-Caucasian | 23% | % Male | 83% | % Female | 17% |
| Part-time faculty headcount | 67 | % Non-Caucasian | 31% | % Male | 84% | % Female | 16% |

*Note: "Faculty" are defined as those with faculty status and/or whose primary occupation is instruction/research/public service.

9. FTE Student to FTE Faculty Ratio: 3.2 : 1 Source: As of November 1, "Instructional" faculty for AAUP and U.S.News

10. Finances

A. Annual Tuition Rate: Undergraduate \$27,309 Note: Tuition is the same for resident and non-resident students.
Graduate \$27,309

B. Total Annual Operating Budget: \$500,000,000

C. Percentage from tuition and fees: 3%

D. Operating deficit(s) for past 3 years: Excess of revenues
over expenses
FY2005 none \$178,377,000
FY2004 none \$49,316,000
FY2003 none \$98,076,000

E. Current accumulated deficit: none

F. Endowment Market value at 9/30/06 \$1,520,478,000

11. Governing Board Size 46 elected Trustees (including the President as ex officio Trustee) and a variable number of Senior Trustees.
As of May 31, 2006, there are 42 Trustees (voting members of the Board), 15 Senior Trustees (voting members of the Board), and 17 Life Trustees (non-voting members).

Meetings/year: The full Board meets five times a year. The Executive Committee holds an additional three meetings.

12. Off campus locations None

13. Electronically-mediated programs None

CALIFORNIA INSTITUTE OF TECHNOLOGY

WASC Data Element 1 -- Headcount Enrollment by Level (Fall Term)

As reported to IPEDS (Fall Enrollment)

| | Total Headcount Enrollment | Lower Division Headcount | | Upper Division Headcount | | Total Undergraduate Headcount | | Graduate Headcount | | Post-Baccalaureate (Non-Graduate) Headcount | | Non-Degree Headcount | | Total FTE Enrollment |
|-----------|----------------------------------|--------------------------------|-----|--------------------------------|-----|-------------------------------------|-----|-----------------------|-----|---|----|-------------------------|----|-------------------------|
| | | # | % | # | % | # | % | # | % | # | % | # | % | |
| Fall 2001 | 2,058 | 439 | 47% | 503 | 53% | 942 | 46% | 1,116 | 54% | 0 | 0% | 0 | 0% | 2,058 |
| Fall 2002 | 2,120 | 486 | 52% | 453 | 48% | 939 | 44% | 1,181 | 56% | 0 | 0% | 0 | 0% | 2,120 |
| Fall 2003 | 2,172 | 469 | 53% | 422 | 47% | 891 | 41% | 1,281 | 59% | 0 | 0% | 0 | 0% | 2,172 |
| Fall 2004 | 2,171 | 422 | 47% | 474 | 53% | 896 | 41% | 1,275 | 59% | 0 | 0% | 0 | 0% | 2,171 |
| Fall 2005 | 2,169 | 455 | 50% | 458 | 50% | 913 | 42% | 1,256 | 58% | 0 | 0% | 0 | 0% | 2,169 |

CALIFORNIA INSTITUTE OF TECHNOLOGY

WASC Data Element 2 -- Headcount Enrollment by Status and Location (Fall Term)

As reported to IPEDS (Fall Enrollment)

| | Total Headcount Enrollment | Full-Time | | Part-Time | | On-Campus Location | | Off-Campus Location | |
|-----------|----------------------------------|-----------|------|-----------|----|-----------------------|------|------------------------|----|
| | | # | % | # | % | # | % | # | % |
| Fall 2001 | 2,058 | 2,058 | 100% | 0 | 0% | 2,058 | 100% | 0 | 0% |
| Fall 2002 | 2,120 | 2,120 | 100% | 0 | 0% | 2,120 | 100% | 0 | 0% |
| Fall 2003 | 2,172 | 2,172 | 100% | 0 | 0% | 2,172 | 100% | 0 | 0% |
| Fall 2004 | 2,171 | 2,171 | 100% | 0 | 0% | 2,171 | 100% | 0 | 0% |
| Fall 2005 | 2,169 | 2,169 | 100% | 0 | 0% | 2,169 | 100% | 0 | 0% |

CALIFORNIA INSTITUTE OF TECHNOLOGY

WASC Data Element 3 -- Degrees and Certificates Granted by Level

As reported to IPEDS (Completions)

| | Total Degrees Granted | Bachelor | | Master | | Doctor | | Other | |
|-----------|-----------------------------|----------|-----|--------|-----|--------|-----|-------|----|
| | | # | % | # | % | # | % | # | % |
| Fall 2001 | 484 | 204 | 42% | 120 | 25% | 159 | 33% | 1 | 0% |
| Fall 2002 | 514 | 249 | 48% | 126 | 25% | 139 | 27% | 0 | 0% |
| Fall 2003 | 493 | 244 | 49% | 112 | 23% | 137 | 28% | 0 | 0% |
| Fall 2004 | 532 | 208 | 39% | 156 | 29% | 166 | 31% | 2 | 0% |
| Fall 2005 | 528 | 217 | 41% | 122 | 23% | 187 | 35% | 2 | 0% |

CALIFORNIA INSTITUTE OF TECHNOLOGY

WASC Data Element 4 -- Faculty by Employment Status

Data as of November 1 each year, as reported to IPEDS (Employees by Assigned Position)
Includes "Primarily instruction" and "Instruction/research/public service"

| | Total Faculty Headcount | Full-Time Faculty | | Part-Time Faculty | | Total Faculty FTE |
|---------|----------------------------|----------------------|-----|----------------------|-----|----------------------|
| | | # | % | # | % | |
| 2001-02 | 338 | 308 | 91% | 30 | 9% | 318 |
| 2002-03 | 337 | 302 | 90% | 35 | 10% | 314 |
| 2003-04 | 343 | 310 | 90% | 33 | 10% | 321 |
| 2004-05 | 335 | 309 | 92% | 26 | 8% | 318 |
| 2005-06 | 327 | 311 | 95% | 16 | 5% | 316 |

WASC Data Element 4 -- Faculty by Employment Status

Data as of November 1 each year, as reported to IPEDS (Fall Staff)
Includes "Instruction/research/public service"

| | Total Faculty Headcount | Full-Time Faculty | | Part-Time Faculty | | Total Faculty FTE |
|-----------|----------------------------|----------------------|-----|----------------------|-----|----------------------|
| | | # | % | # | % | |
| 2001-02 | 422 | 357 | 85% | 65 | 15% | 379 |
| 2002-03 | | | | | | |
| 2003-04 | 441 | 368 | 83% | 73 | 17% | 392 |
| 2004-05 | | | | | | |
| 2005-06 * | 435 | 368 | 85% | 67 | 15% | 390 |

* 2005-06 excludes PostDocs 516

CALIFORNIA INSTITUTE OF TECHNOLOGY

WASC Data Element 5 -- Key Financial Ratios

Data as of September 30, for fiscal years ending:

| Financial Statement ratios | 2001 | 2002 | 2003 | 2004 | 2005 |
|-----------------------------------|-------------|-------------|-------------|-------------|-------------|
| Return on Net Assets | -18% | 0% | 10% | 4% | 9% |
| Net Income Ratio | -28% | -8% | 5% | 1% | 8% |
| Operating Income Ratio | 1.0 | 1.3 | 1.3 | 1.0 | 1.2 |
| Viability Ratio | 7.3 | 6.8 | 5.3 | 5.4 | 6.1 |
| Instructional Expense per Student | \$64,100 | \$60,800 | \$66,700 | \$69,800 | \$72,800 |
| Net Tuition per Student | \$7,300 | \$6,500 | \$8,100 | \$8,100 | \$8,900 |

WASC Data Element 6 -- Inventory of Educational Effectiveness Indicators (Undergraduate Program)

At the institutional level:

1. *Have formal learning outcomes been developed?*

No. In general, however, the undergraduate program aims to provide undergraduate students with well-rounded, integrated programs that will not only give them sound training in their professional fields, but that will also develop character, intellectual breadth, and physical well-being.

2. *Where are these learning outcomes published?*

N/A

3. *Other than GPA, what data/evidence is used to determine that graduates have achieved stated outcomes for the degree?*

Student participation and achievement in research, students' post-graduate plans, including persistence in the field, continuation to graduate programs and industry employment, student retention and graduation rates, and survey data are also used to measure student achievement and success.

Caltech employs several mechanisms for feedback on its education and research programs, including ABET accreditation for its engineering curriculum, external visiting committees for each division, and biennial student-faculty conferences.

In addition, class surveys are conducted of both incoming freshmen and outgoing seniors each year. Course evaluations for individual courses are conducted and reviewed by the division and option administrators.

The majority of undergraduate options offer undergraduate research for academic credit and/or senior thesis options. Students who participate in the Summer Undergraduate Research Fellowships (SURF) program submit a technical paper and give an oral presentation at the end of their research experience.

4. *Who interprets the evidence? What is the process?*

Visiting Committees. Caltech's visiting committee program solicits periodic independent and authoritative evaluations of the Institute's six academic divisions and the Jet Propulsion Laboratory. Each of the academic visiting committees convenes formally every three years for a three-day period. The committee charge is to assess the Institute's research and teaching programs to affirm their strengths and to identify weaknesses and opportunities. The committee prepares a final report describing their findings and offering

recommendations that will strengthen the division. The report is addressed to the President, with copies to the Provost and the division chair. Confidential or sensitive issues may be addressed in the committee's oral debriefing or in a separate cover letter to the President. The division chair distributes copies of the written report to the faculty of the division being evaluated. The entire Board of Trustees receives a copy, and the visiting committee chair presents an oral report at a full Board meeting highlighting the findings of the report.

An outline describing background and meeting guidelines for visiting committees is enclosed.

Student Faculty Conferences (SFC). The Student Faculty Conference is a biennial event that provides a forum for discussion between students, faculty, and administrators on issues related to academic, the honor code, and the quality of undergraduate life. The conference is organized by the students, and the working committees are composed of students, faculty, and administrators. The output includes reports that provide recommendations and identify areas for further improvement.

The agenda, discussion topics, and committee memberships from the most recent Student Faculty Conference are enclosed.

Undergraduate Research. Over 60% of the Caltech student body participates in undergraduate research, including the summer undergraduate research fellowship program (SURF). For SURF, students are required submit written technical reports and give oral presentations at the end of the ten-week research experience. In addition, surveys of both SURF participants and research mentors are distributed annually.

Course Surveys. Course surveys for core curriculum courses and their results are posted on the Teaching Quality Feedback Reports (TQFR) website. A sample survey is attached.

The Senior Director for Academic Support and Planning in Student Affairs, working in collaboration with other offices on campus, provides evidence and research on undergraduate achievement, student retention and graduation rates, and assessment of student support initiatives.

5. How are the findings used?

The findings of these visiting committees and student faculty conferences are broadly discussed among trustees, administrators, faculty, and students. Appropriate constituencies – senior administrators, the Council on Undergraduate Education, the Student Affairs office, division chairs, executive officers, option representatives, faculty and student committees – are charged with implementing recommendations.

The surveys of both SURF participants and research mentors are examined by the Student-Faculty Programs office and the SURF advisory committee, and used to guide improvements in the SURF program. The Core Curriculum course survey results are posted on the Caltech website, and the six academic divisions distribute and examine course surveys for all courses.

Research on student achievement, retention, and graduation are periodically discussed with Student Affairs' offices, the Council for Undergraduate Education (CUE), and Student-Faculty conference committees.

A list of relevant committees, their compositions, and functions can be found online at <<http://oof.caltech.edu/committees/>>.

6. Date of last program review for this degree program?

| | | | | |
|----------------------|-----|-------------|-----|-----------|
| Visiting Committees: | EAS | Spring 2004 | GPS | Fall 2004 |
| | HSS | Spring 2005 | CCE | Fall 2005 |
| | BIO | Spring 2006 | PMA | Fall 2006 |

Student Faculty Conference: April 12, 2005

For the undergraduate core curriculum (general education):

1. Have formal learning outcomes been developed?

No. In general, the core curriculum aims to expose freshmen and sophomores to a broad range of subjects and to provide them with a shared set of basic knowledge and tools in science and engineering. It is the dominant experience for students arriving at Caltech and establishes the common background for option-specific courses.

2. Where are these learning outcomes published?

N/A

3. Other than GPA, what data/evidence is used to determine that graduates have achieved stated outcomes for the degree?

Caltech has a new online course evaluation survey that is being used for the core curriculum.

4. Who interprets the evidence? What is the process?

In addition to coordinating and supervising the content and teaching of the core curriculum, the Core Curriculum Steering Committee (CCSC) also monitors the performance of the core curriculum courses and devises improvements to the core.

5. How are the findings used?

All proposed changes in the core curriculum courses are reviewed and approved by the CCSC.

6. *Date of last program review for this degree program?*

The core curriculum was one of four discussion topics at the 2005 Student Faculty Conference. It is also one focus of a self study project on undergraduate education at Caltech, planned for 2006-07.

List each degree program (2005-06):

| Option | Division |
|---|-----------------|
| Applied and Computation Mathematics | EAS |
| Applied Physics | EAS |
| Astrophysics | PMA |
| Biology | BIO |
| Business Economics and Management | HSS |
| Chemical Engineering | CCE |
| Chemistry | CCE |
| Computer Science | EAS |
| Economics | HSS |
| Electrical and Computer Engineering (phasing out) | EAS |
| Electrical Engineering | EAS |
| Engineering and Applied Science | EAS |
| English | HSS |
| Geology | GPS |
| Geobiology | GPS |
| Geochemistry | GPS |
| Geophysics | GPS |
| Planetary Science | GPS |
| History | HSS |
| History and Philosophy of Science | HSS |
| Independent Studies Varies | |
| Mathematics | PMA |
| Mechanical Engineering | EAS |
| Philosophy | HSS |
| Physics | PMA |
| Political Science (new this year) | HSS |
| Social Science (phasing out) | HSS |

1. *Have formal learning outcomes been developed?*

No.

2. *Where are these learning outcomes published?*

N/A

3. Other than GPA, what data/evidence is used to determine that graduates have achieved stated outcomes for the degree?

In addition to GPA and core curriculum course performance, academic achievement is measured in terms of participation in research, retention and graduation rates, and post-graduate career plans. Both paper and online course surveys are conducted.

4. Who interprets the evidence? What is the process?

In addition to Institute-level committees, counterpart division and option committees monitor the performance of degree option programs. The Registrar's office maintains and reports progress-to-degree information about undergraduates. Offices providing academic and other support for students also examine the findings to identify areas of needed intervention and best strategies for support students.

5. How are the findings used?

They are used as the basis for recommendations by the Council for Undergraduate Education and other Institute-level and division committees.

6. Date of last program review for this degree program?

| | | | | |
|----------------------|-----|-------------|-----|-----------|
| Visiting Committees: | EAS | Spring 2004 | GPS | Fall 2004 |
| | HSS | Spring 2005 | CCE | Fall 2005 |
| | BIO | Spring 2006 | PMA | Fall 2006 |

Purpose

The California Institute of Technology is universally recognized as one of the premier research universities in the world. In order to ensure the continued high quality of its creative pursuit of excellence, the Institute solicits frank views and opinions through its visiting committees. Caltech's visiting committee program is carefully designed to provide the President, the Provost and the Board of Trustees with periodic independent and authoritative evaluations of the Institute's six academic divisions and the Jet Propulsion Laboratory.

Function

Visiting committees at the California Institute of Technology assess the Institute's research and teaching programs to affirm their strengths and to identify weaknesses and opportunities. Visiting committees occasionally are asked to appraise facilities and to provide recommendations for improvement or change. To provide focus for each meeting, the President issues a charge that seeks guidance, recommendations and opinions on specific questions and issues.

Each of the academic visiting committees convenes formally every three years. Because of the magnitude of the activities at the Jet Propulsion Laboratory, it is anticipated that the JPL Visiting Committee will meet more frequently. Meetings cover a period of three days. On the final day of each visit, the committee orally conveys preliminary recommendations and feedback to the President, the Provost and the Division Chair or JPL Director. Following each visit, the committee writes a formal report summarizing its findings and recommendations. This document is submitted to the President and the committee chair reviews its substance with the Board of Trustees.

Visiting committee members are frequently called upon for counsel and advice in the period between formal meetings. It is not at all unusual for committee members to visit on their own to give lectures or to meet with students, staff and members of the faculty.

Committee Composition

At the California Institute of Technology, Trustees chair visiting committees and members of the Board comprise approximately half the membership. The President balances the expertise of each committee by appointing academicians from other universities and individuals with relevant research interests and experience. A good proportion of the non-Trustee members of each visiting committee are alumni of the Institute.

Background Briefing Book

The
California
Institute of
Technology

Visiting
Committees

In preparation for each formally convened visiting committee meeting, the Division Office assembles a briefing book which includes the following background material:

- The draft agenda (reflecting the consolidated schedule of activities for all three days)
- The President's Charge (provided by the President's Office)
- Roster of committee members (provided by the President's Office)
- Photographic biographical sketches of visiting committee members (provided by the President's Office)
- Report written by the previous Visiting Committee (available from the President's Office)
- A white paper written by the Division Chair providing an overview of the Division which includes (at a minimum) the following:
 - ❖ The Division's perception of its identity and its role (within the Institute and in the world beyond the campus boundaries)
 - ❖ The Division's current activities and programs—both in research and teaching
 - ❖ The Division's strategic plan for the future
 - ❖ Actions taken in response to the previous Visiting Committee meeting
 - ❖ Other issues or concerns the Division Chair wishes to incorporate in the document.
- White papers written independently by each of the Executive Officers providing the committee with an overview of all options in the Division.
- A full list of courses offered by the Division and their enrollments—over the previous five-year period.
- A list of the current graduate students in the Division, the year admitted to candidacy, field of study and advisor.
- Placement records of graduate students (including their current positions) over the previous five-year period.
- Analysis of the current age distribution of the faculty and the history of faculty count over the previous five-year period (including the number of unfilled or soon-to-be vacated faculty FTE's)
- One-page CV's for each faculty member in the Division providing (at a minimum) the information listed on the attached sample (Exhibit 1). *[A complete set of current faculty CV's, including publications, shall be available in the Division Office for the committee's reference.]*

The Division Chair is free to supplement the above with other publications and information that will aid the visiting committee in developing an overall perception of the Division and its activities.

Timeline: Visiting Committee Meeting Preparations

(At Least) One Year Prior to the Meeting Date

- President's Office conducts survey and confirms meeting date with all involved parties.
- President's Office makes hotel and dinner reservations at the Athenaeum and reserves the Millikan Board Room.

(At Least) Four Months Prior to Meeting Date

- Mary Webster (Secretary, Board of Trustees) and Kari Johnson (Special Events Coordinator) visit the Division staff to:
 - ❖ review meeting guidelines
 - ❖ discuss the Briefing Book
 - ❖ talk about logistics
 - ❖ clarify each office's responsibilities
 - ❖ establish a mutually supportive working relationship
 - ❖ discuss meeting and meal locations
- President's Office forwards initial meeting information and forms to committee members and in return requests attendance confirmation, photographs, biographical sketches and information regarding travel plans and lodging needs.
- Division Chair initiates discussion of meeting plans and goals with faculty and the visiting committee chair.
- Division Chair and Executive Officers begin work on White Papers.

Three Months Prior to Meeting Date

- Division Chair begins to finalize agenda content (discussing plans with the Committee Chair, the President and the Provost).
- Division Office begins to assemble contents of the Briefing Book.
- Division Chair and Executive Officers continue work on White Papers.

Two Months Prior to Meeting Date

- Division Office continues assembly of Briefing Books.
- Division Chair discusses White Papers, the agenda and proposed speakers with the President and Provost.
- Division Chair provides the President and the Provost with suggested questions to be posed in the President's Charge.
- Public Relations finalizes production of the committee's biographical sketches.
- President's Office finalizes menu-planning and meeting arrangements.

One Month Prior to Meeting Date

- President finalizes the meeting charge.
- Division Office distributes copies of the Briefing Book to members of the Visiting Committee, the President, the Provost and the Secretary of the Board of Trustees.
- President's Office provides each committee member with confirmation of relevant logistical arrangements and finalizes all event details and transportation arrangements.

Report Guidelines (guidance for visiting committee members)

The
California
Institute of
Technology

Visiting
Committees

- The Secretary of the Board of Trustees (Mary Webster) is responsible for:
 - ❖ Coordinating the preparation of the committee's written report (e.g., serving as the collection point for portions of the report written by members of the committee; fitting the various parts together in a coherent text).
 - ❖ Circulating the consolidated draft to all participating committee members for review, comment and further editing. (This is an iterative process and continues until the committee reaches full consensus on the report's content.)
 - ❖ Preparing the final report.

Note: e-mail is particularly useful in moving this process along as expeditiously as possible.
- Committee members should focus on:
 - ❖ The report's content
 - ❖ Defining and clarifying issues that arise in their deliberations
 - ❖ Developing recommendations that will strengthen the Division
- In order to take maximum advantage of the committee's insight and work, the President anticipates that the Division Chair will be able to distribute visiting committee reports to the faculty. To enable this comprehensive distribution, the President asks that visiting committees raise confidential or sensitive issues in their oral debriefing or incorporate these topics in a separate cover letter.

Generic Report Outline (guidance for visiting committee members)

provided as a tool to help committees organize their thoughts

- Section 1. Introduction and Overview
An executive summary. Written either by the committee chair or “volunteer(s)” selected by the committee chair.
- Section 2. Scientific Direction/Research Initiatives
This section incorporates the committee’s response to the Division’s research activities—highlighting such things as:
- *areas of strength*
 - *areas of weakness*
 - *evaluation of proposed new initiatives*
 - *areas on which the faculty, Division Chair and/or the Administration need to focus attention*
- Section 3. Faculty
This section may include such topics as:
- *quality*
 - *appointment process*
 - *departure/retention issues*
 - *recruiting*
 - *diversity: minority/women’s issues*
 - *collaboration*
 - *mentoring of younger faculty*
- Section 4. Students and Postdoctoral Scholars
This section may include such topics as:
- *quality of students and post docs*
 - *issues raised in the committee’s sessions with these groups (including the quality of life at Caltech)*
 - *comments on the education students receive at Caltech and the quality of teaching*
 - *quality of research opportunities*
 - *curriculum issues*
- Section 5. Instrumentation, Space and Facilities
- Additional Sections
Can be included to provide comprehensive coverage of other topics the Visiting Committee wishes to raise

The
California
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Technology

Visiting
Committees

Section 6. **The President's Charge**
This section includes the Visiting Committee's specific response to the questions posed in the President's Charge

Section 7. **The Visiting Committee Process at Caltech**
This section includes feedback from committee members about their visit. The Visiting Committee process at Caltech is a "work in progress" and feedback provided by committees at the end of their visits has enabled the Institute to develop more effective procedures and increasingly beneficial meetings. Comments would be particularly appreciated on the following:

- *agenda content*
- *schedule*
- *briefing book (material provided and what was missing)*
- *missed opportunities*
- *composition of the committee*
- *the process in general*

Special Thanks

ASCIT

Graphic Resources

Tom Mannion and Student Life

Academic and Research Committee (ARC):

Jenny Fisher (Chair)

Meng-meng Fu (Chair)

Wendy Xu (Secretary)

Brandt Beison

James Berglund

Angelina Crans

Lizz Felnagle

Dorota Korta

Jack Lee

Zhongyi Lu

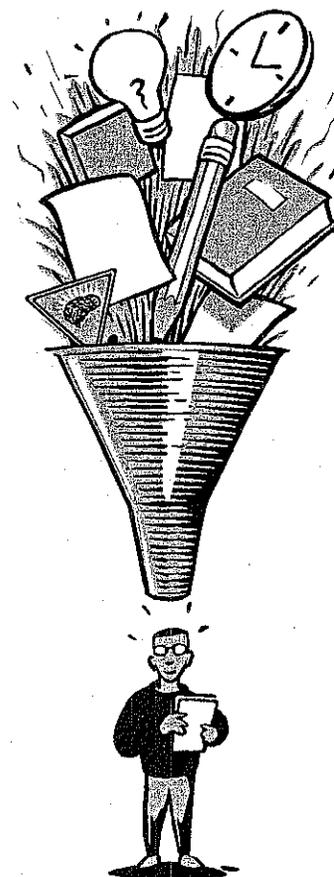
Raman Shah

Alex Shim

Greg Stachelek

Abdul Tariq

Helena Wang



*Academic and
Research Committee
(ARC) and ASCIT*

presents

*Student
Faculty
Conference
2005*

April 12, 2005

SFC History

The Student Faculty Conference is a biennial event that began in 1980. It provides a forum for discussion between students, faculty, and administrators on issues related to academics, the honor code, and the quality of life. This year's conference is the culmination of months of investigation by an array of student-faculty committees. Throughout the years, the Student Faculty Conferences have been responsible for a number of academic and non-academic changes across campus. We hope the 2005 Student Faculty Conference will continue to improve the quality of student life at Caltech.

Honor Code:

Student members: Nick Wall*, Ann Bendfeldt, Matt Krogstad, Galen Loram, JD Salazar.

Faculty members: Gary Lorden*, Jean-Paul Revel, Brian Stoltz, Barbara Green, Siddharth Jaggi, Catherine Ward, Tom Mannion

HSS:

Student members: Angelina Crans*, Francesca Colonnese, Lizz Felngle, Csilla Felsen, Galen Loram.

Faculty members: Kim Border, Peter Bossaerts, Warren Brown, Preston McAfee, George Pigman, Cindy Weinstein.

Ma/ACM:

Student members: James Berglund*, Yuliya Gorlina, Nick Hutzler.

Faculty members: Emmanuel Candes, Nathan Dunfield.

MechE/Aero:

Student members: Kevin Monajati*, Joanna Cohen, Kayte Fischer, Tammy Ma, Jason Yosinski.

Faculty members: Melany Hunt*, Chris Brennen, Guruswami Ravichandran, Joseph Shepherd.

Physics, Astro, APh:

Student members: Jaclyn Hornick*, Adam Azarchs, Janet Sheung, Vivian U, Joe Wasem.

Faculty members: Ken Libbrecht*, Steven Frautschi, Lynne Hillenbrand, Emlyn Hughes, Mark Wise.

Quality of Life:

Student members: Rocky Velez*, Galen Loram, Nick Ma, Kate Magary, Kim Pendorf, Ryan Witt.

Faculty members: Ben Brantley, Chris Brennen, Lee Coleman, Jane Curtis, Miriam Feldblum, Barbara Green, Cathy Jurca, Ed Stolper.

* Denotes student or faculty co-chair.

Committees

Biology:

Student members: Vincent Auyeung*, Tim Barnes, David McKinney, Paul Nagami, Ransom Poythress, Ziqing Zhao.

Faculty members: Marianne Bronner-Fraser, David Chan, Scott Fraser, Kai Zinn.

Chem/ChemE:

Student members: Raman Shah*, Christine Chang, Lydia Ng, John Sadowski, Mayra Sheik.

Faculty members: David Tirrell*, Rick Flagan, Mitchio Okumura, Jonas Peters, Brian Stoltz.

Core Curriculum:

Student members: Andy Green*, Meghan Crowley, Grant Chang-Chien, Lea Hildebrandt.

Faculty members: Scott Fraser, Emlyn Hughes, David MacMillan.

EE/CS:

Student members: Jacob Burnim*, Arjun Bansal, Will Coulter, Peter Foley, Michelle Wyatt, Hao Ye.

Faculty members: Joheshua (Shuki) Bruck, Andre DeHon, Jason Hickey, Richard Murray, Yu-Chong Tai, Chris Umans.

ESE/CNS/CE/Mat Sci/BE:

Student members: Kayte Fischer*, Meghan Crowley*, Rachel Maire, Martin Peek, Helena Wang.

Faculty members: Joel Burdick, Brent Fultz, John Hall, Michael Hoffman, Christof Koch.

GPS:

Student members: Belle Philibosian*, Tina Dwyer, Lizz Felnagle, Kate Magary, Susan McDonald.

Faculty members: John Eiler*, Rob Clayton, Andy Ingersoll, Dianne Newman, George Rossman, Kerry Sieh.

SFC Schedule

| | | |
|------------|--|-----------------|
| 8:15-9 | Continental Breakfast | Beckman Mall |
| 9-10:30 | Honor Code | Ramo Auditorium |
| 10:30-12 | Quality of Life (Workload, Student Morale, Student-Faculty Interaction) | Ramo Auditorium |
| 12-12:30 | Break (Lunch) (Free BBQ served until 2pm) | Beckman Mall |
| 12:30-1:30 | Hum. and Soc. Sci. | Ramo Auditorium |
| 1:30-2:30 | Core Curriculum | Ramo Auditorium |
| 2:30-3:30 | CS/EE | 070 Moore |
| | Ph/APh/Astro | Ramo Auditorium |
| | Biology | 119 Kerckhoff |
| | MechE/Aero | 101 Guggenheim |
| 3:30-4:30 | Math/ACM | 151 Sloan |
| | Ch/ChE | 147 Noyes |
| | GPS | 151 Arms |
| | ESE/CNS/SM/Mat.Sci. | 142 Keck |

Discussion Topics

Biology

- Bi 8/9 discussion
- Graduate and undergraduate TAs
- Subtopics within the Biology Major

Chem/ChemE

- Teaching feedback questionnaires
- Caltech Course Catalog
- Undergraduate teaching assistants
- TA training in introductory laboratory courses
- Chemistry: discussion on Ch 21a, Ch 41abc, Ch 14, and Ch 80 counting for a laboratory requirement
- Chemical Engineering: discussion on ChE 64, and heavy course loads during first and second term

Core Curriculum

- Phys1a Section 1 and 2: will be remerged with the rest of the physics class; suggestion to create a section (not assigned) with additional practice problems.
- Phys2ab: suggestions for rearranging the content and scheduling.
- Math1a: suggestion to replace Ma1a with a logic class
- Math2: switching the order of Math 2a and 2b next year
- Chem1b, Bi1: suggestions for improvements from survey.

EE/CS

- Communication: option-wide email list, student liaison to the faculty option representative, more student-faculty social events
- Course feedback
- Modernizing 5x series

ESE/CNS/CE/Mat Sci/BE:

- Catalog revisions – make requirements more understandable
- Establishment of student club
- Menu/seminar classes to attract freshmen into the concentrations
- CS1 alternative offered through the engineering department
- Bioengineering minor – creation of a solid proposal with a high likelihood of implementation in the next year
- Accreditation requirements, E&AS required electives
- E11 – analysis of survey data and suggestions

GPS

- Better recruitment of freshmen and sophomores
- Geochemistry is being revamped
- Geobiology: Changes happening, need field trip
- Undergraduate research as an elective
- Undergraduate handbook
- Other course adjustments (ACM 95, Ge112, 11 series, 111)

Honor Code

- Establishment of a faculty Honor System Rep. in each Division
- Examination of the Conduct Review Committee (election procedures for CRC reps, CRC talks for freshmen)
- Discuss stewardship of the Student Houses

Humanities and Social Sciences

- discussion of minors in the HSS division
- feedback on participation component of grade at midterms
- improving course offerings

Math/ACM:

- Increased student/faculty interactions within department
- SURF accessibility
- More student-oriented talks, better course descriptions

MechE/Aero

- Student-faculty feedback system
- ASME/AIAA membership
- ME72
- Aerospace/Aeronautics option

Physics/Astrophysics

- ACM95: should it be required or recommended?
- Programming courses for Phys/Astro majors
- Clarification of course descriptions in catalog

Quality of Life

- Student-faculty interaction: ombudspeople, advisors, improving faculty awareness of policies, interaction outside of class
- Academic quality of life: overloading, systematic offering of courses, unlimited time exams, class attendance, retention rate concerns
- Non-academic quality of life: improving awareness of support systems on campus, athletics

Welcome to TQFR Online

[Home](#)

[Surveys](#)

[Sign In](#)

Background

"TQFR" stands for "Teaching Quality Feedback Report". Traditionally, TQFRs are paper surveys filled out by students at the end of each term giving feedback on a class a student has just completed.

Second term of academic year 2004-05, Caltech's Core Curriculum Committee (CCC) debuted a new online TQFR survey system for core curriculum classes.

Below are links to background material and other information on the project, as well as links to the initial core survey questions. Please direct feedback on the system to Professor Scott Fraser of the CCC and Stacey Scoville of the Provost's Office [via email here](#). Final authority on how online TQFRs work resides with the CCC, represented by Professors Scott Fraser and David Goodstein.

Email sent regarding the system is usually posted in the discussion area below for everyone's consideration unless you ask us not to. Responses to emailed questions and comments also appear in the discussion board. If you want your comments to be private instead of public to members of the Caltech community discussing online TQFRs, please note so in your email.

[Project Background Info](#)

[Project Overview](#)

[System Basics](#)

[Basic Survey Sections and Questions](#)

[Current Term Survey Courses, Professors, and TAs](#)

[Ongoing Discussion of the TQFR System](#)

Have a problem or question? Call or email [Stacey Scoville](#) at the Provost's Office at (626) 395-6320.

[TQFR Survey, Third Term, 2005-06](#) > Ay 001

[Home](#)

[Surveys](#)

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[Background](#)

Click on the survey title above to return to the course list.

Survey Questions for Ay 001

The Evolving Universe

Catalog Text: 9 units (3-3-3); third term. This course is intended primarily for freshmen not expecting to take more advanced astronomy courses and will satisfy the menu requirement of the Caltech core curriculum. Introduction to modern astronomy that will illustrate the accomplishments, techniques, and scientific methodology of contemporary astronomy. The course will be organized around a set of basic questions, showing how our answers have changed in response to fresh observational discoveries. Topics to be discussed will include telescopes, stars, planets, the search for life elsewhere in the universe, supernovae, pulsars, black holes, galaxies and their active nuclei, and the Big Bang. There will be a series of laboratory exercises intended to highlight the path from data acquisition to scientific interpretation. Students will also be required to produce a term paper on an astronomical topic of their choice and make a short oral presentation. In addition, a field trip to Palomar Observatory will be organized. Not offered on a pass/fail basis.

COURSE OVERVIEW

What grade do you expect?

(Select)

How many hours per week did you spend on this course?

(Select)

About what percentage of class sessions did you attend?

(Select)

What percentage of the homework did you complete?

(Select)

COURSE MATERIAL

Please rate the following characteristics of **Ay 001** on the scales provided.

- | | | | | | | | | | | | |
|---------------------------------------|------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------------|--------------------------------------|
| Challenge level of the course: | too easy | <input type="radio"/> | too hard | <input type="button" value="Clear"/> |
| Interest of material: | dull | <input type="radio"/> | stimulating | <input type="button" value="Clear"/> |
| Helpfulness of text or lab notes: | useless | <input type="radio"/> | essential | <input type="button" value="Clear"/> |
| Was the homework or lab work helpful? | useless | <input type="radio"/> | essential | <input type="button" value="Clear"/> |
| How predictable was the grading? | random | <input type="radio"/> | predictable | <input type="button" value="Clear"/> |
| Have you learned something valuable? | nothing | <input type="radio"/> | a great deal | <input type="button" value="Clear"/> |
| Would you recommend this course? | not at all | <input type="radio"/> | very highly | <input type="button" value="Clear"/> |

Do you have any general comments on the material? What was good? What could use work?

For lecturer Charles Steidel:

LECTURER

Please rate lecturer **Charles Steidel** on:

- | | | | | | | | | | | | |
|---|------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------|--------------------------------------|
| Organization: | unclear | <input type="radio"/> | very clear | <input type="button" value="Clear"/> |
| Ability to convey concepts: | poor | <input type="radio"/> | excellent | <input type="button" value="Clear"/> |
| Rapport with the class: | poor | <input type="radio"/> | very good | <input type="button" value="Clear"/> |
| Attitude toward questions in class: | poor | <input type="radio"/> | receptive | <input type="button" value="Clear"/> |
| Rapport with individual students: | poor | <input type="radio"/> | very good | <input type="button" value="Clear"/> |
| Enthusiasm: | bored | <input type="radio"/> | excited | <input type="button" value="Clear"/> |
| How highly would you recommend this lecturer? | not at all | <input type="radio"/> | very highly | <input type="button" value="Clear"/> |

Any general comments on the lecturer? What was great? What could be improved?

With the following form, students will be able to choose to rate one or more of the following teaching assistants: Ann Marie Cody, Thiago Goncalves, Andrew Green, Tyson Mao, Sean Moran, Hilke Schlichting, Amber Swenson, Vivian U, and/or Maximilian Zavodny. Only one TA is shown for this sample page.

TEACHING ASSISTANT

Please rate teaching assistant **Ann Marie Cody** on:

- | | | | | | | | | | | | |
|---------------------------------|------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------|--------------------------------------|
| Enthusiasm level | bored | <input type="radio"/> | excited | <input type="button" value="Clear"/> |
| How well-informed he or she was | not at all | <input type="radio"/> | very well | <input type="button" value="Clear"/> |
| Proficiency with English: | quite poor | <input type="radio"/> | fluent | <input type="button" value="Clear"/> |
| Ability to convey concepts: | poor | <input type="radio"/> | excellent | <input type="button" value="Clear"/> |
| Would you recommend this TA? | not at all | <input type="radio"/> | very highly | <input type="button" value="Clear"/> |

Any general comments on this TA? What was great? What could be improved?

LABORATORY

- | | | | | | | | | | | | |
|--|-------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------------|--------------------------------------|
| How much constructive criticism of your work was provided? | none at all | <input type="radio"/> | a great deal | <input type="button" value="Clear"/> |
| Were the lab materials available? | never | <input type="radio"/> | always | <input type="button" value="Clear"/> |
| Was lab equipment in good repair? | never | <input type="radio"/> | always | <input type="button" value="Clear"/> |

Any general comments about the lab? What was great? What could be improved?

CATALOG DESCRIPTION

The Caltech catalog description for **Ay 001** is as follows:

9 units (3-3-3); third term. This course is intended primarily for freshmen not expecting to take more advanced astronomy courses and will satisfy the menu requirement of the Caltech core curriculum. Introduction to modern astronomy that will illustrate the accomplishments, techniques, and scientific methodology of contemporary astronomy. The course will be organized around a set of basic questions, showing how our answers have changed in response to fresh observational discoveries. Topics to be discussed will include telescopes, stars, planets, the search for life elsewhere in the universe, supernovae, pulsars, black holes, galaxies and their active nuclei, and the Big Bang. There will be a series of laboratory exercises intended to highlight the path from data acquisition to scientific interpretation. Students will also be required to produce a term paper on an astronomical topic of their choice and make a short oral presentation. In addition, a field trip to Palomar Observatory will be organized. Not offered on a pass/fail basis.

Does the catalog description match how the course actually was?

not at all

very closely

Clear

How accurate are the listed catalog units?

- About right
 Quite noticeably low
 Quite noticeably high

Clear

If the catalog description doesn't match the course in some way, how do they differ?

COURSE COMMENTS

What general comments do you have regarding the course? Is there anything you wish you had known before you took it? What was particularly good about it? What could be improved? If something could be improved, perhaps suggest how it could be improved (if it's not obvious).

Please remember: While your comments here are anonymous, they have real impact. TQFR comments become part of a public, enduring record of feedback on this class and professor -- so please keep criticism and suggestions constructive.

General Course Comments:

Have a problem or question? Call or email [Stacey Scoville](#) at the Provost's Office at (626) 395-6320.

CALIFORNIA INSTITUTE OF TECHNOLOGY
Degree Programs
2005-06

Bachelors Degrees

Applied and Computation Mathematics
Applied Physics
Astrophysics
Biology
Business Economics and Management
Chemical Engineering
Chemistry
Computer Science
Economics
Electrical and Computer Engineering
Electrical Engineering
Engineering and Applied Science
English
Geology
Geobiology
Geochemistry
Geophysics
Planetary Science
History
History and Philosophy of Science
Independent Studies
Mathematics
Mechanical Engineering
Philosophy
Physics
Social Science

Masters Degrees (terminal)

Aeronautics
Applied Mechanics
Civil Engineering
Electrical Engineering
Mechanical Engineering

Masters Degrees (in conjunction with a Doctorate)

Aeronautics
Applied & Computational Mathematics
Applied Mechanics
Applied Physics
Astrophysics
Biochemistry & Molecular Biophysics
Bioengineering

2005-06 Degree Programs (continued)

Biology (Biology; Biotechnology; Genetics; Cellular Biology and Biophysics;
Immunology; Cellular and Molecular Neurobiology; Integrative Neurobiology;
Developmental Biology; or Molecular Biology and Biochemistry)
Chemical Engineering
Chemistry
Civil Engineering
Computation & Neural Systems
Computer Science
Control & Dynamical Systems
Electrical Engineering
Environmental Science & Engineering
Geological & Planetary Sciences (Geobiology, Geochemistry, Geology, Geophysics, or
Planetary Science)
Materials Science
Mathematics
Mechanical Engineering
Physics
Social Science

Research Doctorate (PhD) Degrees

Aeronautics
Applied and Computational Mathematics
Applied Mechanics
Applied Physics
Astrophysics
Biochemistry and Molecular Biophysics
Bioengineering
Biology
Chemical Engineering
Chemistry
Civil Engineering
Computation and Neural Systems
Computer Science
Control and Dynamical Systems
Electrical Engineering
Environmental Science and Engineering
Geobiology
Geochemistry
Geology
Geophysics
Planetary Science
Materials Science
Mathematics
Mechanical Engineering
Physics
Social Science