1 Introduction

We were charged with reviewing the Department of Physics and Astronomy at San Francisco State University, a major teaching and research institution within the California State University system. Our overall impression of the Department is very positive. The faculty is composed of internationally recognized astronomers and physicists who are striving to provide their students with a first-class education. We were particularly impressed by the overall quality of the faculty and staff, which is comparable to what is typically found at major research universities. The teaching appears to be equally strong. The students that we interviewed are remarkably satisfied with the education they are receiving. They repeatedly expressed high regard for both the teaching and the opportunities and guidance in research provided by Physics and Astronomy faculty.

The review committee visited SFSU during two full days (April 22 and 23, 2013). We met with all faculty members in the department, either individually or in small groups (with the exception of Maarten Golterman, who is on sabbatical). We also met with all four staff members, both technical and administrative, and a large sample of the graduate students. We met briefly with the senior SFSU administrators at the beginning of the process and at the end of the second day. Prior to our visit we were provided with copies of the Department’s self study, which provided a comprehensive overview of the Department, and with a copy of the Academic Program Review Sixth Cycle Handbook outlining the review process.

Throughout the process we sought to identify the Department’s strengths and weaknesses. During our visit we had complete cooperation at all times, from everyone concerned. Our discussions were open and candid. Although it is impossible to develop a complete picture of the entire program in the span of just two days, we believe the observations provided below can be a starting point for administrative actions to help strengthen the Department.

The primary focus of this report is to offer advice that we hope will allow the SFSU administration to sustain the quality of the Department’s teaching and research programs. The stresses of the past several years have taken a toll. We do not believe that present quality will be sustained if present conditions continue. We are well aware that economic conditions in California limit the capacity of SFSU’s
senior administration to fully address the needs of this Department and others for which it is responsible. But because of our concerns that successive years of budget shortfalls are impacting morale and putting in jeopardy a small but truly excellent Department, we urge the administration to be proactive and positive in its response to this report. Those items below that can be addressed now should be incorporated into a plan of action; those that cannot should nevertheless be recognized, discussed with the Department, and integrated into longer term University planning.

We have organized our report into three broad sections: Facilities and Administration; Research (including graduate education, faculty quality, and support); and Teaching. Within each section, we report our Findings and Recommendations.

2 Facilities and Administration

A. Findings

(1) Department faculty and office space is fragmented across multiple floors of Thornton Hall. This fragmentation reflects years of space reallocations among Departments within TH. Perhaps because of its small size, the Physics and Astronomy Department appears to be the most severely impacted unit.

(2) Inadequate space, particularly lab space, is harming the instructional program. We learned that lab equipment has to be erected and disassembled on a regular (weekly) basis because lab rooms are shared by several courses. Economies in space gained by these procedures are outweighed by the inefficient use of faculty and staff time and by the undue strains placed on the limited personnel responsible for organizing the labs. The time lost is time that would otherwise be invested in maintaining and improving laboratory instructional equipment. Space issues also affect many other aspects of departmental life, limiting activities ranging from department meetings to GTA interactions with undergraduates.

(3) The Department’s “crown jewel” is its planetarium, one of the nicest in the Bay area. Despite its advanced age, the Spitz projector is of exceptional quality and produces a very nice representation of the night sky. The seating is arranged attractively and without crowding. Impressive shows can be produced with this facility.
(4) The Department is one of several requiring expert machine shops and machinists to support its research program, including projects involving graduate students. Most institutions have migrated to more centralized facilities where the best equipment and best machinists are concentrated. The drivers for this reorganization are 1) safety and 2) cost. Safety is critical: centralization and concentration of the skilled machinists in one or two shops allows proper training and supervision of students and other researchers needing access to the equipment. SFSU facilities are decentralized and small. Given the number of SFSU shops and the difficulty of attracting skilled machinists to campuses generally, it is unlikely that adequate supervision and training is available in all of these shops. This is potentially a major liability issue for the institution, as other universities have unfortunately learned in recent years.

(5) There is a great deal of support among the faculty for Department administrators, headed by Chair Susan Lea and Associate Chair Ron Marzke. We observed a Department that works together well, with a minimum of conflicts and interpersonal tension. In addition, Faculty members were overwhelmingly supportive of Dean Sheldon Axler, who they recognize as someone who has made and is making every effort to further the Department’s research and teaching goals, despite limited resources. His positive efforts have helped to sustain and encourage the Department.

(6) In contrast, faculty criticism of the University’s Office of Research and Sponsored Programs (ORSP) is intense and widespread. Analogous offices in most universities with which we are familiar view themselves as expert facilitators, there to help faculty members not trained in administrative details to navigate through federal and institutional regulations. Yet repeatedly we were told of ORSP rejecting requisitions for travel reimbursements or purchasing not for substantial reasons, but because of minor technical issues that could have been easily and more efficiently corrected within ORSP.

B. Recommendations

(1) The space issues in TH require both near-term and long-term solutions. In the near term, the fragmentation of Physics and Astronomy space should be addressable, as this problem can be ameliorated by re-organization, without the addition of new space. We recommend a “bottom up” approach where the Department constructs a plan to consolidate its space, in cooperation with other TH units that may also suffer from fragmentation. While we do not underestimate the difficulty of such a re-organization, there is the potential for a “win-win” solution that will incrementally improve departmental space and
provide Physics and Astronomy with a better physical identity within TH. The absence of a Departmental meeting room might be solved by a Dean's-level agreement on the sharing of meeting space among several units. The full list of space issues – affecting undergraduate teaching labs, upper division labs, GTA space, department meetings (including seminars, colloquia, thesis defenses) – are unlikely to be fully solved by re-organization, nor are they limited to one unit in TH. Either a new building or new supplementary space should be among SFSU's long-term planning goals.

(2) The planetarium has been the focus of Department outreach to the local community. It is also an important component of student training: many of the graduate students (including all astronomy GTAs) are given instruction in using the planetarium, and some learn to produce planetarium shows. The Department chair recognizes the potential role of the planetarium in development. We encourage even more utilization of this unique facility for both educational and public outreach activities. The GTAs being trained to give shows should utilize their skills for the benefit of students in the introductory GE courses as well as the public at large. The public outreach efforts should be increased and supported by the university, which could publicize the efforts. Among the advantages of SFSU's location is the large community of wealthy and technically literate San Franciscans. The Department has already identified supporters to fund telescopes. With big-ticket items like the eventual replacement of the aging Spitz projector looming in the future, additional outreach could be helpful in sustaining the planetarium program as well as in broader Department development.

(3) We recommend that SFSU conduct as soon as possible an outside review of its campus machining facilities and associated ES&H policies, addressing both safety and cost, and determining whether the current system of small, dispersed machine shops provides the necessary level of user instruction and oversight.

(4) We recommend that the University administration conduct a survey of its units to assess the quality of support received from ORSP. If the discontent found in Physics and Astronomy extends to other departments, the administration should consider steps to help ORSP become a more responsive and supportive organization. For example, the University might consider assigning staff to either grant development, or to post-grant administration, but not both. Such a change could make it easier for new staff to learn their duties more quickly without being overwhelmed.
3 Research (Including Graduate Education and Faculty Quality)

A. Findings: Research

(1) The overall quality of the faculty is excellent, and the record of recent hires is specifically first rate - comparable to that of leading universities. In fact, faculty members have been recruited from the Department into institutions such as Berkeley and Yale. All faculty hired in the past decade have external grant support and actively involve students, both graduate and undergraduate, in their research programs. There are a large number of faculty connections to national laboratories (SLAC, LBL, LLNL), major observatories (Lick, Keck, Kitt Peak), and prominent research universities (Stanford, Berkeley, Davis, Harvard, Princeton, etc.). SFSU’s location provides a major recruiting advantage, as the Bay Area is an academic and technological hub, and many young people trained here are reluctant to leave.

(2) The Department had an allocation of 10.4 FTE faculty at the time the Self Study was written, though one additional faculty member was recently hired. Before the cutbacks that began in Fall 2008, the faculty count was 16.2. The attrition came from elimination of non-tenure-track positions and the decision not to replace faculty who retired or left. The Department has coped with the reduction through “augmentations,” funding received for lecturer positions that are allocated as class sections fill. Other funds come from “buy-outs” by the most research-active faculty. The diminished number of FTE faculty limits courses and research opportunities for students. Although upper division and graduate courses are always taught by PhDs, there are dramatically reduced opportunities to teach graduate or elective courses, even in areas of department research strength, such as photonics.

(3) The recruitment of new faculty has been aided by the Dean’s efforts to provide adequate startup funding, provide lab space, and pay competitive salaries. These actions have addressed some of the barriers to effective recruiting that were identified in a previous report. The absence of salary increases over the past several years, however, have led to inversions that can persist for long periods (e.g., to the next promotion).

(4) We found the graduate students, in private discussions with us, to be overwhelmingly positive about the education they are receiving at SFSU and about the quality of faculty teaching and mentoring. It is unusual in such reviews for student reactions to be so positive. The MS program has an excellent record of placing students in PhD programs at major research universities. Graduate student criticisms focused on the infrequency of certain
courses and highly unpopular “paired” courses serving undergraduate and graduate students.

(5) We learned that the primary source of support from graduate students is through GTAs, and that the Department relies on faculty buyout and augmentation funds to help fund these positions. Unfortunately, graduate student research stipends are extraordinarily low: we understand that the typical amount is $2-3K/semester. There are no tuition waivers for GTAs or research students, and only about half of the faculty grants provide support for students. Consequently many of the students who arrive with no support leave the university heavily in debt.

(6) The Department attracts a relatively diverse group of graduate students, in terms of both representation and age. But Physics at SFSU has not experienced growth in student interest comparable to that seen in some other Departments, such as biology. The recent creation of a concentration in Astronomy was motivated in part by capturing more students from this discipline.

(7) Younger research faculty cited previously described problems with ORSP as impediments to research – analogous to “death by a thousand cuts.” A typical example is ORSP rejection of a purchase order for printer ink, on the theory that such expenses should be a charge to departmental supplies and services; however the departmental supplies and services budget fails to cover even basic non-research functions. Another example described to us is the need to navigate through three ORSP web pages to place a single purchase order.

(8) Technical support is inadequate, despite some excellent personnel who work long hours. Understaffing in IT is affecting research efforts: an excellent staff member is overwhelmed by his duties in several departments. The Department’s skilled machinist is limited by the university’s balkanized machine shops. In teaching, all undergraduate labs are suffer from a lack of graduate assistants, and insufficient support for instructional training and syllabus development. Administrative support was described as nonexistent. The overworked technical staff members are demoralized. They see the effects of deferred maintenance on facilities ranging from window shades to bathrooms, but do not have time to respond. They have lost student assistance, and now have less access to the equally overworked faculty. The space squeeze has forced the lab manager to repeatedly build and rear down labs; at the same time, the storage room needed to store equipment has been taken over for other uses.
B. Recommendations: Research

(1) Additional faculty hiring is clearly needed and should be done strategically, to strengthen the appeal of the graduate program. Economic drivers for San Francisco include biotechnology and computing, and potential Department partners include UCSF and the SFSU biology and computer science departments. The Department has strong programs in optics and soft condensed matter physics, areas relevant to biophysics. It has interests in astronomy/astrophysics, where the mining of large data sets is increasingly important, and in lattice QCD, one of the most computationally sophisticated subfields in physics. While the specifics of hiring proposals must come from the Department, such directions could increase the flow of graduate students into the Department while also motivating the administration to support badly needed growth. This suggestion is consistent with an earlier recommendation to develop an applied physics track, though we favor targeting the applications to areas like biomaterials, biological manipulations, big data, and high performance computing.

(2) To alleviate some of the financial pressures on graduate students, we urge the faculty to ask for graduate student support in all research proposals submitted to outside agencies. In our discussions with faculty, we sensed that some felt that asking for student funding for research would jeopardize their chance of being funded. From our experience this is not the case, and if anything, it might be the opposite. Federal agencies such as the National Science Foundation are quite committed to student research experience at all levels including the undergraduate and Master’s level.

(3) The self-study notes that the financial challenges facing SFSU physics graduate students have led some to decline in admissions. Many university physics departments provide their RAs and GTAs with stipends and tuition waivers that allow their students to limit debt. Thus SFSU is at a competitive disadvantage. The cost of living in San Francisco and recent increases in SFSU tuition further tilt the playing field. It seems to us that SFSU should be alarmed by this situation and should be taking steps to address the issue.

4. Teaching

A. Findings: Teaching

(1) The graduate students are very satisfied with the quality of graduate instruction and with the commitment of the faculty to classroom teaching and to providing
research opportunities; however, they are unhappy with the infrequency and uncertainty of courses that are nominally elective, but often central to student research interests. The students noted that the MS program is a two-year one, but in practice requires three years or more, due to difficulty in getting courses, their GTA duties and other jobs.

(2) The students share faculty and staff unhappiness over space and facilities, pointing out rooms containing eight desks that are assigned to 11 students, the lack of any structure space for tutoring, and the lack of any assigned space for students who are not GTAs.

(3) The Department is committed to providing research opportunities for each graduate student. With current FTE constraints, this is possible because every faculty member is active in research supervision and theses, and because elective courses have been curtailed.

(4) Department polling of recent MS program graduates, while largely positive, points to the small number of electives, insufficient research opportunities, and insufficient emphasis on computer skills as program weaknesses.

B. Recommendations: Teaching

(1) We endorse the recommendation of a previous program review committee to increase the coverage of lab methods and computational techniques by scheduling Physics 710 and 740 every year.

(2) If additional faculty appointments are made in interdisciplinary fields such as materials, the condensed matter/biology interface, and computation, we urge corresponding development of disciplinary or interdisciplinary courses in these fields.

(3) We endorse the (partially implemented) recommendation of a previous program review committee to increase student tracking. In particular, we recommend gathering data on the new astronomy concentration to determine whether it increases graduate student interest in the MS program and whether graduate students who continue on to PhD programs elsewhere find that the new concentration has provided adequate preparation.
5. Concluding Remarks

The Department’s strengths are the quality of its faculty and the commitment of the faculty to classroom teaching and research mentoring. Recent hires have been excellent. Leadership at both the Department and College levels is strong. Despite so many deficiencies in support and facilities, the graduate students are pleased with the education they are receiving because of the quality of their interactions with the faculty.

Despite these positives, we are concerned that the reduced staffing caused by five years of budget contractions will begin to take a more substantial toll. The stresses are affecting students, staff, and faculty. Too much is being asked of too few. Two primary concerns are faculty retention and graduate student recruitment. Limited and fragmented space, a lack of support staff, university systems that transform routine travel and procurement into challenges, and an inability to schedule elective courses are among the issues bothering faculty. If young faculty begin to depart, future hiring will become more difficult. The Department’s graduate students face steep financial challenges, attending school in one of the nation’s most expensive urban areas, but without the tuition and RA/GTA support available in most other departments. SFSU has created conditions that will likely frustrate any efforts the Department may make to improve graduate recruiting.

As we stressed in the introduction, we hope the University will respond to this report by taking positive actions in those areas where change is possible, and by acknowledging the need for improvement in other areas, where limited resources now preclude a positive response. We think a constructive response to this report is an important first step in restoring Department morale.