Department of Biology

Self Study

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I. MISSION AND HISTORY

A. Mission

Within the Vision, Mission and Values Statements of the University of San Francisco, the faculty of the Biology Department educates undergraduate students in current biological concepts and methodologies in the laboratory and the natural environment to prepare them to be good citizens, to go on for advanced work in the sciences, and to enter professional careers in the health field.

The core mission of the University is to promote learning in the Jesuit Catholic tradition. The University offers undergraduate, graduate and professional students the knowledge and skills needed to succeed as persons and professionals, and the values and sensitivity necessary to be men and women for others.

The University distinguishes itself as a diverse, socially responsible learning community of high quality scholarship and academic rigor sustained by a faith that does justice. The University draws from the cultural, intellectual and economic resources of the San Francisco Bay Area and its location on the Pacific Rim to enrich and strengthen its educational programs.

B. History

The University of San Francisco is more than 150 years old and the first University established in the city of San Francisco. There are over 10,000 students enrolled at the University, including 6,246 undergraduate students in programs associated with the College of Arts and Sciences, and Schools of Business, Nursing and Professional Studies; and 3,624 graduate students in these along with the schools of Law and Education.

The College of Arts and Sciences has seven science departments: Biology, Chemistry, Physics, Mathematics, Computer Science, Environmental Science, and Kinesiology. The Biology Department is one of the oldest departments at the University and has the largest number of majors within the sciences. Currently, we have 355 undergraduate majors and 91 students with other majors (mostly undeclared science) formally advised by our faculty. There are 7 graduate students in our Master of Science program and 32 students in the new Professional Science Masters in Biotechnology program. Of the 15 full-time faculty members in the department, 9 are tenured, 2 are probationary tenure-track, and 4 are term (non-tenure track) appointments. We usually have 30-40 part-time faculty teaching each semester. Support staff includes one program assistant, one lab manager, and the shared services of one instrument specialist and one technical operations manager.

In addition to offering required and elective courses for students majoring and minoring in Biology, we also provide several courses for non-majors. These include three service courses for the School of Nursing (Microbiology, Human Anatomy and Survey of Human Physiology) and one course for the Gerontology minor (Biology of Aging). In addition, the department now offers three courses for non-science majors to satisfy the University's Core Curriculum requirement in laboratory science (The Science of Life, Human Biology, and Good Germs, Bad Germs). Students majoring in Kinesiology, Environmental Science, and Biochemistry have required Biology courses for their curricula. Non-Biology students who are minoring in Neuroscience or who wish to use General Biology I or II to satisfy the Core requirement in laboratory science also enroll Biology courses. In addition, non-science majors planning to apply to post-graduate health professional schools (e.g., medical school, dental school, pharmacy programs, and physical therapy programs) take the yearlong sequence of General Biology and/or the other service courses listed above.

The Biology Department is a very successful, vibrant, and vital component of the University. We provide required courses (most with laboratories) for hundreds of students every semester. In addition to teaching and extensive advising responsibilities, the faculty are active participants in all aspects of the University community, and most have

strong research programs. We serve on numerous college and University-wide committees and as faculty advisors for student organizations, as well as participating as volunteers in many University, professional, and community organizations and activities. The department is very collegial, and we have an exceptionally friendly work environment.

The last program review occurred in 2007 and the major recommendations of the reviewers, and the response of the department and administration to these recommendations, are as follows:

1. **Reduce the advising load and discontinue the practice of advising undeclared students and minors.**
   We no longer advise students with a minor in Biology, but Biology faculty do still advise undeclared science students. The department has adopted an official advising policy in which advisees are equally distributed among all full-time faculty. While the department is still asked by the Dean's office to take on the majority of Undeclared Science students, the policy is that we do not advise Undeclared Students unless they specifically request an academic advisor in Biology (which most do). The department currently advises more than 500 students, and each faculty member is assigned far more advisees than our colleagues in most other departments in the College. We are also in the process of implementing a Peer Advising system in which more experienced students are available to aid newer students that may alleviate some of the advising strain on Biology faculty.

2. **Hire additional technical staff.**
   Since the previous program review, the College has hired a Life Sciences lab manager who primarily works in Biology and an Instrument Specialist who serves all the science departments. A new position, Laboratory Safety Officer, to serve all science departments, has just been created and is expected to be filled this summer.

3. **Continue teaching collaboration with UCSF but refrain from using adjuncts as primary or sole course instructors.**
   The partnership with UCSF has grown and we now hire 30-40 adjuncts each semester, primarily to staff lab sections but experienced adjuncts are frequently hired as sole course instructors because we do not have enough full-time faculty members to staff all the courses we need to offer each semester. One important exception to this practice is that the General Biology sequence is taught only by full-time faculty in order to ensure that incoming students get the best quality instruction and have access to their instructor for assistance if needed.

4. **Improve the sophomore curriculum by revamping or eliminating Cell Physiology and adding a laboratory component to Genetics.**
   We have added a laboratory component to Genetics starting in Spring 2014. We have not made any changes to the Cell Physiology course because it provides an important foundation required for success in upper division courses, and because many students take this course concurrent with Organic Chemistry and Lab, which is a significant course load.

5. **Implement new and interactive teaching pedagogies.**
   Our faculty continue to use a variety of teaching methods, including case studies, journal clubs, flipped classrooms, and twitter feeds.

6. **Space is needed and faculty common spaces and student meeting spaces should be protected and included in the new addition planned for Harney. Administrative offices should be removed from Harney.**
   The LoSchiavo Center for Science and Innovation opened in Fall 2013 and includes a faculty lounge and much needed breakout spaces, in addition to modern classrooms and laboratories. The Biology Department also gained back 3 offices and 1 lab space on the 3rd floor of Harney that were formerly occupied by administrators and faculty from the Environmental Science department. However, space continues to be an issue that will be discussed in the current review, particularly research space for tenure track faculty and office space for term faculty.

7. **Improve overall quality of students in major courses by continuing to place grade restriction on required courses and supporting the University Scholars program.**
   The minimum grade requirements for freshmen and sophomore level courses has helped improve the quality of students in upper division Biology courses and also helps to identify students who might have better success in other majors. The department continues to support the University Scholars program and many of these students are leaders in the classroom and also serve as Peer Advisors within the Department.

8. **Strengthen and expand graduate program.**
   We have not had the resources or support to expand the Masters in Biology program, and this remains a concern to the faculty that will be also be a focus of this review. The administration is more supportive of new programs, and a Professional Science Masters in Biotechnology program has been developed. This program is currently in its second year and will undergo a separate program review at a later date.

C. Goals and Learning Outcomes

The goals of the Biology Program are to develop the following knowledge and skills in its students:
1) An understanding of major biological concepts
2) Problem solving, analytical, and communication skills as they apply to biological sciences
3) The ability to apply the scientific method and critical thinking in an ethical fashion to biological problems
4) An awareness of career pathways in the biological sciences.

The learning outcomes for these goals are for students to be able to:
1) Demonstrate both in-depth and broad knowledge of the concepts that comprise the biological sciences
2) Apply the scientific process, including designing and conducting experiments and testing hypotheses
3) Perform laboratory techniques (such as light microscopy, gel electrophoresis and keeping a laboratory notebook and understanding of principles of laboratory safety)
4) Demonstrate the ability to read, understand, and critically review scientific papers and prepare oral and written reports in a standard scientific format
5) Express an awareness of the careers and professions available in the biological sciences and an understanding of the significance ethics plays in the field.

II. CURRICULUM

A. General

In addition to offering students the opportunity to major or minor in Biology, the Biology Department also offers courses that fulfill curriculum requirements for the Nursing major, the Kinesiology major, the Neuroscience minor and the Gerontology minor. Through a combination of lecture, laboratory, and field courses, the department strives to expose USF students to the all the many wondrous facets that reside within the field of Biology, including those in biochemistry, cell Biology, genetics, development, evolutionary biology, organismal biology, and ecology.

Over the past 5 years, the number of declared majors in the Biology program has steadily increased from 231 in 2008 to 355 in 2013 (See Figure 1). The number of declared minors has fluctuated somewhat in the past five years, dipping down from seven students in 2008 to three students in 2009 then back up to twelve students in 2013 (See Figure 2). The number of degrees awarded in Biology has remained relatively constant, with approximately fifty to sixty degrees awarded per year (See Figure 3).

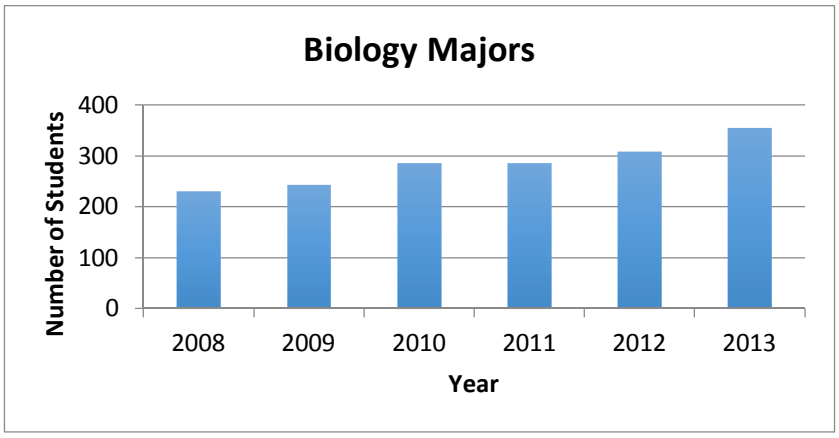

Figure 1: Number of Biology majors at USF, from 2008 to 2013

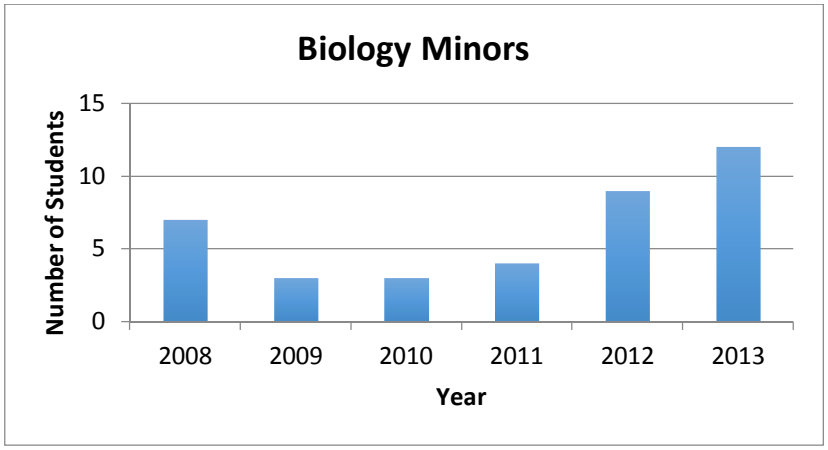

Figure 2: Number of Biology minors at USF, from 2008 to 2013

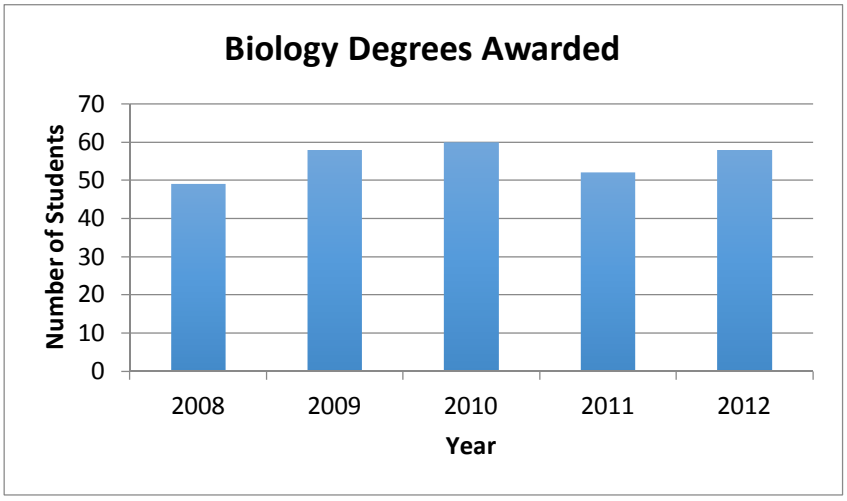

Figure 3: Number of Biology degrees awarded at USF, 2008 to 2012.
(Note: Data from 2013 was not included in this graph, as the number of students graduating in December 2013 is not yet available.)

As can be seen from the data in Figure 1, the number of declared majors within Biology has increased by approximately 53% from 2008 to 2013. It is likely that this number will continue to increase over the coming years. Many universities have seen an increase in the number of science students in years following the opening of a new science building, so it is possible that the opening of the LoSchiavo Center for Science and Innovation will draw more students into the Biology major in the future. So far, the increase in the number of declared majors has not yet translated into a significant increase in the number of students graduating each year with a degree in Biology. This may be due to the fact that there is a lag time between when a student declares their major as Biology (typically prior to entering as a freshman) and when they actually graduate with a degree in Biology (typically four or five years later). Thus, we are likely to see the number of degrees awarded by the Biology program increase over the next five to ten years.

The curriculum for the Biology major is in line with other Biology programs nationally. Students majoring in Biology are required to take two semesters of general Biology, two semesters of general Chemistry, at least one semester of organic chemistry, two semesters of physics, one semester of cell physiology, one semester of genetics, one semester of evolution, and five additional upper division Biology electives, three of which must be lab or field courses. In addition, beginning this year, students are also required to take one unit of a Biology seminar course prior to graduation. Course content is generally under the discretion of the individual professors teaching the course. One unit of course credit is assigned for each hour of weekly lecture instruction and to every three hours of weekly laboratory activity.

The majority of courses offered by the Biology Department at USF are primarily, and sometimes exclusively, taken by Biology majors. General Biology I and II, which are required courses for those in the Biology major, are also taken by students majoring in Biochemistry (offered through the Chemistry department), Kinesiology, Environmental Science, and Computer Science in order to satisfy requirements in their respective majors. The department also offers courses in Human Anatomy, Human Physiology, and Microbiology that are taken specifically by Nursing majors and not Biology majors. Each semester, the Biology Department also offers a small number of courses that are geared towards non-science majors wishing to fulfill their Core B2 (natural or laboratory science) requirement for graduation. These courses, which include Human Biology, The Biology of Aging, and The Science of Life, are quickly filled to capacity each semester by non-Biology majors, and it is an ongoing frustration that the department lacks the available staff to teach additional Core courses geared towards non-majors.

B. <u>Undergraduate Program</u>

Overview: The undergraduate program in Biology is composed of a series of required foundation and supporting courses, upper-division elective courses and a senior capstone course. Thus an undergraduate Biology major must complete, in addition to the core curriculum and foreign language requirement (36 to 44 units not including science core), General Biology I and II lecture and lab, General Chemistry I and II lecture and lab, Introductory Physics I and II lecture and lab, at least one semester of Organic Chemistry lecture and lab, one semester each of Biostatistics, Cell Physiology, Genetics (with a lab to be instituted beginning Spring 2014), and Evolution (our capstone course). In addition, the student takes five upper division Biology courses, at least one of which must be a "field" course, and at least two others must have a laboratory or field component (67-71 units). Alternatively, in the upper division portion of the degree, a student may opt to complete one of our two emphases, Molecular Biology or Ecology. The Molecular Biology emphasis requires General or Medical Microbiology, Biochemistry (either the one-semester Fundamentals of Biochemistry or Biochemistry I and II), Molecular Genetics and Biotechnology, and two electives chosen from a list of "molecular" courses. The Ecology emphasis requires General Microbiology and four courses chosen from a list of field courses. The overall program goals, learning outcomes and assessment parameters are presented in the curriculum map (Appendix A).

We believe that the program's design is logical, sequential and consistent as shown in the sample curricula (Appendix B). In particular, we find that clearly stated and consistently applied prerequisites are essential to the academic quality of the program and the student's experience as a Biology major (see pre- and co-requisite grid, Appendix C). While we

adhere to course prerequisites very closely, we also build flexibility into the program so that our students have the best possible chance to successfully complete the major within four years. For example, a student may take General Biology II prior to completing General Biology I; we offer a "catch-up" section of General Biology II in the fall semester and a "catch up" section of General Biology I in the spring semester; Cell Physiology, Genetics and Evolution are offered in both fall and spring semesters, and we have been offering some combination of General Biology, Genetics, and upper division Biology courses in the summer as well as one upper division Biology course during intersession.

Delivery of the Curriculum: The Biology faculty is diverse with respect to fields of expertise. Thus we are equipped to offer a range of upper division lecture and laboratory courses from which Biology majors, including those opting to pursue an emphasis, may choose. In any semester we may be in need of additional upper division course of a particular type. This is addressed in one of three ways: 1) a faculty member may increase enrollment in a class, 2) a faculty member may add a second course section to the schedule in order to accommodate more students, or 3) the Department may hire an adjunct professor, typically a post-doctoral fellow from UCSF, to teach a particular course. Given that we prefer to keep upper division elective course enrollments to approximately 16 (lecture) and 12 (lab), a student is sometimes not able to register in a "first choice" upper division course, but we always ensure that students are able to take the courses they need in order to graduate.

With respect to class sizes, General Biology I and II lecture courses are among the largest on campus. While the largest lecture hall on campus accommodates 157 students, we typically divide our General Biology students into three or, if needed, four sections, with a cap of 80 students, and each laboratory section is capped at 24. In addition to Biology majors, those enrolled in General Biology include Kinesiology majors, Biochemistry majors, and students pursuing other majors but who are taking the courses in preparation for health professions programs. Cell Physiology, which is typically taken by majors in the fall of the second year, is limited to about 40 students per section (two sections in the fall and one in the spring), while Genetics lecture is offered as a single section with an enrollment of about 80 in spring and 20 in the fall. Along with the Genetics lecture, the student is required to attend a discussion section (about 20 students per section). However, beginning in the spring of 2014, the discussion section will be replaced by a required laboratory, each section capped at 20. Evolution is offered in two sections each semester with a cap of about 20 students per section. Keeping the enrollment 20 and under is critical to the seminar style of this capstone course. Indeed, this course has been modified in the last few years from a lecture style course to one that is primarily reading, writing about, and discussing primary research articles. Upper division elective lecture courses, as noted above, are limited to about 16 students, and labs to about 12 students.

A student with a grade point average of at least 3.2 overall, and at least a 3.4 in Biology and supporting science courses, may choose to complete the Biology Honors Program. This begins with an application to the Honors Thesis Program Committee in the third year, and requires the completion of a research project and thesis, and culminates with a written thesis and departmental seminar. The Honors designation is noted on the student's transcript.

Biology students often elect to declare a minor, such as Chemistry or neuroscience. The Chemistry minor requires Organic Chemistry I and II, which most of our students take; Organic Chemistry II lab (not required in the Biology major), and an upper division Chemistry elective. The neuroscience minor requires two additional courses in psychology (beyond General Psychology), and the student must include, as part of the upper division course work in Biology, Neurobiology and either Human Physiology, Animal Toxicology or Endocrinology. Psychology is a common minor among our students followed by Environmental Science and various minors in the Humanities. A number of our students participate in the St. Ignatius Institute and in the Honors in Humanities program through which they complete a number of courses in the University's Core Curriculum.

The Department of Biology supports minors in Biology and Natural Sciences. The Biology Minor consists of General Biology I and II lecture and lab, General Chemistry I and II lecture and lab, at least one semester of Organic Chemistry lecture and lab, Cell Physiology, Genetics, and one upper division elective. The Natural Sciences Minor is designed for a

non-science major who is interested in the sciences. The minor consists of most of the health professions program prerequisites: General Biology I and II, at least one semester of Organic Chemistry I with lab, Organic Chemistry II, and Introductory Physics I and II. Students in the minor also complete General Chemistry I and II since completion of the latter is a prerequisite for Organic Chemistry I. The department also provides courses that support the interdisciplinary minors in Gerontology, Neuroscience, and Health Studies.

Students interested in obtaining research experience can usually find positions in laboratories within the Department. Faculty members are enthusiastic about undergraduates participating in research, and they do their best to accommodate and support this interest, as long as there is space and a project available. For most students, this begins in the second or third year, and continues through graduation. These students may earn upper division units (no more than four units total), or simply participate as a volunteer. As noted above, a student in the Honors in Biology Program is required to complete a research project and thesis, and earns credit for the work (for a maximum of five units of upper division credit). The assessment of the student's research endeavors is accomplished in various ways: students present their studies during lab meetings, and compose and present posters for local, national and international research conferences. The Department also includes questions regarding research experience in the annual senior survey.

Another avenue for securing research positions is through the USF/UCSF PUMT (Partnership for Undergraduate Mentoring and Teaching) program, which was established and is supervised by a Biology faculty member, Dr. Deneb Karentz. The goal of the program is to provide UCSF graduate students and post-doctoral researchers/clinicians with opportunities to teach and mentor undergraduate students, to provide USF undergraduate science majors with highly qualified instructors for lecture and laboratory classes, and to provide opportunities for students to gain research experience. The research mentoring program is designed to both enhance research experiences for USF science majors, and to provide UCSF graduate students and post-doctoral researchers with opportunities to acquire undergraduate mentoring experience, as well as assistance with their research projects.

Still other students secure research and internship positions elsewhere independently, or through EdgeInterns, which was created by a USF alumnus. EdgeInterns matches student applicants who are interested in science, technology, and health care with research institutes and companies in the Bay Area.

Given the research opportunities, the technique- and project-based laboratory courses, and the breadth of lecture courses we offer, a student graduating as a Biology major has a solid footing on which to build as an employee of an academic, clinical, government, or industrial laboratory. The student is likewise well positioned for success in a Masters or PhD programs in the biological sciences. At this time, our knowledge of graduates pursuing these paths is anecdotal, and based on personal communications between faculty and alumni.

The Pre-Professional Health Committee (PPHC) serves to guide students interested in careers such as dentistry, medicine, optometry, occupational therapy, pharmacy, physical therapy, physician's assistant, podiatry, and veterinary medicine. In addition to advising, the services provided by the Committee are practice interviews, and the development of a "committee letter" of recommendation.

Students interested in going on to health professions programs include those pursing any major (except, typically, Nursing) and non-degree seeking post-baccalaureate students who are completing health professions program pre-requisites. While each advisor is called upon to address student questions and concerns related to these programs, pre-health advising primarily falls upon the Chair of the Pre-Professional Health Committee (PPHC), also known as the Chief Health Professions Advisor, who is a Biology faculty member, Dr. Mary Jane Niles.

Historically, the Chair of the PPHC, and the bulk of the Committee's activities, has been centered in the Biology Department. However, as a result of the 1993 Program Review, it was decided that pre-professional advising should be moved to an Academic Advising Office, given the extra workload associated with advising and mentoring students from

across the campus. Thus in 1995, an administrator in Academic Services took on the role of PPHC Chair, and the functions of the Committee were then carried out by him and his administrative assistant. However, the position of PPHC Chair moved back to the Biology Department in 2000, at the request of the Dean of the College. The responsibilities of the Chair of the PPHC (Dr. Mary Jane Niles) include advising undergraduate, graduate, and post-baccalaureate students seeking entrance to health professions programs; maintaining each candidate's PPHC file; scheduling practice interviews; writing the bulk of the committee letters of recommendation; submitting letter packets to health professions programs; organizing the annual "Health Professions Alumni-Student Dinner" each Spring, maintaining and assembling acceptance data for other University offices (e.g., Institutional Research, Alumni Relations, the College of Arts and Sciences, and Admissions); and publicizing PPHC services and events through the Pre-Heath web site (www.usfca.edu/artsci/biol/pre-health_information/) Facebook (USF Pre-Health Advising), and an email list. The pre-health email list is composed of current USF students who have met with the Chair of the PPHC for advising. As of this writing, 221 students are on the list. This list is updated each semester as students graduate. So, while this number reflects current students who advised by the Chief Health Professions Advisor, this individual also advises those who are seeking admission to health professions programs after they have graduated. Subsequent to the 2006 Program Review, and upon the advice of the reviewers, the Chair of the PPHC is now given either one course release per year, or two units of overload compensation per semester, in recognition of this year-round commitment.

As an additional service to those students interested in applying to medical school, the Department of Biology instituted a Medical College Admissions Test (MCAT) prep course in Fall 2011, which is currently taught by an adjunct faculty member. The course content includes a review of the basic sciences as well as strategies for success in the Biological Sciences, Physical Sciences, and Verbal Reasoning sections of the MCAT. It is a two-unit, pass/fail course, which does not count toward credit in the Biology major or minor.

The students who seek admission to health professions programs are tracked by the Chair of the PPHC with respect to admissions test scores, interviews, acceptances, and matriculation information (Tables 1-3). The average health professions program acceptance rate from 2007 to 2012 is 65.5%, ranging from a low of 55% and a high of 80%. This reflects only those students who go through the PPHC process. From 2007 to 2012, the number of students seeking the services of the PPHC ranged from a low of 20 to a high of 32.

Table 1. Recent Health Professions Program Admissions: All Program Types

Year of health professions program matriculation	Number applying to health professions programs	Number accepted to health professions programs	Health professions programs acceptance rate
2004	19	12	63%
2005	16	11	69%
2006	20	12	60%
2007	27	15	55%
2008	20	16	80%
2009	32	24	75%
2010	25	16	64%
2011	28	18	64%
2012	29	16	55%

Table 2. Recent Health Professions Program Admissions: Medical School

Year of health professions program matriculation	Number applying to medical school	Number accepted to medical school	Medical school acceptance rate
2004	13	8	61%
2005	16	11	69%
2006	16	10	62%
2007	19	8	42%
2008	14	11	78%
2009	22	17	77%
2010	15	10	67%
2011	20	12	60%
2012	21	12	57%

Recent National Averages (Medical School Acceptances), 2008: 46%; 2009: 46%; 2010: 46%, 2011: 46%

Table 3. Health Professions Programs attended by USF graduates 2008-2012

Boston University School of Medicine	UCLA Drew School of Medicine
Case Western Reserve School of Dentistry	UCSF School of Dentistry
Cornell University, Weill Medical College	UCSF School of Pharmacy
Creighton School of Medicine	USC –Keck School of Medicine
Drexel University School of Medicine	University of Hawaii School of Medicine
Duke University School of Medicine	University of Illinois, Chicago
Georgetown University School of Medicine	University of Iowa, Carver College of Medicine
Howard University College of Medicine	University of Nevada Las Vegas School of Dentistry
Louisiana State University School of Medicine	University of Oklahoma School of Medicine
Mayo Medical School	University of Vermont College of Medicine
NYU School of Dentistry	University of the Pacific Dugoni School of Dentistry
UC Irvine School of Medicine	Western University College of Osteopathic Medicine

C. <u>Graduate Programs</u>

The Biology Department offers a Master of Science Program. A student who has successfully completed the program should be well prepared to enter into a technical position in a related research or industrial laboratory, or continue further postgraduate work. The degree requires that students undertake an active research project that culminates in a formal written thesis, plus complete a total of 24 units in Biology or Biochemistry (16 units of coursework).

To be considered for this graduate program the applicant must submit the results of the Graduate Record Examination (GRE) and have at least a 3.2 grade point average in his or her undergraduate major and in all upper-division work in Biology. We have a Graduate Director who initially reviews the applications. Qualified applications (fulfilling the minimum requirements) are then submitted to potential faculty advisors. Students are not accepted into the program unless a faculty advisor (a specific faculty member in the department) also accepts them. Accepted students are required to complete 24 units of coursework and although we are unable to offer pure graduate level courses (other than the graduate seminar offered every year), students are able to take upper division undergraduate courses and are required to complete additional work in those courses. Student learning assurance methods have been implemented and there are both semester and annual evaluations submitted by both student and advisor to assess learning outcomes.

The graduate program is relatively small (with a maximum of eight students enrolled at any given time) and enrollment tends to vary from year to year. The primary reasons for this variation are the additional faculty workload and financial constraints. Faculty supervising graduate student research do not receive any workload compensation, so faculty members accept students at their own discretion. In addition, USF is a private University situated in a metropolitan setting, and there is no funding available for graduate student stipends. While we can offer a maximum of eight full tuition scholarships, the only living expenses our graduate students earn is a small salary ($2-3,000 per semester depending on the course) for serving as a teaching assistant. The department itself has instituted a Grants-in-Aid program for supporting student research and travel costs for scientific meetings. The department provides financial support (up to $2,500 per year) for student research and travel to scientific meetings. This support is made possible by the generous contributions of donors to the Biology Gift Fund.

Despite its relatively small size and lack of extensive support, the graduate program makes an important contribution to research conducted in the Biology Department as well as the scholarly atmosphere of the department. Undergraduates are important in the Department's research programs; however, they generally have limited time to devote to research. Graduate students have more time and can commit to relatively long-term projects, increasing the lines of research that can be pursued in a laboratory. Moreover, by providing supplemental training and supervision, graduate students can enhance a faculty member's capacity to mentor undergraduates in research. Graduate students present oral defenses of research proposals and thesis projects, providing a forum for both undergraduates and faculty to learn about work being done in faculty laboratories in the Department. Graduate students also contribute importantly to the research productivity of the Department, collaborating with faculty members on publications as co- and first authors. Additionally, our graduate students are required to complete a teaching assistantship for at least one semester during their program. A recent improvement to the graduate program has been the addition of credit for summer research, which also enables the students to maintain continuous health coverage through Student Health Services.

Over the past years the graduate program has modified its Goals and Learning Outcomes to better reflect the Program Mission. The current Program Mission Statement reads: The Biology Masters degree program at the University of San Francisco is a research-based program in which the student undertakes an active research project that culminates in a formal written thesis. A student who successfully completes the program will be well prepared to enter into a technical position in a related research or industrial laboratory or to continue further postgraduate work (e.g., Ph.D. or M.D.).

The M.S. in Biology Program Goals are for students to:
1) Develop scientific literacy in the areas of Biology relevant to selected research interests
2) Exhibit advanced technical, critical thinking, inquiry and analysis skills
3) Communicate clearly and persuasively to a variety of audiences.

The student learning outcomes for these goals are as follows.

For Goal 1, students should be able to a) describe, synthesize and apply concepts & techniques in the current literature within a specific research area, and b) ask scientific questions based upon the literature and construct research hypotheses and design experiments to test hypotheses.
For Goal 2, students should a) select and meet with graduate committee members, b) conduct original research, demonstrating research skills within a specific research area and evaluate collected data, c) prepare a thesis outline and a written thesis to be reviewed and accepted by graduate committee members. The thesis will consist of the following sections: Introduction, Materials and Methods, Results, Discussion and References, and d) determine suitability of thesis work for publication in a peer reviewed scholarly journal.
For Goal 3, students should a) demonstrate the ability to be an effective teaching assistant, b) present and discuss orally the justification for the research, hypothesis tested, materials and methods used, findings with conclusions and

implications for further research; as well as the relevance of the research to the general field of interest in a public format in front of peers, and c) critique and justify research project to the Graduate Chair.

D. International Programs

The Biology Department does not participate in any international programs and no courses are currently taught overseas. With the recent hiring of two new faculty members who have active field research programs, it is possible that courses including field work in other countries may be offered in the future.

E. Admission and Transfer Policies

Most of the Biology majors at USF declare their major prior to matriculating in the fall, and are there are no specific requirements (e.g. math or science requirements) that need to be satisfied for these entering freshman to declare their major as Biology. If a student enters USF as "undeclared science" but wishes to switch his/her major to Biology after he/she has matriculated, or if a student wishes to switch to Biology from another major, we typically require the student to complete General Biology I and II with at least a C- along with General Chemistry I and II with at least a C before the student is granted admission into the Biology major.

Biology majors are advised to take all courses required for the Biology major here at USF. Exceptions are granted in a few circumstances. For example, students may use AP (advanced placement) credit in order to place out of General Biology I and II, provided they have obtained a score of 5 on the AP Biology exam. Transfer students may receive credit for courses taken at other universities prior to enrolling at USF. After attempting a course required for the major at USF and failing to achieve the minimum required grade, students may retake the course for credit at another institution. This practice, however, is generally discouraged by the Biology Department. Students are strongly advised to retake any required courses here at USF instead of another institution (e.g. a community college).

In addition to awarding credit for traditional lecture and lab based courses, students may also receive up to four credits total by participating in a directed study (BIOL 398: Reading for Advanced Undergraduates) or by participating in laboratory research (BIOL 498: Research for Advanced Undergraduates). The Biology Honors Program (BIOL 598 and BIOL 599) requires students to engage in an extensive research project within a lab and requires the writing of an honors thesis. Although many faculty members in the Biology Department regularly accept undergraduate students into their research labs, the demand for opportunities to engage in undergraduate research can exceed the Biology Department's capacity to accommodate those students (other opportunities, like the PUMT program and EdgeInterns, were discussed under Undergraduate Program on pages 9-10).

F. Advising

Academic advising of students is an extremely time consuming yet exceedingly important task that is taken very seriously by members of the Biology Department. The Biology faculty currently advise nearly 500 students, with 355 of those students being declared Biology majors and 91 of those students being undeclared science majors, many of whom eventually declare Biology as their major. Since our last program review, as per the suggestions of the program reviewers, the Biology Department no longer advises students who are minoring in Biology but majoring in another subject. We are also in the process of implementing a Peer Advising Program, described below.

Students are encouraged to meet with their faculty advisors as often as they wish, both to discuss their progress in the Biology major as well as to discuss their future career goals and trajectories. Students who are specifically interested in pursuing a career in the health sciences are encouraged to contact the chair of the Pre-Professional Health Committee (PPHC), Dr. Mary Jane Niles, who is also a member of the Biology faculty.

Prior to matriculation at USF, all incoming students participate in WebTrack, an online advising system featuring short videos that describe curriculum requirements, followed by a quiz to ensure the student has understood the information. Students then register for courses and that schedule is reviewed by a faculty member from the department who contacts the student via email or phone to discuss any recommended changes. The University has an online system, AdvisorTrac, for advisers to document advice and conversations with students, which has proven useful for the WebTrack system and for students who seek advice from several different faculty members and/or from University advisers in CASA (Center for Academic and Student Achievement). Immediately upon arrival at USF, students participate in an Orientation to the Biology Major event, in which they are introduced to the faculty and staff, learn more about curriculum requirements and course schedules, and meet a panel of current Biology students.

All first year, second year, and new transfer students in the Biology major are required to meet with their Biology advisors prior to selecting courses for the following semester. Upperclassmen with science GPAs lower than 2.0 are also required to meet with their Biology advisors before being allowed to register for classes each semester. Although most third and fourth year students are technically not required to meet with their Biology advisors, many of them do so voluntarily in order to make sure that they are staying on track for graduation and in order to seek advice on career planning. This official two-week advising period falls approximately two-thirds of the way into each semester, and students typically sign up for twenty or thirty minute time slots to speak with their advisors.

For the first time, during the spring 2013 semester freshmen Biology majors were asked to attend a group "pre-advising" session led by a Biology faculty member in order to help them be better prepared for their one-on-one appointment the following week. Many, but not all, students attended the group advising session. The group advising session seemed to be useful, in the sense that faculty reported that those students who attended the group advising session did indeed seem better prepared to discuss their upcoming course schedules during their official advising appointments.

Based on the recommendation of the previous program review, a Peer Advising Program is now being developed in the department. Starting in Spring 2014, upper division students who were recommended by a faculty member will undergo training and hold office hours during which students can drop in with general questions about courses, scheduling, and other topics. This system is not intended to replace academic advising by the faculty, but rather to supplement it and help students come to their advising appointments better prepared.

Although there is no formal evaluation process for advising, the Biology Department does conduct an optional senior survey of graduating Biology majors each spring semester. Out of the thirty three seniors that responded to the survey in 2012 and 2013 combined, thirty of the seniors either agreed or strongly agreed with the statement: "My academic advisor was available, informed, and helpful." Three respondents either disagreed or strongly disagreed with that statement. This data is suggestive that the students think that the Biology faculty are doing a good job with advising, although a larger sample size would be required to draw a stronger conclusion.

G. <u>Overall Academic Quality</u>

The Biology faculty appear to be largely satisfied with the Biology curriculum as it currently stands. Even in the face of increasing student enrollment in the Biology major in recent years, we continue to offer relatively small classes that foster student/professor interactions in a wide range of disciplines within the biological sciences. The General Biology classes (BIOL 105 and BIOL 106), which at many other universities would be several hundred students large, are purposely split up into several smaller lecture sections in order to provide a more intimate classroom experience for the students. Upper division courses are usually capped at twelve to fifteen students per class, with associated lab courses taught by the lecture professors themselves, rather than by teaching assistants.

Within the last five years, several positive changes have been made to the Biology curriculum. The Biology Department has, for the last four years, been offering summer courses to students, including General Biology, Genetics, and other

upper division courses (e.g. Biology of Cancer). This has helped students to stay on track for graduation in four years. With the addition of new faculty members, the Biology Department has broadened its offerings with several Biology courses that are not directly focused on human biology. These include courses in invertebrate zoology, animal development, ecology, and plant biology. Genetics was restructured for the Spring 2014 semester; the discussion section component has been replaced with a weekly laboratory session where students will gain hands-on experience working with the bacterium *Escherichia coli* and the fruit fly *Drosophila melanogaster*. Finally, the opening of the new Lo Schiavo Center for Science and Innovation in Fall 2013 has provided faculty in the sciences with new teaching spaces for both lecture and laboratory courses.

Many Biology majors are interested in engaging in research, and the Biology Department strives to provide opportunities for qualified undergraduates to perform laboratory research during their time here at USF. Several professors in the Biology Department actively recruit undergraduates into their labs each year, and undergraduates engaged in research are encouraged to present their research at the annual Creative Activity and Research Day (CARD) event held on main campus. In addition, the UCSF/USF Partnership for Undergraduate Mentoring and Teaching (PUMT) program, organized and led by Biology Professor Dr. Deneb Karentz, helps place USF students into research labs at the nearby University of California, San Francisco, affording USF Biology majors additional research opportunities off the USF campus.

III. ASSESSMENT

In 2011, the Biology Department completed a new three year Student Learning Assurance Plan for the 2011-2014 academic years (Appendix D). The plan includes the mission statement and student learning outcomes for the undergraduate program in Biology, rubrics for assessing student learning outcomes, a curriculum map indicating which parts of the curriculum address specific outcomes, and an outline of steps to be taken in 2011-2014 to assess the effectiveness of the department in achieving its program outcomes. Learning outcomes and rubric for the M.S. Biology program are also included in Appendix D.

Student learning assurance reports have been completed for 2011-2012 and 2012-2013, the first two years covered by the learning assurance plan (Appendices E, F). During this time, methods for assessing student learning outcomes have included a review of syllabi to ensure that courses were properly aligned with outcomes on the curriculum map for Biology, an evaluation of student grades, surveys of students graduating from the Biology program, and a focus groups in which graduating seniors discussed the effectiveness of the Biology Department in attaining student learning outcomes. Evaluation of student learning was also accomplished through regular discussions in department meetings and at a day-long faculty retreat in January 2013. Below is a synopsis of the main findings in the learning assurance reports, and summaries of changes made in response to findings in the reports.

Alignment of courses with program outcomes. The department's evaluation of course syllabi indicated that Evolution, the capstone course, was not covering the learning outcomes specified on the curriculum map. In particular, students did not read and evaluate the primary literature in the course. The course syllabus was modified to include reading and discussion of scientific articles, and assessment in the course was modified to include assignments requiring evaluation of the literature.

Student achievement. Appraisal of student grades indicated that student achievement was satisfactory to excellent in required first and second year courses, and good to excellent in upper division electives and Evolution, the capstone course in the program. Surveys of graduating seniors also indicated that students felt confident that the Biology program provided them with both broad and in-depth knowledge of Biology, and the ability to use laboratory techniques important in the biological sciences.

Understanding of the scientific method. Student comments from focus groups indicated that upper-division laboratory courses in particular provide students with an understanding of methods used in scientific investigation. Students suggested that lab work in lower division courses focused primarily on following a set of instructions, whereas lab work in upper division courses involved evaluation of hypotheses through experimentation, and collection and analysis of data to draw conclusions. Students articulated an appreciation of the importance of scientific investigation, and indicated that practicing the scientific method lab classes helped them learn to think independently and analytically. Discussion at the faculty retreat in January 2013 led the department to add a laboratory component to Genetics, an upper division course required in the second year of the curriculum that is a pre-requisite or co-requisite for all other upper division Biology courses. The lab has been incorporated into the course beginning in Spring 2014, and will cover experiments and exercises with fruit flies, prokaryotes, and molecular techniques. Adding the lab to the course will help students attain an understanding of the scientific method and familiarity with important molecular procedures.

Awareness of ethical issues in the biological sciences. Student comments from the focus groups also indicated that students completing the Biology program have an awareness of ethical issues and the significance of social responsibility in the biological sciences. Students were able to articulate specific ethical issues related to biological research and medicine, and express an appreciation for the importance of discussing and evaluating ethical considerations. Students also commented that courses outside of Biology provide an opportunity to explore ethical issues in Biology and medicine in greater depth.

Awareness of careers in the biological sciences. Student comments from the focus groups and senior survey indicate that the curriculum provides students with a general awareness of careers in Biology. However, students believe that the department could do better in helping students prepare for and find opportunities off campus that would increase their exposure to career options and give them the opportunity to apply and reinforce what they learn in coursework. Students further indicated that student organizations on campus were not always helpful in finding off-campus opportunities. To address this issue, the department added a one-unit required seminar to the curriculum that will bring in speakers from a variety of areas in the biological sciences, require evaluation of the primary literature, and cover preparing for and finding short-term off-campus opportunities as well as long-term jobs after graduating. The seminar will be open to students after they complete General Biology I and II so that they will have some background in Biology and will be early enough in their academic careers to benefit from exploring various careers and opportunities to gain real world experience. The seminar will be helpful in exposing students to areas of Biology in which people work, developing skills for evaluating scientific papers, and acquiring the ability to research and find extracurricular opportunities and formulate plans for career development.

Access to upper division elective courses. Student comments in focus groups and surveys of graduating seniors both indicated that students sometimes are not able to get into the upper division elective courses they would like to take. The department has added additional lecture and lab sections of popular classes when possible. However, the ability to add additional sections is constrained by limits such as availability of teaching lab space and faculty. The department has also occasionally increased enrollment caps for popular courses, but strives to keep upper division classes small to provide students with more attention and make it possible to have in-depth discussions and laboratory activities.

Laboratory instruments and equipment. Discussions in department meetings indicated that updates in instrumentation would enhance students' exposure to modern techniques used in the study of Biology. Course work that incorporates instruments used in research and industry provides greater understanding of how science works, and exposure to methods used in different Biology-related careers. The department obtained a grant to open a microscopy center that has a confocal microscope and scanning electron microscope. The department also recently added a Professional Science Master's program in Biotechnology, and as part of the program was able to acquire equipment and instruments that can be used in undergraduate courses in molecular Biology.

IV. FACULTY

A. Demographics

The department consists of 15 full-time faculty (see Appendix G for biographies and CVs). Of these faculty, 8 are male and 6 are female. A study by the National Center for Education Statistics reports a ratio of 53% male, 47% female at universities in the United States. The same report found that 7% of college and University faculty were black, 6% were Asian/Pacific Islander, 4% were Hispanic, 1% were American Indian/Alaska Native, and about 79% were White. Of the 13 USF faculty who responded to a questionnaire, 3 identified as Asian/Pacific Islander and 10 as White. This shows that although the faculty demographics of the department do not mirror the diversity of the student body that it serves, they are reflective of the demographic trends in higher education in general.

B. Teaching

In the Collective Bargaining Agreement negotiated in 2011 between the USF Faculty Association and the University of San Francisco, a workload of 30 units per academic year was agreed upon. Of these, 18 units minimum must be spent on teaching; this is the standard teaching workload for tenured and tenure-track faculty. Term faculty do not maintain research programs, instead they teach 24 units per academic year. Part-time faculty are not allowed to teach more than 8 units per semester.

The teaching loads of tenured and tenure-track faculty members are generally organized around a 2-year, 36 unit cycle. In the Biology Department, our laboratory/field courses have separate course numbers for the three units of lecture and the 1 unit of lab (generally one 3-hour lab session per week) that make up a 4-unit course (e.g., Biology 320 Human Physiology lecture = 3 units, the co-requisite lab is Biology 321 = 1 unit). However, each 4-unit combination of lecture and lab courses for students is considered as six teaching units for faculty due to the extra work associated with laboratory courses. A typical 2-year workload for Biology faculty is three “heavy” semesters of one lab course and one lecture-only course (for 10 units total) and one “light” semester of one lab course (for 6 units total). For the purpose of illustration, an example of a 2-year teaching schedule is provided in Appendix H.

While time preparing for lectures is considered roughly equivalent regardless of the course topic, time devoted to grading, office hours, help sessions and other forms of faculty-student communication is directly proportional to class size. The average Core course size at USF is 28 students and the average “major/elective” class size is 20 students. For General Biology, the Biology Core courses, and the other service courses, the class sizes for lecture average 75-100 students each semester. Required sophomore and junior level Biology courses also have significantly larger class sizes than the University norm; Cell Physiology and Genetics classes are usually 40-80 students each. Our upper division courses are typically limited to 12 students for laboratory/field courses and 15 students for lecture only courses (with the exception of Genetics and Evolution). However, we do increase class sized to provide additional seats when needed to accommodate the growing number of majors and undeclared science students that we have at the University.

The faculty come from diverse scientific backgrounds and have a wide range of experience (Appendix G). The first two years of the major curriculum could be taught by any of the current faculty members, and in fact, the teaching responsibilities for the introductory courses often rotates between several different main instructors. The current upper division courses are also well covered by the existing faculty, but it should be noted that this in part due to the upper division curriculum being tailored to meet the areas of expertise found amongst the faculty. For example, fall 2012 saw the first offering of a Developmental Biology course by the department for many years, thanks to the hiring of a new faculty member. This same new faculty member created a new field course, Invertebrate Zoology. This was only possible due to the addition of a new position to the department. The Plant Biology course was in danger of being discontinued after the department’s sole plant biologist retired, but can now be offered again thanks to the hiring of a new faculty member with a background in botany. In short, the expertise within the department is well suited to our

current curriculum, but due to the relatively small number of faculty and an impacted teaching schedule, faculty members are restricted in their ability to innovate and change teaching schedules, and any changes due to retirement, sabbaticals, or health issues may require changes to the course offerings made to students.

Teaching assignments are made by agreement between the Department Chair and each of the faculty members. This is a dynamic process and requires considerable work by the Chair to ensure that the schedule is acceptable, as they must juggle considerations such as conflicts with other classes both within the program and with other programs. Many faculty members teach either the same or very similar sets of courses from semester to semester, but requests for changes are well received and the climate is one that is open to negotiation.

Since the last program review, support staff positions have been created to help with equipment maintenance and laboratory preparation. This has been a tremendous asset to the program. However, the individuals filling these positions often work beyond normal working hours to keep the labs running, and were asked to do a significant amount of additional work to facilitate the transition to the new LoSchiavo Science building. Most of their time is devoted to the larger lab classes, and so faculty who are teaching smaller upper division lab classes are often responsible for most of the preparation and clean-up associated with their labs, adding considerably to the work required to teach these courses. More support staff, or an increased budget for student assistants to help these staff members, will eventually be necessary to relieve the work burden on these positions.

The Biology Department faculty members are extremely enthusiastic about teaching and enjoy the classes that they teach. Some faculty would like to teach a wider variety of classes, or have specific additional classes that they would like to add to the curriculum. However, the current teaching needs of the department make this impractical, since all existing faculty have full teaching loads, and thus there are few options for covering course changes. Some faculty take additional units ("overloads") to cover classes, or in some cases decline course releases that they are due from administrative work, in an effort to help the Department maintain its current curriculum. An improved faculty to student ratio would provide opportunities to teach different classes or add new classes to the curriculum.

Space, equipment, and budgets for labs also affect how classes are taught. Field class instructors have commented that they would teach their field classes differently if they had a room that was better suited and equipped for field studies. In lab classes such as microbiology and genetics, pressure to keep lab materials costs low is an impediment to introducing newer techniques to the classroom, particularly molecular Biology techniques that can often be costly.

Despite these pressures, faculty still find ways to successfully interact with and mentor students in and out of the classroom. Faculty members supervise undergraduate and graduate student research projects, serve as advisors for a number of student science clubs, and make exceptional efforts to be available to students for advising beyond scheduled office hours. These close relationships with the students are a point of pride for the Department.

Finally, it should be noted that despite the teaching challenges described above, the climate of the Biology Department and of USF in general is highly supportive of teaching. The Center for Instruction and Technology provides workshops on teaching techniques, assistance with integration of new technology into the classroom, and hosts "Open Classroom" sessions that invite faculty to visit other instructor's classrooms in order to learn from their techniques. Classroom technology is generally well supported, with LCD projectors and laptops in nearly all classrooms and a system for delivery of projector systems on request to those rooms that need them. The atmosphere is inviting for junior faculty to seek advice from other faculty on any professional matters.

C. Research

Of the 30 units per year contracted by each tenured or tenure-track faculty member, six units are allotted for scholarly research. Although finding time for research can be challenging, faculty carry out research in diverse fields, including the

UV photobiology of marine organisms, cellular Biology of marine algae, transcriptional regulation in breast cancer, grassland ecology, viral immune evasion, animal behavior, conservation Biology and herpetology, tissue regeneration, and host-parasite interactions. This work is published in a variety of peer-reviewed journals and presented at research conferences, as can been seen in the individual curriculum vitae of the faculty members (see Appendix G).

Biology research at USF is supported by both internal and external grants. A list of funded external grants since 2008 can be found in Appendix I, including grants from the National Institutes of Health and the National Science Foundation totaling over $1.9 million. A grant submitted by Deneb Karentz to NSF in May 2012 titled "Collaborative research: Biological adaptations to environmental change in Antarctica - An advanced training program for early career scientists" for $215,343, (collaborative with Donal Manahan at the University of Southern California) is pending, contingent on review of Antarctic logistics support. Juliet Spencer has submitted an NIH R15 AREA (Academic Research Enhancement Award) proposal "Modification of Host Chemokine Responses by Human Cytomegalovirus" for $424,783 that is currently under review. James Sikes has also submitted a proposal for an NIH R15 AREA grant entitled "Mechanisms of axial polarity modifications during development" for $375,413 that is under review, as well as a preliminary proposal submitted to the NSF RUI (Research in Undergraduate Institutions) program "Mechanisms of axial polarity modification and re-establishment during postembryonic development".

The University has several intramural programs that provide faculty with an opportunity to apply for institutional research support. These include the Faculty Development Fund and the Lily Drake Cancer Research Fund. Biology Faculty make use of these resources to obtain funding for research supplies and equipment, student stipends, and travel expenses to meetings.

The Biology Department strives to maintain a diverse faculty, with the goal of exposing students to wide-ranging areas of study. As mentioned in the teaching section, the upper division courses offered are partially determined by the areas of study represented amongst our faculty. This influences hiring decisions when those opportunities arise, as the Department considers what areas of Biology are not currently well represented. This is discussed further in the section on Recruitment and Development.

D. <u>Service</u>

Faculty are contracted to spend the equivalent of three units each semester in the pursuit of service activities. Biology faculty members are dedicated to providing quality service to the community, the University, our colleagues, and our students.

Committees. At USF, Biology faculty serve on a wide array of committees, including the Task Force for Excellence in Research and Scholarship, the Arts and Sciences Writing Retreat Selection Committee, the Arts and Sciences Peer Review (Promotion and Tenure) Committee, the Valedictorian and Dean's Medal Selection Committees, the Sustainability Task Force, the Arts and Sciences Curriculum Committee, the Faculty Development Committee, the University of San Francisco Admissions Advisory Board, and the New Science Building Committee, just to name a few. In addition, our faculty members are active in the USF Faculty Association, two holding elected positions and providing significant leadership for the union. Biology faculty members also serve on several new faculty search committees each year and are dedicated to helping bring the best and brightest new talent to USF.

Advising. One of the most important roles of Biology faculty, and perhaps the one activity that takes up the most time after teaching, is academic and career advising. We take this responsibility quite seriously and have devised and implemented a very effective advising system (see the section on Advising for details).

Other Service Contributions. Biology faculty members provide a wide variety of other services to students and the University. These include

- Writing letters of recommendation for scholarships, internships, employment, and applications to medical schools and graduate programs.
- Serving as faculty advisors to student organizations and regularly attending and participating in student-centered and student-organized events. Among these organizations are:
  - *Beta Beta Beta National Biological Honor Society, Omicron Alpha Chapter*: Tri-Beta functions as an honor and professional society for students in the biological sciences. Its activities are designed to stimulate interest, scholarly attainment and investigation in the biological sciences, and to promote the dissemination of information and new interpretations among students of the life sciences. In addition, the Omicron Alpha chapter is a service organization.
  - *LGBTQ Caucus*: The Lesbian, Gay, Bisexual, Transgender and Queer Caucus is an organization of USF faculty, staff, graduate students and alumni with the mission of promoting LGBTQ scholarship, community, and social justice.
  - *Pre-American Medical Student Association (AMSA):* A student organization dedicated to helping all aspiring doctors gain the exposure necessary to build a competitive application, as well as explore common interests in the medical profession.
  - *University Scholars Mentoring Program*: The University Scholars Program recognizes incoming freshmen with extraordinary scholarship at aptitude, with the goal of providing them with additional support to aid in their retention at USF. The Mentors program hosts events to introduce students to faculty and provide guidance and perspective on their careers.
  - *USF Corpus Clinical Pre-meds*: This is a volunteer program that gives USF pre-med students a chance to volunteer at the St. Vincent De Paul Homeless Center Clinic.
- Recruiting new students for USF: Faculty are often asked by the Admissions Office, the Dean's Office, ROTC or the Athletics Department to meet with prospective students and their families. We always have at least one representative at any of the Admissions or College events to which we are invited (e.g., USF Preview Day, Major/Minor Fair).
- The Biology Department maintains two awards for Biology majors. The Chihara Awards are given out each semester to upper division Biology majors who demonstrated a high level of academic achievement in the previous semester. Three awards ($500 each) are given each semester at a departmental luncheon for faculty and recipients. The Edward Kessel Award ($1000) is given to an outstanding graduating senior based on academic achievement, service to the department and career potential. The award is presented at a dinner for graduating seniors. Awards are funded from donations to the Biology Gift Fund.
- Faculty members volunteer to organize and present seminars for the LCSI seminar series and Biology Department Seminar series.
- Attendance at events sponsored by department-related groups (e.g., Pre-professional Health Committee events, "Meet the Faculty Night", etc.).

On their own time, Biology faculty serve the community by preparing and serving meals to homeless people at the Gubbio Project; assisting at the St. Vincent de Paul Ozanam Wellness Center; volunteering at the San Francisco S.P.C.A.; volunteering time at local schools by giving science presentations or helping with administrative work; membership with a local support committee supporting international scholarship, and serving on the board of a local multilingual, multicultural private school.

E. <u>Relationships with Other Departments and Programs</u>

One member of the Biology Faculty has a joint appoint in the Environmental Science Department, and as a result she teaches classes in both disciplines. Other faculty members engage in collaborations with faculty from the Environmental Science Department. Most other interactions involve discussions of curriculum development with the Chemistry

Department. Biology majors must take a year of general chemistry and a year of organic chemistry as a requirement for the major, and Chemistry majors with an emphasis in Biochemistry must take the core Biology courses as well as the Genetics course offered by the Biology Department. This requires some coordination between the departments, in particular in regard to scheduling of classes so as to avoid conflicts.

F. Interdisciplinary Programs

The Biology Department does not currently participate in any degree-granting interdisciplinary programs.

G. Recruitment and Development

The Biology Department is very much understaffed relative to full-time faculty. Areas in which we could use additional expertise include, but are not limited to, microbiology, ecology and vertebrate anatomy/physiology.

- *Rationale for Microbiology:* We have a service course in microbiology that must be offered every semester for Nursing and Kinesiology majors, two upper division courses (General and Medical Microbiology) that are in high demand, and a First Year Seminar in microbiology that we can't offer as often as we would like.
- *Rationale for Ecology*: The Ecology Emphasis in Biology has been growing in numbers and we need to offer more ecology courses. Current field courses fill quickly every semester as every Biology major, except for students following the Molecular Biology Emphasis, is required to take one field course.
- *Rationale for Vertebrate Biology:* We offer both lower division service courses and upper division Biology courses in Anatomy and Physiology. These courses are always over-subscribed and for upper division we often have offer two lab sections that are taught as a paid overload for faculty.

The employment history of current Biology faculty covers a range from newly hired in 2013 to 43 years (Figure 4). Five faculty have been hired in the past 5 years, two tenure-track (one new line and one retirement replacement) and three non-tenure track (term) faculty (one replacement and two new lines, one of these new positions is associated with the new PMS). However, nearly a third of our teaching is currently the responsibility of part-time faculty. Retirement plans of faculty are not known, but there are potentially five faculty who might be retiring within the next ten years or less.

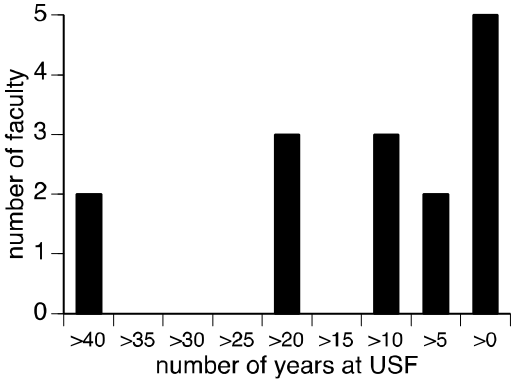

Figure 4. The employment structure of the faculty in the Biology Department displayed in five-year increments. Note that the >20-year category is three faculty all with 21 years of time at USF.

The department does not have any of its own formal programs for full-time faculty development and relies on the College and University to provide these opportunities. (See description of the PUMT program for our association with the UCSF Preparing Future Faculty Program and professional development of part-time faculty.) New full-time faculty are mentored through the College where the Dean's Office identifies a current faculty member to serve as a first point of contact as new faculty settle in to USF. All faculty in the Biology Department are very willing to provide support and

share advice on teaching, research and service. In addition, the USF Faculty Association has information sessions for faculty preparing tenure and promotion applications. These meetings are organized by members of the Peer Review Committees and the union Executive Board, and are intended to make the application review process as transparent as possible. In the past 10 years, Biology faculty have had a 100% success rate when applying for tenure and promotion.

USF/UCSF Partnership for Undergraduate Mentoring and Teaching (PUMT). The University of California San Francisco (UCSF) is a leading University dedicated to promoting health worldwide through advanced biomedical research, graduate-level education in the life sciences and health professions, and excellence in patient care (http://www.ucsf.edu). The University of San Francisco/University of California San Francisco Partnership for Undergraduate Mentoring and Teaching (PUMT) program was initiated in 2006 to address two objectives:

1. To provide UCSF graduate students and post-doctoral researchers/clinicians who want to pursue faculty careers with opportunities to teach and mentor undergraduate students, and
2. To provide USF undergraduate science majors with highly qualified instructors for lecture and laboratory classes, and provide opportunities for students to gain research experience.

The partnership is coordinated through the UCSF Office of Career and Professional Development (OCPD) (http://career.ucsf.edu). Since 2006, USF has been hiring UCSF graduate students and post-doctoral researchers/clinicians as part-time faculty to teach semester-long classes (lectures and lab sections). These part-time faculty are picking up the slack because we do not have enough full-time faculty to teach all of the courses we need to offer. We used to struggle with finding qualified people to teach full courses and were relying on undergraduates to serve as laboratory teaching assistants (TA). It was difficult to find qualified PhDs to teach lectures and undergraduate students were generally not very effective as TAs. Instructors from UCSF have relieved some of the pressure in staffing our courses and lab sections; and perhaps more importantly, they have greatly enhanced student learning at USF. In turn, the part-time faculty have gained valuable hands on experience in teaching undergraduates and being mentored by USF full-time faculty.

From Fall 2006 to through Fall 2013 (including summer sessions starting in 2010) we have hired 157 UCSF graduate students and postdocs, along with an additional eight non-UCSF personnel and 19 USF graduate students. These people have taught 68 lecture classes and 378 lab sections (Figure 5).

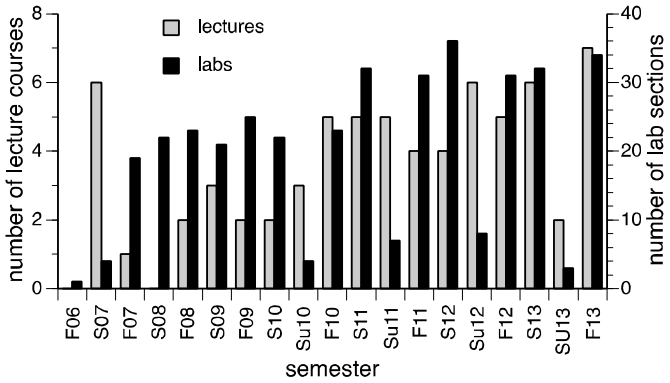

Figure 5. Number of lecture and lab sections taught by part-time faculty in fall (F) and spring (S) semesters, and summer (Su) sessions from Fall 2006 through Fall 2013.

We have found that while most applicants are very good, and some excellent, as lab instructors, hiring qualified people to teach lectures is still a challenge. Early on in the PUMT program we learned that part-time faculty were not an effective way of staffing General Biology or upper division lectures, and have avoided doing so whenever possible. Our current practice is to try and staff lectures with part-time faculty who have proven to be good teachers in lab sections. However, while UCSF graduate students and post-docs may be qualified and are eager to gain teaching experience in full

courses, the most do not have the time to take on a full course and also fulfill research obligations. Therefore, trying to expand this program to compensate for our deficiency of full-time faculty is not a viable option. Many of our part-time lecturers come were part-time lab instructors who have completed graduate school or their post-doc and can teach a course for one or two semesters before moving on to a full-time job elsewhere. While we do not view the PUMT program as a recruiting tool for full-time faculty, two of our term faculty first came to USF through the UCSF partnership program.

At the start of the partnership the UCSF OCPD had a very active program called Preparing Future Faculty (PFF), part of a national initiative for graduate students and post-docs. The UCSF PFF activities included the Teaching Apprentice Program (PFF-TAP) that sponsored workshops and discussion groups on best practices in the classroom and how to apply for faculty positions. In 2012 OCPD had a change in personnel and a shift in focus away from the PFF program. The OCPD still facilitates advertising of part-time teaching positions at USF, but no longer sponsor their own teaching mentorship programs. While we still receive many applications for part-time teaching at USF, the lack of support from UCSF is unfortunate.

A second component of the PUMT program is research mentoring of USF undergraduates by UCSF graduate students and post-docs. This part of the program was added in 2011 to allow for a more flexible time commitment from UCSF personnel than teaching formal courses and to increase research opportunities for our students. This aspect of the PUMT program has not gained much momentum. Ten students have been placed in UCSF labs and at least three of those research opportunities have turned into full-time jobs after graduation. While we have many students inquiring about research, but only a small number apply for the available positions, and not all of the applicants have strong enough academic backgrounds to be successful in the selection process.

This year information materials were printed and distributed to UCSF campuses advertising the research mentoring aspect of the PUMT program and this opportunity is also included in the fall, spring and summer announcement of part-time teaching positions. We hope to see the research mentoring steadily increase in the future.

V. DEPARTMENTAL GOVERNANCE

The Biology Department operates within the framework of the USF Faculty Association contract and the policies established by the Provost and Dean's Offices. We do not have by-laws or other governance documents of our own. Based on our union contract, the Department Chair is supposed to be elected by secret ballot and by a simple majority of full-time Biology faculty members. However, since very few faculty are willing to take on the role of Chair, it is more usual for someone to volunteer and then be voted into office. The Chair is elected for a 3-year term and provides leadership for the department. The Chair is compensated with release time of five teaching units per semester. It must be noted that the Chair of the Department is a member of the USF faculty union and as such, is an equal colleague to the faculty, not part of the administration.

The Chair is accountable to the Dean in areas such as communication with faculty, student advising, course scheduling and staffing, budgeting, program development, report writing, oversight of Department programs (e.g., Peer Advising programs, Molecular and Ecology emphases), planning department functions, recommending part-time faculty, and approval for student forms (e.g., course substitutions/waivers, petitions to enroll at another University, change of program, directed study registration, etc.). In addition, the Department has instituted a policy that the Chair be the only signature accepted for adding and dropping courses. In other departments the instructor of record is allowed to control class size, but we have found it more practical and efficient for the Chair to monitor student enrollments and manage waitlists for courses. The Chair determines the schedule of Department meetings at the beginning of each semester, based on faculty teaching schedules. Agenda items are requested from the faculty and meetings are typically held for 45 minutes every two-three weeks during the semester. Minutes are recorded and distributed by the Chair. The Chair also represents the department at monthly College Council and College of Science Executive Council meetings.

The two graduate programs (the MS Biology and the PSM Biotechnology) each have a Director, a faculty member who manages the day-to-day operations and receives release time from teaching or paid overloads for their service. Currently, Dr. James Sikes serves as Director of the MS Biology Program, Dr. Jennifer Dever serves as the Director of the PSM Biotechnology Program, and Dr. Christina Tzagarakis-Foster serves as Associate Director of the PSM Biotechnology Program. Responsibility for part-time faculty is also delegated to another faculty member, Dr. Deneb Karentz, who receives course release or paid overload for this service. In addition, a Department Historian has been appointed to take photographs and archive these to document events like department socials, student award luncheons, and graduation day. Dr. Ammon Corl presently serves as the Department Historian.

Unlike the situation at many institutions, where a program assistant filters all contact with the Department Chair, the USF Biology Chair is directly accessible by phone, e-mail or a knock on the door. As a result, much time is spent as an *ad hoc* advisor fielding questions from students (majors and non-majors), non-departmental faculty, administrators and the general public. The Chair has daily contact with the Department program assistant, the Sciences Instrument Technician and the Life Sciences Manager, and oversees office and teaching lab activities. However, because of the union structure, the Dean (or staff in the Dean's office), and not the Department Chair, is the actual supervisor of the office and laboratory staff.

One of the challenges we face in terms of governance is that the Department has very little input into decisions made by the administration that directly affect our teaching and research activities. In fact, there is a perceived general disregard for faculty opinions, and no apparent process for faculty to be involved in major decisions beyond communication through the Chair, who is rarely consulted or informed by the Dean's Office. The recent construction of the new science building and the renovation of the existing science building are prime examples. To avoid increasing the size of this section of the self-study, two specific examples can illustrate our frustration with the lack of communication and perceived indifference of the administration to the needs of the Biology Department. These are not isolated incidents, but they are representative the administration frequently makes decisions and does not seem to appreciate that faculty are capable of providing good suggestions and can be a valuable source for resolution of problem issues.

- During the completion of the new science building, it was decided to eliminate the sink from the microbiology prep room, for reasons that are still unclear. The Biology Department was never consulted or even informed of this decision. The Department found out after the fact and by accident, and when we explained that this was completely unacceptable, we were told the decision would not be reversed. This prep room is currently not utilized except for storage, since the lack of a sink renders the space non-functional and also makes the use of the autoclave difficult.
- The University has begun renovation of the Harney Science Center, where all faculty offices, research labs, and many teaching labs are still located, but there is no master plan that we have been made aware of, and the Biology Department not been asked what we would like to see in terms of improvements to our existing spaces. Workers just showed up one day to renovate a prep room for a teaching lab, and even the Life Sciences Lab Manager had not been informed that this renovation would be taking place.

VI. STUDENTS

USF students are typically first generation college students, working part-time, and commuting as upper classmen. From 2008 to Fall 2013, we have ranged from 231-355 declared Biology majors each fall semester. This number does not include additional students (Biology minors, undeclared majors and others) who are advised in Biology. For example, during the Fall 2013 semester we had approximately 446 students on our advising list, and 91 of these students are undeclared majors considering Biology as their major.

From fall 2008 to Fall 2013, an average of 77±18 freshmen entered USF as Biology majors each fall and 55±5 students graduated each year (through spring 2012). New students each fall have been primarily female (69±4%) and Asian (42±7%), and this is reflected in the overall gender and ethnic profiles of all Biology majors (again, measured each fall) from 2008-2013 (Figure 6). The average combined math + verbal SAT scores (1124±28) and high school GPAs (3.65±0.07) for fall entering Biology majors have been fairly consistent during this time. The Biology Department also has an average of 28 transfer students each year, and their demographic profile is similar to that of entering freshmen.

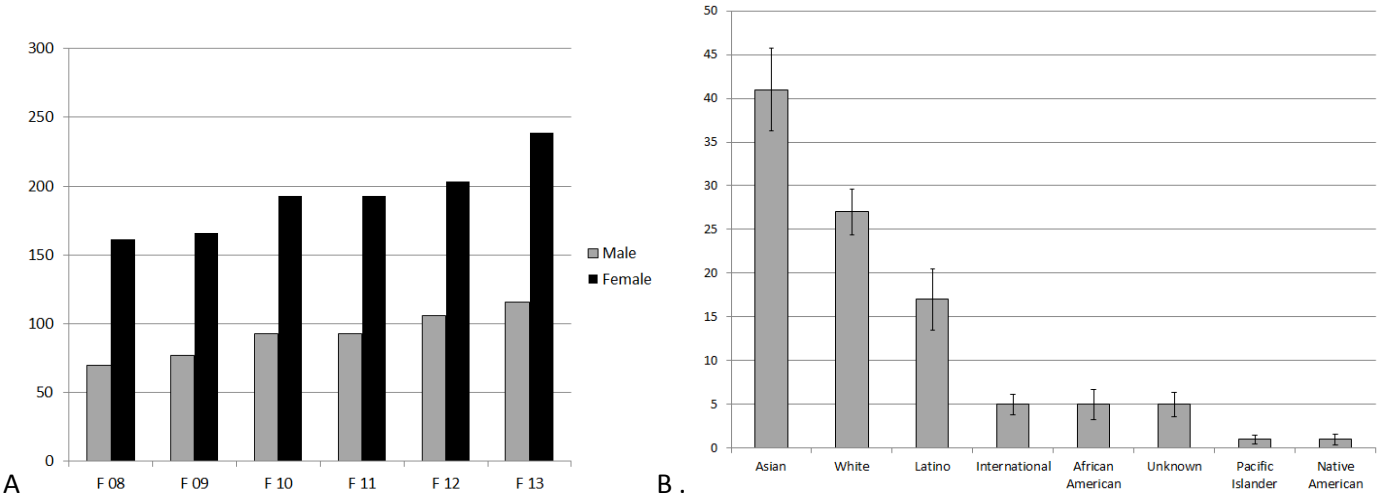

Figure 6. A. Total number of males and females in the Biology major each Fall from 2008 to 2013. B. Mean (± standard deviation) ethnic make up (% of total) of Biology majors during Fall semesters from 2008 to 2013.

It is difficult for us to determine how many of the students entering as freshman Biology majors are actually part of the group that graduates from USF as Biology majors. A portion of the incoming freshman class does not successfully complete General Biology and/or General Chemistry and changes to a major outside of the sciences. Our perception of these students is that they are not sufficiently prepared (whether in terms of work ethic, study skills, aptitude, or secondary school preparation) to undertake what is one of the more demanding majors at USF.

Faculty members have minimal involvement in recruitment of new students, which is essentially a University function. Faculty members continue to support recruitment by answering questions from prospective students and their parents via email, phone calls, and campus visits. We also accommodate special requests from the Athletics Department. When asked, we participate in any USF Admissions events on campus (even though these are most often held on weekends).

Since USF Alumni Relations does not track our graduates effectively, most of our information about where students go after USF is from faculty who are keeping in touch with our alumni on a personal basis. We have a reasonably high success rate of students applying and being accepted to medical school (65.5% of those who applied between 2007-2012, with 20-32 applicants per year) and this information is readily available from the Pre Professional Health Committee. Below are a few examples of the kinds of careers our Biology alumni undertake:

- Medical and other health professions programs
- Laboratory research positions at universities, research institutes, pharmaceutical and biotechnology companies, government agencies
- Masters and Ph.D. programs
- Various non-science professions

VII. STAFF

One full-time Program Assistant and one full-time Laboratory Manager serve only this department. A Chief Technician is shared by at least three other departments. An Instrument Specialist was recently hired to aid in the evaluation of new equipment for the Fletcher Jones Microscopy Center; however, this position serves all 7 science departments in the College. A Laboratory Safety Officer position has been just created and the new hire will oversee lab safety for all the science departments as well as the Art + Architecture department.

The Program Assistant maintains all routine operations and some special events such as arranging student/faculty social events. The diversity of needs of this department may be similar to other science departments but the number of faculty [including adjunct] and students [both majors and non-majors], means that this position is easily twice as demanding as any other Science department. The wide array of responsibilities includes processing student worker personnel forms, preparing purchase orders, receiving shipments, assigning advisees, maintaining advisee files, interacting with students and department visitors, handling phone calls, distributing mail, running errands, and generally assisting faculty with whatever is required. Occasionally student workers are hired to assist in the office, but that is left to the discretion of the Program Assistant.

Program Assistants tend to stay in this position for a few years and then leave for graduate programs or new jobs outside of USF. We have been very fortunate to have excellent office support in the last four Program Assistants. Our good "fortune" has been enhanced by excellent applicants and the reputation for in-house applicants that this department is an excellent place to work regardless of its demands.

The Laboratory Manager has become designated only for Biology in the past two years. His job requires a breadth of knowledge and a zeal to meet the lab needs of the curriculum, especially with the advent of the new Lo Schiavo Science building and its labs. We have been blessed with his total commitment, attitude and good humor. He meets with faculty regularly to plan and implement equipment needs, supplies, hire and train student assistants [preparation of media, maintenance of the microbiology prep room and inventory]. Other students are hired as needed. Most faculty prepare their own labs and maintain their own small equipment/instruments but that does not mean that the Lab Manager is relieved of countless entreaties. However, the Lab Manager cannot meet the maintenance of specialized instruments.

The adjunct faculty who teach labs for non-majors, e.g., Human Biology, have relatively simple labs to prepare but often they do not know where to find certain supplies/equipment and the Lab Manager not only must aid them but may have to arrange the availability of certain equipment. Seemingly imperative is that Monday labs have to be finalized on Sunday by the Lab Manager. There are not enough duplicates of equipment or trained persons who can get everything ready by Friday. Hence, the Lab Manager "volunteers" his time to be sure all is in order.

The Dean's Office has extensive training programs for new personnel in the use of the computer systems, procedures for purchasing, etc. However, to our surprise, the recent hire of the current program assistant was scheduled so that there was only one day of overlap with the previous program assistant. This meant that the Chair and some faculty spent quality and a quantity of time helping the new program assistant adjust to the new job. Happily, she is a quick study and there have been no issues or interruption of administrative support to the department.

VIII. DIVERSITY AND INTERNATIONALIZATION

A. Diversity

The University of San Francisco is consistently ranked as one of the most diverse college campuses in the nation and the students in the Biology Department reflect this diversity (Figure 6B).

B. Internationalization

Typically, ecological and medical issues related to topics like climate change, energy and fresh water resources as well as cancer rates etc. are incorporated into individual classes by instructors. No structured curriculum on international issues has been established.

In the past 5 years, we have 42 students going through our Study Abroad Program on campus. Very few students would take a leave of absence form 6 months to a year and go abroad on their own. Most of the students abroad prefer to attend institutions in Europe and Asia.

A small number of faculty members have been active in long term international research and teaching programs. Some recently published papers show coauthors of different nationalities. Several of us are regularly attending international scientific meetings abroad. We host, on the average, two visiting scholars form Europe and Asia for the duration from several weeks up to one year each. Several times a year, there are visiting teams of scholars and University administrators, particularly from Asia, passing through USF, and Biology faculty members often participate in the welcome parties and discussion groups.

The department as a whole does not participate in student recruitment any more. Individual faculty members during their travel overseas may unofficially introduce our graduate and undergraduate programs to potential students. Few successful recruits did come to USF but not necessary to our department, most of them took up other majors.

Recently, USF has a large influx of undergraduates from non-English speaking countries. Only a few of them major in Biology. However, we notice that they have different levels of success in introductory courses in Biology and Chemistry. We identify those students in trouble very quickly and found the main reason of their problem is insufficient preparations in language. Our faculty members are very concerned with these few students and have spent much time in personal coaching and counseling to help them succeed. We have alerted the University administration that Biology majors may need a better proficiency in English than other majors. The administration is aware of the problem and is trying to address it.

We do recruit new faculty members internationally by advertising in international journals, such as *Science*. We received many applications abroad and even interviewed a potential candidate from overseas. We do not recruit staff outside the country.

As part of the tradition of Ricci Institute, USF has established a sister relationship with a major University in Shanghai, China since 1980. Biology faculty members and students are the most active in academic exchanges with corresponding departments in China. Throughout the years, dozens of professors and graduate students have exchanged visits and coauthored papers. Similar exchange programs also extend to a dozen other universities in China including Hong Kong.

IX. TECHNOLOGY AND INFORMATIONAL RESOURCES

A. Technology

The majority of small and large lecture courses are taught in classrooms on campus including Cowell Hall, the School of Education, Lone Mountain, and Kalmanovitz Hall. Since 2006, USF has updated virtually all of their lecture classrooms to be 'smart classrooms' with installed digital projectors, both mac and PC desktop computers, and AV equipment. USF's Information Technology Services (ITS) department does a good job of maintaining and updating classroom technology equipment.

All full-time faculty receive their choice of laptop or desktop from the University. All computers are on a three-year replacement cycle. There is a standard suite of software provided by the University and the Department can purchase any special software required, although such purchases are rare. The computing needs of the Biology Department are satisfactorily met.

Most Biology classes do not require or teach advanced or specialized computing skills. In upper division courses, students routinely use software such as Microsoft Word for writing reports and Microsoft PowerPoint for oral presentations. Most faculty use an online course management system (either Canvas or Blackboard) for their classes to share lecture slides and class assignments, to make course announcements, and as an online grade book.

B. Distance Learning or Online Learning

The Department has not been involved in distance learning or online programs. While it is feasible that some Biology lecture classes move to an online format, most of the laboratory and field courses that are key components of the program could not be transferred to an online only format. Certain members of the faculty have integrated new technology into their classes, such as using online quizzes and assessment tools and incorporating iPad technology in their classrooms. USF's Center for Instruction and Technology (CIT) provides excellent training and support to faculty members interested in utilizing such teaching technology.

C. Library

The faculty members rarely use the library's physical holdings (books, periodicals, etc.). Faculty do routinely access scientific journals that can be downloaded from the USF Gleeson library journal finder website. The collection of journals that the USF libraries can access is somewhat limited – articles from recent years of major journals are usually available, but many specialized journals cannot be found. Additionally, the website navigation to get to the correct journal article is somewhat cumbersome, requiring multiple clicks to navigate to the correct journal, volume, issue, and then paper. Many other institutions and universities have a one-click access system where papers can be downloaded directly from PubMed searches, speeding the process. Faculty members use few library resources otherwise, except to put textbooks on reserve for example, and have infrequent contact with their library liaison.

D. Other - Vehicles

Vehicles are used frequently by the department to bring students to off-campus sites in particular for field-based lab courses. Additionally, vehicles are sometimes used to bring students to orientation events and company tours. The vehicles available for Biology Department use are owned by the College of Arts & Sciences and can be reserved by Biology faculty members. The current list of vehicles can be found in Table 4. The older Suburban vehicles are very old and are potentially on the verge of mechanical breakdown. Replacement of the older vehicles with newer vans would be beneficial.

Table 4. Vehicles available for department use

Vehicle	Year	Capacity
Van #1	2002	8
Van #2	2003	8
Van #3	2013	8
Suburban #1	1993	9
Suburban #2	1995	9
Suburban #3	1996	9
Suburban #4	1997	9
Yukon	1994	4
Excursion	2003	9

X. FACILITIES

The Biology Department is housed in the Harney Science Center (HR), with most office and lab spaces on the 3rd floor. Biology faculty have office space and some also have research lab space (see Faculty section) in HR. Most research space is restricted to lab space assigned to specific faculty members. These spaces are generally small and reflect the age of the building (1966). However, August 2013 saw the opening of the new Fletcher Jones Microscopy Center (HR103) that houses a Zeiss AxioObserver Wide-field Fluorescence Microscope, a Zeiss LSM700 Laser Scanning Confocal Microscope, a BD Accuri C6 Flow Cytometer, and a Hitachi TM3000 Scanning Electron Microscope and associated image-capture and computer resources. The center is designed for both teaching and research applications and represents a significant new resource for microscopy at USF.

There has been a major update to teaching facilities since the previous self-study in 2006 with the opening of the John Lo Schiavo, S.J. Center for Science Innovation (LS) in August 2013. This new, "green" modern science building is exclusively designed for teaching, and includes multiple wet labs, lecture rooms, and computer science and multi-use rooms. Biology shares the use of this new building with Chemistry, Computer Science, Environmental Science, and Physics. Biology currently has three dedicated lab spaces (LSG04, LS205, and LS208) and also utilizes the shared lecture room (LS103), chemical and cylinder storage room (LSB03), field processing and cold room (LSB04), and shared preparatory spaces associated with the wet labs. See Table 5 for the capacities and general uses of these rooms.

Table 5. Teaching laboratory space in the Harney Science Center and the John Lo Schiavo, S.J. Center for Science Innovation that is utilized by the Biology Department.

Room Number	*Maximum Student Capacity*	*Room use*
HR340	16	Various upper division courses (lecture and laboratory) and as meeting/seminar room
HR314	24	Human Anatomy and Physiology Laboratory
HR322	25	Microbiology Laboratory
HR346	25	General Biology Laboratory
HR349	12	Biotechnology Laboratory
LS205	16	Cell and Molecular Biology Laboratory
LS208	24	General Biology Laboratory
LSG04	16	Upper division Microbiology

The new teaching facilities in LS have provided much need additional teaching laboratory space. However, only one new lecture room (LS103) is now available in that is equipped with both monitors and a projector and screen for lectures. Other rooms in LSC that could be used as lecture facilities lack projectors and projection screens. This is an unfortunate oversight that limits their utility as lecture rooms, as many faculty have found the wall-mounted monitors ineffective for displaying lecture material. Despite the additional resources now available in LS, many Biology lecture courses are still scheduled in other buildings on campus, including Lone Mountain and the School of Education.

Many of our existing resources are inadequate. These specifically include: 1) limited and outdated research lab space in HR, 2) poor lecture facilities in both HR and new LS (lacking projectors and screens), 3) a dilapidated greenhouse on roof without student access, 4) problematic student access to rooms in the new LS building.

The department lacks a classroom ideally suited to teach field courses. Field courses require different arrangements than a classical teaching lab space. This need has been met for many years by the use of a small room (fits 12-15 students) that is awkwardly arranged due to its additional use as a classroom space and meeting space. Although the LS

opened up some lab classrooms in HR as alternatives, these labs are also not ideally suited for the teaching of a field class.

The department also lacks adequate research lab space. The new LS building is entirely devoted to classroom space, and the classrooms in HR are still in use and thus, cannot be repurposed as research lab space. The current research space for existing faculty is shown in Appendix J. Several faculty have given up their research space to be used as offices for other faculty, or have research space that doubles as classroom space. The changes required to link the LS and HR buildings reduced the research space of one faculty member by nearly half, and left only an awkward passageway through a darkroom as an entrance to the lab.

Both research space and classroom space are limited, and are currently less than ideal for existing faculty and courses, and limit the department's ability to increase course offerings or hire new faculty. This situation might be improved by remodeling existing spaces to be more efficient or to better suit the department's needs. Until that becomes possible, it will be necessary to limit the number of majors to fit the number and type of courses that we are able to offer.

XI. CONCLUSIONS

The greatest strength of the Biology Department is the outstanding commitment of our faculty to student success. Our faculty are experts in their fields and are dedicated to providing students with a rigorous background in a diverse range of topics within Biology, as well as providing marketable skills that prepare students for employment upon graduation. Likewise, one of our most impressive long-term accomplishments is the relatively high rate at which USF students earn admission to medical and professional schools (Table 2). Other recent accomplishments include the opening of the new Fletcher Jones Microscopy Center equipped with a laser scanning confocal microscopes and a scanning electron microscope for student use, as well as the development of the Professional Science Master's Program in Biotechnology.

The weaknesses of the department are closely intertwined with our strengths. The strong commitment of our faculty to student success contributes significantly to our current advising problem. Although the Biology Department has 355 declared majors (nearly 10 times that of most other science departments at USF), our faculty also serve as academic advisors to the majority of Undeclared Science students. Because of our commitment to the students, we continue to do this in order to provide guidance and help these students stay on track to graduate, despite the fact this makes our advising load significantly greater than science faculty from any other department. While we consider the diverse backgrounds of our faculty members to be a strength, the reality is that because of this diversity, it has been a challenge to establish a vibrant seminar program that includes topics of interest to all faculty members. The difficulty in supporting the seminar series also underscores another fundamental problem, which is that many faculty are simply too busy with tasks like lab prep, student advising, and other service commitments to participate in the seminar series, which is unfortunate, because seminars should be an enriching and enjoyable part of academic life.

XII. COMPEHENSIVE PLAN FOR THE FUTURE

Based on this self-study document and discussions at the departmental retreat in January 2013, the department has identified several areas in need of improvement. These are: 1) Space, 2) Graduate Program, 3) Faculty, 4) Curriculum, and 5) Academic Advising. Specific descriptions of the needs for each area are provided below:

1. Space

In the 2006 self-study, the Biology Department identified space as one of the major challenges facing the department. Since that time, construction of the Lo Schiavo Center for Science and Innovation (LS) began and was recently

completed. This facility provides new classroom space with teaching labs dedicated to general Biology, microbiology, developmental Biology, molecular Biology, and genetics. The department continues to make full use of the labs in the Harney Science Center building in addition to the new facilities.

The opening of the LS building in August 2013 has affected the Biology Department in many ways. The presence of three new Biology teaching labs not only allows faculty to teach in up-to-date spaces with new equipment, but also enables the department to move certain courses out of Harney Science Center and therefore ease some of the space issues formerly faced. For example, with the movement of BIOL 105 (General Biology I) lab into LS, the department is able to offer more, less crowded, lab sections to our beginning majors. This also allows for other courses to spread out more evenly among the Harney teaching labs and allow for more in-room prep time for those courses. Despite these obvious advantages of having a new building in which to teach, Biology faculty have been disappointed with some of the aspects of the LS, and these are described in greater detail in Appendix K.

The department also lacks adequate research lab space. The new LCSI building is entirely devoted to classroom space, and the classrooms in the Harney Science Center building are still in use and thus cannot be repurposed as research lab space. Two rooms previously used by the Dean's office and another two rooms previously used by the Department of Environmental Science have recently been made available to Biology faculty, and this has helped to alleviate some of the space concerns, but not all of them.

The current research space for existing faculty is shown in Appendix J. Several faculty have given up their research space to be used as offices for other faculty, or have research space that doubles as classroom space. The changes required to link the LS and Harney buildings reduced the research space of one faculty member by nearly half, and left only an awkward passageway through a darkroom as an entrance to the lab.

Both research space and classroom space are limited, and are currently less than ideal for existing faculty and courses, and limit the department's ability to increase course offerings or hire new faculty. This situation might be improved by remodeling existing spaces to be more efficient or to better suit the department's needs. Until that becomes possible, it will be necessary to limit the number of majors to fit the number and type of courses that we are able to offer.

Although the administration has not yet revealed any plans or budget for the renovation of Harney, the Department is taking a pro-active approach to solve some of our space issues. We have formed a committee to evaluate space priorities and develop ideas for repurposing of existing space. **The specific spaced needs identified to date are:**

1. **Office and research lab space for every tenure-track faculty member.**
2. **Office space for current and new term faculty.**
3. **A new modern teaching laboratory for field classes.**
4. **A graduate student office.**
5. **Conference room/meeting space that can be used by Biology faculty and students.**

While we plan to seek some funding through alumni donations and foundation grants to help carry out these renovations, support from the administration is needed, in the form of funding and approval for renovations deemed necessary by the Department.

2. Graduate program

The department includes two Masters level graduate programs, a research-based MS degree program and a professional coursework-intensive PSM degree program in biotechnology. (Note that the PSM program is quite new and will be evaluated in a separate, future review). The MS Biology program is incredibly small with only eight student positions, each associated with full tuition remission, provided to the entire Biology Department. With the addition of faculty members who have established intensive research programs, this limitation in graduate student enrollment severely

affects the advancement in faculty research objectives. Currently, there are several Biology faculty laboratories with active research programs funded by NIH or NSF, but with only eight graduate student positions, it is a challenge to maintain productivity in research laboratories. Other science departments within the College of Arts and Sciences have significantly higher numbers of graduate student positions (up to 22 in Chemistry) that provide a full-tuition benefit. **In order for USF Biology faculty to maintain competitive research programs, the number of available graduate student positions should be doubled, which would allow 3-4 graduate students per current active research laboratory.**

Aside from tuition assistance, graduate students receive minimal financial support. Graduate students often serve as teaching assistants for laboratories within the department but receive only $2000-3000 per semester for such positions. Given the cost of living in the San Francisco Bay area, it is impossible for students to make ends meet with such support. Additionally, graduate students are not provided with necessary support outside the research laboratories, as they have no dedicated spaces within the science buildings to support their teaching and computing needs. **No graduate student office space exists, making it difficult for teaching assistants to host office hours and to prepare written proposals or theses required by the program.**

The department has instituted a Grants-in-Aid program for supporting student research and travel costs for scientific meetings. The department provides financial support (up to $2,500 per year) for student research and travel to scientific meetings. This support is made possible by the generous contributions of donors to the Biology Gift Fund, but based on the rate of requests for funding in recent semesters, this line of support is likely not sustainable into the future. Many faculty members include such expenses in research grant proposals, but often are limited in the amount of support they can provide to students due to the costs of running research laboratories.

Support from the administration in this area is critical. We require a minimum of eight additional graduate student positions, additional funding to support these students, and a dedicated graduate student office.

3. Faculty

For the past 20 years (or more) the Biology Department has not had enough full-time faculty to:

- deliver all courses required for our curriculum (i.e., lower and upper division Biology courses for majors and graduate students, and more recently, graduate courses for the Professional Science Master's Degree in Biotechnology)
- completely staff service courses for other majors (i.e., courses offered for Nursing, Kinesiology, Gerontology and Health Studies)
- meet the demand from non-majors who require Biology courses for application to post-graduate programs (e.g., medical school, physical therapy programs, etc.)
- provide a sufficient number or variety of courses to satisfy USF's Core Curriculum (B2 Laboratory Science) for non-science majors, or
- consistently offer First Year Seminars.

Insufficient full-time faculty has been a focal point in the last two Department self-studies (1993 and 2006) and is still a significant issue. This situation is owing to two main factors:

1. We have an obligation to offer many different courses for a large number of both Biology majors and other students who have curriculum requirements for Biology courses. The number of seats required and the number of courses that have to be offered far exceed the teaching capacity of Biology faculty. While we hire many part-time faculty to teach lectures and labs, it is not possible to staff every extra course with a part-timer. Full-time faculty are often teaching overloads for extra pay to make up for the fact that we do not have enough professors to teach oversubscribed courses in specific fields.
2. A significant number of Biology faculty are receiving course release time from the Dean for service activities provided to the College and the University (Table 6). In many cases, faculty are teaching overloads for extra pay and not using the release time as it was intended - to compensate for time that would otherwise be taken away from research and

standard service responsibilities, not increase overall workload. This situation has escalated over the years with more and more release time allotted.

Table 6. Course load release allowed by the Dean for various services provided by Biology faculty each semester (data shown are from Fall 2013).

Service:	*Course release per semester:*
Chair, Biology Department	5
Director, Professional Science Master's Degree in Biotechnology	4
Associate Director, Professional Science Master's Degree in Biotechnology	2
Director, Biology Graduate Program	2
Coordinator, USF/UCSF Partnership for Undergraduate Mentoring and Teaching	2
Chair, Pre-Professional Health Committee	2
Liaison, LoSchiavo Center for Science and Innovation	1
Total	18 units

The Fall 2013 semester can be used as an example to illustrate our chronic of shortage of full-time faculty. For Fall 2013, 28 lecture sections, two seminars and 13 laboratory sections were taught by full-time faculty for a total of 2709 student credit hours (SCHs). (Note: SCHs do not equate to faculty workload credits.) There were an additional 30 SCHs for undergraduate and graduate directed studies, but no teaching credit is allotted for mentoring students in research. An additional eight lecture and 28 laboratory sections were taught by part-time faculty, and USF graduate student teaching assistants covered six laboratory sections. Total SCHs for part-time faculty and graduate student TAs was 1290, this comprises 32% of the Biology Department teaching load. (Section IV - Subsection G describing the USF/UCSF Partnership for Undergraduate Mentoring and Teaching further addresses the issue of part-time faculty.) Moreover, Biology upper division courses were over-enrolled by ~10%, and numerous students were unable to register for their preferred courses or take as many courses as they wanted. Six faculty received a total of 18 units release from teaching (Table 6), and seven full-time faculty received a total of 19 units extra pay (1-5 units each for the semester, and five of these seven are the same faculty who have releases from teaching for providing extra service). **The total of overload units is equivalent to the full semester teaching workload of 2.1 full-time faculty members (at the contract rate of nine units/semester).**

Compared to other science departments, Biology has among the highest student credit hours to faculty ratio and the highest number of advisees per advisor. Biology also provides the lowest number of Core courses and First Year Seminars. For several other science departments, Core courses make up a significant proportion of their student credit hours and new tenure track and term faculty lines have been added and maintained to subsidize these non-science major course offerings. At USF, non-science majors are required to take only one science class and we feel it is extremely important to have Biology included in the mix of classes that students can choose from and to have these courses taught by full-time experienced faculty. Lack of full-time faculty to teach courses to non-majors puts us in the position of not being able to offer the variety of courses or provide the number of seats that would give USF undergraduates a comparable number of options for a Core science course in Biology. The two courses that we do occasionally offer (BIOL100 The Science of Life and BIOL103 Human Biology) are being taught by part-time faculty and are limited to 20 students each for lecture and one lab section. Both courses close very quickly after registration starts, so we know that additional seats would be welcome.

Core courses in other departments accommodate many more students. In Environmental Science the core course takes over 60 students with labs of 14 students each that are often taught by full-time faculty. Core courses in Physics (not including Introductory and General Physics) totaled over 250 students in Fall 2013, comprising 50% of the Physics Department's teaching load. Once they enter the job market, non-science majors will have a large influence on the public's perception of science and will, perhaps more importantly, be responsible for establishing guidelines for science funding in the future. Therefore**, we feel it is essential that Biology be well represented in the USF Core B2 course**

offerings, with classes taught by full-time faculty. We can only accomplish this goal with more full-time Biology faculty lines for undergraduate courses.

We have only two First Year Seminars (FYS) that have been offered by the Biology Department: Human Biology and Good Germs, Bad Germs. The FYS Human Biology has often been taught by part-time faculty (not the intent of this program) and the FYS Good Germs, Bad Germs has recently been cancelled so that faculty can teach required courses.

The largest challenge that we face in hiring new faculty is current University policy where the USF administration has decided to only consider and approve new faculty positions for new programs. Established successful programs like Biology, even with clearly demonstrated increasing student enrollments, are not a priority for adding faculty lines to relieve the burden of the growing demand for courses. Faculty sabbatical replacements and replacement of retiring faculty are not guaranteed to existing programs. This "new program only" policy was a primary reason for the Biology Department to establish the PSM program. However, it is not yet clear if the addition of this program with one new term faculty member has actually helped the department in delivery of the majors and non-majors undergraduate curriculum. For the Fall 2013 semester 6 units of released time were given to tenured faculty for administration of the PSM program (12 units/year), part-time faculty had to be hired to teach in the PSM curriculum, and the new faculty member for the PSM ended up with a teaching overload.

Support from the administration in this area is required. In the short term, two full-time term faculty positions would enable us to more consistently deliver the Biology curriculum, our service and core courses, not to mention provide much needed assistance with other student support like academic advising. In the longer term, two more full-time tenure track positions would help us staff existing courses, create more diversity in course offerings, and increase onc-campus research opportunities for students.

4. Curriculum

The previous program review recommended improving the sophomore year curriculum by revamping or eliminating the Cell Physiology course and adding a laboratory to the Genetics course. We feel that the Cell Physiology course delivers and reinforces important foundation information and works well as currently presented. Considering that most students are taking this course concurrent with Organic Chemistry, the current lecture-only format seems the best suited for the student schedules. The implementation of the Genetics lab is slated to begin in the Spring 2014 semester, and there has been considerable effort by faculty to develop laboratory activities that will be useful and informative, while still doable with our limited resources.

We are also expanding our curriculum to include more non-human Biology focused courses, as recommended by the previous review. In particular we are working to strengthen the offerings in support of the Ecology emphasis. This effort has included the hiring of a new tenure-track faculty member with expertise in botany and ecology, the re-introduction of the Ecology course, and the addition of new field courses to the curriculum (Invertebrate Zoology and Botany). In addition, we have added a requirement that students participate in the department seminar for one semester, which will help expose students to research in a wide range of topics and give them opportunities to meet scientists from outside USF.

As discussed on page 15, four years ago the department began offering summer courses that enabled students to catch up or even get ahead in the curriculum. While they may be helpful to the students, these courses have been offered at a significant cost to the department. The department has not received a budget increase in more than seven years, in fact, the budget was cut in 2010 due to the financial crisis. Since the expansion of summer course offerings, the department has ended the fiscal year with a deficit of $10,000-$40,000 per year. While the Dean's office has found ways to balance the budget in the past, we have been informed that this practice will not continue. Last year the department ran out of money in April and was unable to order basic lab supplies like gloves and pipettes until the new

fiscal year in June. As a result, we have had to curtail our summer offerings this year and carefully trim course budgets. Faculty work hard to keep laboratory costs down, but new, modern laboratory activities require expensive supplies and equipment. Thus, we are extremely limited in our ability to expand and improve our curriculum, particularly with respect to laboratory courses (which is the majority of our curriculum), due to financial constraints.

Finally, one other area for improvement in our curriculum is undergraduate research. While many opportunities exist for students to participate in research projects with USF faculty or through PUMT or other internship programs, there is a large degree of variability in these research experiences and students receive no formal training in the fundamentals of scientific research. Although the department has an Honors Thesis program (described on page 9), very few students complete the program, usually because they don't get interested in research early enough. While the new requirement for participation in the department seminar may help stimulate interest earlier, a course on research design and analysis would also be a great addition to the curriculum.

Support from the administration for curriculum development is required, mainly in the form of increased departmental budget to continue to offer modern laboratory courses to an increasing number of students.

5. Advising

Academic advising is one of the most important roles of Biology faculty and, after teaching, it is perhaps one of the more time-intensive activities for faculty. We take this responsibility quite seriously and have devised, fine-tuned, and implemented a very effective advising system within the department (described in section II F, see also Appendix L). Biology faculty feel that advising in the department is successful due to the careful time spent individually advising students and also due to students' initial advising via Webtrack and the Orientation to the Biology major event. Despite this, several advising issues have been identified by the Department, outlined below.

UNSC majors: Previous reviewers have recommended that Biology advisers not advise UNSC students in order to reduce the time advising takes. However, most of these students wish to declare the Biology major and in addition, experience has shown that non-Biology advisers can (with all good intentions) plan a freshman year that will make it more difficult for the student to complete a Biology degree in four years. What has proven to be most time-consuming regarding UNSC majors are those students who decide not to declare Biology, yet remain advisees of the Biology Department. Two main reasons for this are: 1) the student does not know what major he/she wishes to pursue; or 2) the major the student wishes to declare either does not formally advise or has restrictions for declaring the major (and thus students have lingered on as Biology advisees until they are able to declare the new major). In addition, even if a student does officially change their major (from Biology or from UNSC), the Biology Department is not notified, so students remain on our advisee lists (see under "Banner" below). We have solved these issues as follows:

- Any students wishing to declare another major (or confused about what major to declare) are referred to their University Advisers in CASA and removed from our lists. These advisers then help the student get an adviser in their new major or help the student explore other areas of interest.
- Each Biology faculty member purged their advising list by emailing advisees to determine who was actually in the major; any students who were not were removed from our list, and were referred to CASA if they did not have an adviser in another department.

The Department has also recently spread out the pre-registration advising period to two weeks instead of one, which has alleviated some of the time pressures felt by faculty.

International Students: The Biology Department (as well as other departments) has an increased number of advisees for whom English is a second language. In several cases, the student's level of English proficiency has been low enough to affect his/her ability to succeed in General Biology, leading to grades of "D", "F", or to a withdrawal from the course. In addition, several of these students have entered USF needing to take 10-12 units of ESL courses, preventing them from

taking General Biology and General Chemistry their first semester. This automatically puts the student a year behind in the major unless summer school is taken, but often their language skills are not sufficient enough to catch up in this manner. The Department welcomes these students into the major, but feels there needs to be a way to better advise these students and make them aware that by declaring a Biology major and not taking Biology and Chemistry their first semester, they are behind and will be here longer than they expected.

Banner: Issues with Banner, the University Student Information System, affect our ability to advise. Main issues include:

1. We cannot retrieve from Banner a listing of all Biology majors.

It is not possible for the Biology Department to get an official listing of the 300+ Biology majors from Banner. We can make a request to the Registrar, who apparently has a way of generating a list of Biology majors, but as soon as it is received, the list is pretty much out of date. Our master advising list is maintained by hand and is never correct (see #2 below), as changes in students adding and dropping the Biology major occur almost daily. The Biology Department needs to be able to query Banner at any time for a listing of all Biology majors.

2. The Biology Department is not informed when students drop the major

As mentioned previously, when students change majors, the new department is informed that they have a new student, but the old department is not informed that they have lost one. It is assumed that the new department will assign an adviser; however, some departments do not assign advisers, so students who drop Biology and go to one of these majors never have the Biology adviser removed from the General Student Information page in Banner.

One final item to note is that online mechanisms designed to streamline or help the advising process are often, as in the case of AdvisorTrac, not used to their fullest capacity or in other cases "sprung" on faculty last minute. During Webtrack over the summer, faculty are required to enter all notes about their interaction with the students they call, including recommended course schedules, into AdvisorTrac. However, these notes are not easily accessible by all and in fact after summer many departments never look at AdvisorTrac again. This is a useful tool and if it was easier to use, it would certainly improve the advising process: any faculty or staff working with a particular student could access notes. Sometimes faculty members are informed of new advising programs at the last minute. As an example, an email was sent to all faculty on September 25, 2013 informing them that on October 7, a new web-based tool for advising called Degree Works would be launched, "in time for Spring 2014 advising and course registration." There were only two information sessions planned, each 55 minutes long and one week prior to the launch date.

Support from the administration is needed to relieve some of the strain of advising. Specifically, the hiring of two additional full-time faculty members (as discussed above) would not only help us to deliver the curriculum, but also provide more faculty among with to distribute student advisees. Furthermore, the administration should make a greater effort to identify other departments that can assist with advising UNSC students, particularly those that do not indicate an interest in Biology. Finally, overload pay or some other form of compensation should be considered for faculty who advise an inordinately high number of students (which includes all Biology faculty members).

Concluding Remarks

The Biology Department at USF is a thriving academic department that trains and educates students to achieve their goals. We have identified several key areas that are candidates for improvement (Space, Graduate Program, New Faculty, Curriculum, and Advising) and present a detailed plan that includes contributions from both the department and the administration to achieve these goals.

XIII. APPENDICES

A. Appendix A: Curriculum Map

Program Matrix: Required Courses in the Biology major. X: introduced, reinforced or extended coverage

Learning Outcomes	BIOL 105- General Biology I	BIOL 106- General Biology II	BIOL 212- Cell Physiology	BIOL 310- Genetics	BIOL 414- Evolution
Recognize the relationship between structure and function at all levels: molecular, cellular, and organismal.	X	X	X	X	X
Describe the flow of genetic information, the chromosome theory of heredity, and the relationship between genetics and evolutionary theory.	X	X	X	X	X
Recognize the ecological relationships between organisms and their environment.	X	X	X	X	X
Evaluate the principles of evolutionary Biology.	X	X	X	X	X
Use current research techniques to apply the scientific process by testing hypotheses through experimentation.	X	X			
Demonstrate the ability to understand and critically review scientific papers.	X	X	X	X	X
Develop an awareness of careers and professions available in the biological sciences.[1]	X	X	X	X	
Describe social responsibility in scientific work and explain its importance.	X	X		X	

[1]Other resources available to students include academic advisors, course professors, the USF career center, and special interest clubs.

Program Matrix: Elective Courses in the Biology major. X: introduced, reinforced or extended coverage

Learning Outcomes	BIOL 320/321-Human Physiology/Lab	BIOL 330-Female Biology	BIOL 331/332-Herpetology/ Lab	BIOL 333/334-Endocrinology / Lab	BIOL 340-Animal Toxicology
Recognize the relationship between structure and function at all levels: molecular, cellular, and organismal.	X	X	X	X	X
Describe the flow of genetic information, the chromosome theory of heredity, and the relationship between genetics and evolutionary theory.				X	
Recognize the ecological relationships between organisms and their environment.			X		X
Evaluate the principles of evolutionary Biology.	X	X	X	X	X
Use current research techniques to apply the scientific process by testing hypotheses through experimentation.	X		X	X	
Demonstrate the ability to understand and critically review scientific papers.	X	X	X	X	X
Develop an awareness of careers and professions available in the biological sciences.[1]					
Describe social responsibility in scientific work and explain its importance.	X	X			

[1]Other resources available to students include academic advisors, course professors, the USF career center, and special interest clubs.

Program Matrix: Elective Courses in the Biology major. X: introduced, reinforced or extended coverage

Learning Outcomes	BIOL 341/342- Medical Microbiology/ Lab	BIOL 345- Virology	BIOL 346/347- General Microbiology/ Lab	BIOL 350- Comparative Animal Physiology	BIOL 359- Plant Physiology
Recognize the relationship between structure and function at all levels: molecular, cellular, and organismal.	X	X	X	X	X
Describe the flow of genetic information, the chromosome theory of heredity, and the relationship between genetics and evolutionary theory.	X	X	X		X
Recognize the ecological relationships between organisms and their environment.	X	X	X	X	X
Evaluate the principles of evolutionary Biology.	X	X	X	X	X
Use current research techniques to apply the scientific process by testing hypotheses through experimentation.	X		X		
Demonstrate the ability to understand and critically review scientific papers.	X	X	X	X	X
Develop an awareness of careers and professions available in the biological sciences.[1]	X		X		
Describe social responsibility in scientific work and explain its importance.	X		X		

[1]Other resources available to students include academic advisors, course professors, the USF career center, and special interest clubs.

Program Matrix: Elective Courses in the Biology major. X: introduced, reinforced or extended coverage

Learning Outcomes	BIOL 362/363-Histology/Lab	BIOL 365/366-Human Anatomy/Lab	BIOL 368-Neurobiology	BIOL 370-Biology of Cancer	BIOL 379/380-Conservation Biology/Lab
Recognize the relationship between structure and function at all levels: molecular, cellular, and organismal.	X	X	X	X	X
Describe the flow of genetic information, the chromosome theory of heredity, and the relationship between genetics and evolutionary theory.				X	
Recognize the ecological relationships between organisms and their environment.				X	X
Evaluate the principles of evolutionary Biology.			X	X	X
Use current research techniques to apply the scientific process by testing hypotheses through experimentation.					X
Demonstrate the ability to understand and critically review scientific papers.	X	X	X	X	X
Develop an awareness of careers and professions available in the biological sciences.[1]					
Describe social responsibility in scientific work and explain its importance.				X	X

[1]Other resources available to students include academic advisors, course professors, the USF career center, and special interest clubs.

Program Matrix: Elective Courses in the Biology major. X: introduced, reinforced or extended coverage

Learning Outcomes	BIOL 380/381-California Wildlife/Lab	BIOL 385/386-General Parasitology/Lab	BIOL 390/391-Marine Biology/ Lab	BIOL 392/393-Oceanography/ Lab	BIOL 398-Readings for Adv Undergrads
Recognize the relationship between structure and function at all levels: molecular, cellular, and organismal.	X	X	X	X	
Describe the flow of genetic information, the chromosome theory of heredity, and the relationship between genetics and evolutionary theory.					
Recognize the ecological relationships between organisms and their environment.	X			X	
Evaluate the principles of evolutionary Biology.	X	X	X	X	
Use current research techniques to apply the scientific process by testing hypotheses through experimentation.	X	X	X	X	
Demonstrate the ability to understand and critically review scientific papers.					X
Develop an awareness of careers and professions available in the biological sciences.[1]					
Describe social responsibility in scientific work and explain its importance.	X		X	X	

[1]Other resources available to students include academic advisors, course professors, the USF career center, and special interest clubs.

Program Matrix: Elective Courses in the Biology major. X: introduced, reinforced or extended coverage

Learning Outcomes	BIOL 420-Molecular Biology	BIOL 443/444-Immunology/Lab	BIOL 457-Cell Biology/ Ultrastructure	BIOL 458/459-Light & Electron Microscopy/ Lab	BIOL 481/482-Techniques in Cell Biology/Lab
Recognize the relationship between structure and function at all levels: molecular, cellular, and organismal.	X	X	X	X	X
Describe the flow of genetic information, the chromosome theory of heredity, and the relationship between genetics and evolutionary theory.	X	X			
Recognize the ecological relationships between organisms and their environment.					X
Evaluate the principles of evolutionary Biology.	X	X	X	X	X
Use current research techniques to apply the scientific process by testing hypotheses through experimentation.		X		X	X
Demonstrate the ability to understand and critically review scientific papers.	X	X			X
Develop an awareness of careers and professions available in the biological sciences.[1]					
Describe social responsibility in scientific work and explain its importance.					

[1]Other resources available to students include academic advisors, course professors, the USF career center, and special interest clubs.

Program Matrix: Elective Courses in the Biology major. X: introduced, reinforced or extended coverage

Learning Outcomes	BIOL 485/486- Molecular Biology & Biotech/Lab	BIOL 490- Undergraduate Seminar	BIOL 498- Research for Adv Undergraduates	BIOL 598- Honors Thesis Research	BIOL 599- Honors Thesis Writing
Recognize the relationship between structure and function at all levels: molecular, cellular, and organismal.	X	X	X	X	X
Describe the flow of genetic information, the chromosome theory of heredity, and the relationship between genetics and evolutionary theory.	X				
Recognize the ecological relationships between organisms and their environment.					
Evaluate the principles of evolutionary Biology.	X				
Use current research techniques to apply the scientific process by testing hypotheses through experimentation.	X				
Demonstrate the ability to understand and critically review scientific papers.	X				
Develop an awareness of careers and professions available in the biological sciences.[1]	X	X	X	X	
Describe social responsibility in scientific work and explain its importance.		X			

[1]Other resources available to students include academic advisors, course professors, the USF career center, and special interest clubs.

B. Appendix B: Sample Curricula

1. Years one through four of the Biology major, 2. Years two and three of the Biology major with the Molecular Biology emphasis, and 3. Years two and three of the Biology major with the Ecology Emphasis. Note: The four-year plan depends upon accepted AP courses and placement tests for writing and foreign language. SL: service learning, CD: cultural diversity

1. Biology Major

Fall	Spring
Year 1	
General Biology I Lecture and Lab General Chemistry I Lecture and Lab Core: Oral and Written Communication I Freshman Seminar (Core)	General Biology II Lecture and Lab General Chemistry II Lecture and Lab Core: Oral and Written Communication II Biostatistics
Year 2	
Cell Physiology Organic Chemistry I Lecture and Lab Core Minor/ Elective	Genetics Lecture and Lab Organic Chemistry II Core (SL) Core (CD)
Year 3	
Introductory Physics I Lecture and Lab Upper Division Biology Elective (Field) Core or Foreign Language I Minor/Elective	Introductory Physics II Lecture and Lab Upper Division Biology Elective (Lab) Core or Foreign Language II Minor/Elective
Year 4	
Upper Division Elective (Lab) Core Core Minor/Elective	Evolution Upper Division Elective Upper Division Elective Core

2. Molecular Biology Emphasis

Year 3	
Introductory Physics I General Microbiology (Lab) Core or Foreign Language I Minor/Elective	Introductory Physics I Molecular Genetics and Biotechnology (Lab) Core or Foreign Language II Minor/Elective
Year 4	
UD Elective selected from approved list (Lab) Fundamentals of Biochemistry Core Minor/Elective	Evolution Upper Division Elective from approved list Core Core

3. Ecology Emphasis

Year 3	
Introductory Physics I Upper Division Biology Elective (Field) Core or Foreign Language I Minor/Elective	Introductory Physics I Upper Division Biology Elective (Field) Core or Foreign Language II Minor/Elective
Year 4	
Upper Division Elective (Field) Core Core Minor/Elective	Evolution Upper Division Elective from approved list Upper Division Elective Core

C. Appendix C: Pre- and Co- Requisite Grid

Course	#	Sem	Conditions for taking this course
General Biology I	105	F	none
		S	• permission of department Chair • priority registration for Biology majors/minors who have already taken 106 or are retaking 105
General Biology II	106	F	• permission of department Chair • priority registration for Biology majors/minors who have already taken 105 or are re-taking 106
		S	none (can be taken before BIOL 105)
Cell Physiology	212	F	• completion of General Biology I and II, both with ≥ C- • concurrent enrollment in OChem I (CHEM 230), or completion of OChem II (CHEM 231) or Fund OChem (CHEM 236) with ≥ D-
		S	• completion of General Biology I and II, both with ≥ C- • completion or concurrent enrollment in OChem II or Fund OChem with ≥ D-
Genetics	310	F	• completion of General Biology I and II, both with ≥ C- • completion of Cell Physiology with ≥ C • completion of OChem II or Fund OChem with ≥ D-
		S	• completion of General Biology I and II, both with ≥ C- • completion of Cell Physiology with ≥ C • concurrent enrollment in OChem II or Fund OChem or completion of OChem II Fund OChem with ≥ D-
Note: *Students enrolled in Genetics may also take on UD course (see below) with permission of the department Chair; however, those repeating Genetics may not take an UD Biology course*			
UD courses (see exceptions below)			• completion of General Biology I and II, both with ≥ C- • completion of Cell Physiology with ≥ C • completion of Genetics with ≥ C • completion of OChem II or Fund OChem with ≥ D-
Ecology Invertebrate Zool Herpetology California Wildlife Marine Biology Special Topics: Botany	319 328/329 331/332 381/382 390/391 395/395L		• completion of General Biology I and II, both with ≥ C- • completion of Cell Physiology with ≥ C • Genetics can be concurrent or completed with ≥ C • OChem II or Fund OChem can be concurrent, or completed with ≥ D-

Human Physiology Female Biology Endocrinology Comp Anim Phys Histology Neurobiology	320/321 330 333/334 350 362/363 368	• completion of General Biology I and II, both with ≥ C- • completion of Cell Physiology with ≥ C • Genetics can be concurrent or completed with ≥ C • OChem II or Fund OChem with ≥ D- is pre-requisite, not co-requisite
Med Microbiology Virology Biology of Cancer Molec Gen/Biotec	341/342 345 395 485/486	• completion of General Biology I and II, both with ≥ C- • completion of Cell Physiology with ≥ C • completion of Genetics with ≥ C • completion of OChem II or Fund OChem with ≥ D- (all courses listed above are pre-requisites, not co-requisites)
Evolution	414	• Contact Dr. Karentz to enroll (karentzd@usfca.edu) • completion of Genetics with minimum grade of C (and all Genetics pre-requisites as listed above) and completion of at least one upper division Biology elective. • OChem II or Fund OChem is pre-requisite, not co-requisite • Evolution should be taken in one of the last two semesters before graduation (not the semester after Genetics)
Directed Studies	398, 498 598, 599	Science GPA pre-requisites: 3.0 for 398 (readings), 3.2 for 498 (Research), and 3.4 for 598/599 (Honors Program)

Note: Courses required for the Biology major may not be taken more than twice to satisfy grade requirements.

Note: No more than two courses required for the Biology major can be repeated.

D. Appendix D: Program Student Learning Assurance Plan

Academic Cycle: 2011-2014

Plan Date: November 10, 2011

School/College: College of Arts and Sciences

Department/Program: Biology Undergraduate Program

Person completing the Plan: **Jennifer Dever and Scott Nunes**

Department Mission Statement:
Within the Vision, Mission and Values Statements of the University of San Francisco, the faculty of Biology educates undergraduate students in current biological concepts and methodologies in the laboratory and the natural environment to prepare them to be good citizens, to go on for advanced work in the sciences, and for professional careers in the health field.
Upon graduation, students who complete the degree requirements should be able to meet the following program goals:

- Understand the major biological concepts.
- Exhibit problem solving, analytical and communication skills as they apply to biological sciences.
- Understand and apply the scientific method and critical thinking in an ethical fashion to biological problems.
- Recognize the various career paths available to those in the biological sciences.

Program Student Learning Outcomes:

1) Demonstrate both in-depth and broad knowledge of the concepts that comprise the biological sciences.

2) Apply the scientific process, including designing and conducting experiments and testing hypotheses.

3) Develop laboratory techniques (such as light microscopy, gel electrophoresis and keeping a laboratory notebook and understanding of principles of laboratory safety).

4) Demonstrate the ability to read, understand, and critically review scientific papers and prepare oral and written reports in a standard scientific format.

5) Develop an awareness of the careers and professions available in the biological sciences and an understanding of the significance ethics plays in the field.

Program Student Learning Rubrics:

OUTCOME	Skills demonstrated via:	Weak Achievement	Satisfactory Achievement	Excellent Achievement
1) Demonstrate both in-depth and broad knowledge of the concepts that comprise the biological sciences.	Core courses and upper division elective courses (Lab, Field and Lecture courses); Exit Survey, Biology Field Exam	Grades in core courses below a C. Unable to demonstrate basic comprehension of advanced topics in the biological sciences, grades in upper level courses in the Biology program below a C+. Graduates will achieve less than a 50% rank on a comprehensive, nationally standardized exam their senior year.	Able to demonstrate comprehension of advanced topics in the biological sciences, able to achieve a C to B grade in courses in the Biology program. Graduates will achieve at least a 50% rank on a comprehensive, nationally standardized exam their senior year.	Able to demonstrate mastery of advanced topics in the biological sciences, able to excel in upper level courses in the Biology program (earning above a B in courses for the Biology program). Graduates will achieve at least a 70% rank on a comprehensive, nationally standardized exam their senior year.
2) Apply the scientific process, including designing and conducting experiments and testing hypotheses.	Lab courses	Unable to complete laboratory-based courses for Biology majors in the program. Grades in Biology laboratory core courses (BIOL 105, 106) and upper division elective lab courses (BIOL 321, 334, 342, 347, 356, 386, 444, 471, 482, 486, 498) below C.	Able to complete laboratory-based courses for Biology majors in the program. Grades in Biology laboratory core courses (BIOL 105, 106) and upper division elective lab courses (BIOL 321, 334, 342, 347, 356, 386, 444, 471, 482, 486, 498) in the C to B range.	Able to excel in laboratory-based courses. Grades in Biology laboratory core courses (BIOL 105, 106) and upper division elective lab courses (BIOL 321, 334, 342, 347, 356, 386, 444, 471, 482, 486, 498) above a B.
3) Develop laboratory techniques (such as light microscopy, gel electrophoresis and keeping a laboratory notebook and understanding of principles of laboratory safety).	Lab courses	Unable to master techniques in laboratory-based courses. Grades in Biology laboratory core courses (BIOL 105, 106) and upper division elective lab courses (BIOL 342, 346, 356, 363, 386, 444, 458, 471, 482, 486, 498) below C.	Able to demonstrate mastery of specific techniques in laboratory-based courses. Grades in Biology laboratory core courses (BIOL 105, 106) and upper division elective lab courses (BIOL 342, 346, 356, 363, 386, 444, 458, 471, 482, 486, 498) courses in the C to B range.	Demonstrate superior lab skills in lab courses. Grades in Biology laboratory core courses (BIOL 105, 106) and upper division elective lab courses (BIOL 342, 346, 356, 363, 386, 444, 458, 471, 482, 486, 498) above B.

OUTCOME	Skills demonstrated via:	Weak Achievement	Satisfactory Achievement	Excellent Achievement
4) Demonstrate the ability to read, understand, and critically review scientific papers and prepare oral and written reports in a standard scientific format.	Papers, presentations, posters, essays	Unable to demonstrate literacy skills as applied to the biological sciences in courses (BIOL 310, 330, 331, 333, 345, 370, 380, 398, 420, 490, 499). Reports and/or presentations not in proper format with the majority of students earning below a C on writing/presentation assignments.	Able to demonstrate average scientific communication skills as applied to the biological sciences in courses (BIOL 310, 330, 331, 333, 345, 370, 380, 398, 420, 490, 499). Reports and/or presentations presented in proper format with the majority of students earning a C-B on writing/presentation assignments.	Able to demonstrate mastery of scientific communication skills through upper division courses as applied to the biological sciences literature in courses (BIOL 310, 330, 331, 333, 345, 370, 380, 398, 420, 490, 499). Reports and/or presentations presented in superior format with students earning higher than a B on writing/presentation assignments. Students are participating in department/ college/ professional scientific presentation meetings. Students complete an honors thesis.
5) Develop an awareness of the careers and professions available in the biological sciences and an understanding of the significance ethics plays in this field.	Seminar, Focus Group Discussions, Exit Survey.	Unable to demonstrate an awareness of careers and professions and the need for ethics in the biological sciences as evidenced in the Focus Group discussion.	Able to demonstrate an awareness of careers and professions available in the biological sciences and the need for ethics in the biological sciences as evidenced in the Focus Group discussion.	Able to demonstrate a comprehensive awareness of careers and professions available in the biological sciences and a need for ethics in the field as evidenced in the Focus Group discussion.

Program Student Learning Core Curriculum Map:

Learning Outcomes	105 GEN BIO I	106 GEN BIO II	212 CELL	310 GENETICS	ELECTIVES			414 EVOLUTION
					FIELD COURSES[=]	LAB COURSES[S]	LECTURE COURSES[<]	
1) Demonstrate both in-depth and broad knowledge of the concepts that comprise the biological sciences.	I	I	I	I	R, EC	R, EC	R, EC	R, EC
2) Apply the scientific process, including designing and conducting experiments and testing hypotheses.	I	I				R, EC		
3) Develop laboratory techniques (such as light microscopy, gel electrophoresis and keeping a laboratory notebook and understanding of principles of laboratory safety).	I	I				R, EC		
4) Demonstrate the ability to read, understand, and critically review scientific papers and prepare oral and written reports in a standard scientific format.	I	I	R	R	R, EC	R	R, EC	R, EC
5) Develop an awareness of the careers and professions available in the biological sciences and an understanding of the significance ethics plays in this field.	I	I		R, EC	R	R	R	

I = Introduced, R = Reinforced, EC = Extended Coverage

FIELD COURSES[=] 331/332, 335/336, 379/380, 381/382, 390/391, 392/393; LAB COURSES[S]: 320/321, 333/334, 341/342, 346/347, 355/356, 362/363, 365/366, 385/386, 443/444, 458/459, 470/471, 481/482, 485/486, 498; LECTURE COURSES[<]: 319, 330, 340, 345, 350, 359, 368, 370, 405, 420, 460, 464.

Program Student Learning Assurance Methods:

Assessment for Learning Outcome 1 (Comprehension of Biological Concepts)
Grades in coursework as indicated in the Program Learning Rubric. Grades in the following core courses will be tracked at the end of each year (105, 106, 212, 310, 414). Additionally, one field course and one laboratory course per semester will be randomly sampled and the grades from those courses will be evaluated.

Annually, the ETS Major Field Test will be administered during Cell Physiology (212) and again during Evolution (414). Last year was the first time this standardized test has been used and we have determined that next year it will be administered during the very beginning of the semester in Cell Physiology and at the end of the semester in Evolution to more accurately serve as a pre and post test assessment tool. This exam will provide feedback on student learning of biological facts and concepts, as well as testing for analytical skills. We will be able to compare USF Biology majors performance across the country.

Assessment for Learning Outcome 2 (Understanding the Scientific Method)
Annually, grades associated with lab sections in 105 and randomly sampled upper division lab courses will be evaluated.

Assessment for Learning Outcome 3 (Applied Lab Skills)
Annually, grades from randomly sampled upper division lab courses will be evaluated.
Every three years lab notebooks from courses will be randomly sampled and evaluated using appropriate rubric.

Assessment for Learning Outcome 4 (Scientific Communication Skills)
Every four years representative papers will be randomly collected from upper division courses and reviewed using an appropriate rubric.

Assessment for Learning Outcome 5 (Career opportunities and ethics awareness)
Annually, graduating seniors will take an exit survey to document their immediate career plans post-graduation.
Biannually, interviews with focus groups will be conducted to assess the level of understanding regarding careers in the field as well as the role of ethics in biological careers.

The Biology Department will use the collected data to devise and implement appropriate changes to the curriculum.

For the M.S. Biology graduate program, indirect evidence in the form of annual student/faculty evaluations and exit interviews has been gathered to assess learning outcomes over the past three years. Faculty Advisors are asked to use the rubric below to assess learning outcomes for each of their advisees. Since 2006 we have had 12 out of 13 students graduate from the program on time and with a satisfactory or better rating in their learning outcomes assessment. Beginning next year the Chair will be collecting direct evidence for each goal in one, two and three-year cycles (depending on the method) as described below:

- Assessment for Learning Outcome 1 (Advanced knowledge of specific research area): Assessment of the achievement of Program Goal 1 will be an evaluation of research proposals randomly sampled from students in their first year of the program every four years.
- Assessment for Learning Outcome 2 (Application and written communication of scientific knowledge in specified research area): Assessment of the achievement of Program Goal 2 will be an evaluation of theses randomly sampled from students every four years.
- Assessment for Learning Outcome 3 (Oral presentation of scientific knowledge in specified research area): Assessment of the achievement of Program Goal 3 will be an evaluation of thesis defenses using a standard rubric for students presenting their thesis to the department, randomly sampled every two years.

The overall program assessment will be measured by the exit Interview results. Assessment data will be collected and used as follows: 1) evaluation of research proposals and theses will be completed every four years. 2) an exit survey will be conducted annually for graduating students. 3) On an annual basis, the Biology Department Faculty will review and discuss the data collected from the above assessment findings to devise and implement appropriate changes to the curriculum.

Master of Science Program Student Learning Rubric:

OUTCOME	Unacceptable	Needs Improvement	Satisfactory	Good Achievement	Excellent Achievement
[for Goal 1] A) Describe, synthesize and apply concepts & techniques in the current literature within a specific research area. B) Ask scientific questions based upon the literature and construct research hypotheses and design experiments to test hypotheses.	Seminar series review write-ups incomplete, or unsatisfactory. Research proposal incomplete; objectives not stated; research design not discernible from text or not scientifically testable.	Seminar series review write-ups poorly written. Research proposal submitted with substantial revisions needed. Limited level of background information provided, objectives unclear.	Seminar series review write-ups satisfactory. Research proposal submitted, objectives stated and supported by current literature, research project is justifiable with a testable hypothesis and a proper research design	Seminar series review write-ups well written. Research proposal submitted within the first year with clearly stated objectives that are highly supported by current literature. Hypothesis is relevant and a well developed research design is discussed.	Seminar series review write-ups well written in an in-depth manner. Research proposal submitted within the first year with clearly stated objectives; hypothesis highly supported by current literature. Research design is well defined and provides novel test(s) of problem(s). Proposal puts forth relevant scientific questions that are highly significant to the field.

[for Goal 2] A) Select and meet with graduate committee members. B) Conduct original research, demonstrating research skills within a specific research area and evaluate collected data. C) Prepare a thesis outline and a written thesis to be reviewed and accepted by graduate committee members. The thesis will consist of the following sections: Introduction, Materials and Methods, Results, Discussion and References. D) Determine suitability of thesis work for publication in a peer reviewed scholarly journal.	Graduate committee not formed. Unsatisfactory progress reports regarding lab/research performance. No participation in disciplinary conferences. Thesis outline not submitted to graduate committee, no meeting with committee members to discuss progress. Thesis incomplete with one or more sections not complete; does not follow standard formatting. Final thesis not approved by Advisor. No discussion with Advisor regarding publication.	Graduate committee formed, but not met with regularly. Attempts at research made, but unable to successfully utilize standard methods. Poor progress reports regarding lab/research performance received. No data generated. Limited participation in disciplinary conferences. Thesis outline submitted to graduate committee. Preliminary draft and final draft submitted to graduate committee not submitted in a timely fashion. Minimal meetings to discuss thesis progress with graduate committee not held. Thesis complete including a review of prior research; describes the research design; materials and methods used in the research; the findings in the described research; a summary of the findings with conclusions; however part or all is found to be unacceptable by one or more committee members. Major revisions needed. Final thesis not approved by Advisor. Limited discussion with Advisor regarding publication potential.	Graduate committee formed, meeting held to discuss research design. Research conducted with moderate supervision, student receives satisfactory progress reports regarding lab/research performance. Minimal data generated and analyzed. Participation in disciplinary conferences (poster or oral presentation) resulting in satisfactory product. Thesis outline submitted to graduate committee. Preliminary draft and final draft submitted to graduate committee submitted in a timely fashion. Regular meetings to discuss thesis progress with graduate committee held. Thesis complete, including a comprehensive review of prior research; describes the research design; materials and methods used in the research; the findings in the described research; a summary of the findings with conclusions, implications for further research and significance of research. Moderate revisions needed as recommended by committee members. Final thesis approved by Advisor.	Graduate committee formed, regular meetings held to discuss research design. Research conducted independently, standard methods mastered and student receives good progress reports regarding lab/research performance. Data generated and analyzed. Participation in disciplinary conferences (poster or oral presentation) resulting in recognition from attendees. Thesis outline submitted to graduate committee. Preliminary draft and final draft submitted to graduate committee submitted in a timely fashion. Regular meetings to discuss thesis progress with graduate committee held. Thesis complete including a comprehensive review of prior research; describes the research design; materials and methods used in the research; the findings in the described research; a summary of the findings with conclusions, implications for further research and significance of research. Thesis well written, error free and minimal revisions needed. All committee members highly satisfied. Final thesis approved by Advisor. Discussion with Advisor regarding publication potential resulting in choice for submission and preparation of manuscript.	Graduate committee formed, regular meetings held to discuss research design. Research conducted independently, methods mastered and novel approaches utilized. Student receives excellent progress reports regarding lab/research performance. High degree of data generated and quantitative methods are elegantly used to clearly describe results and analyzed, supporting the research hypotheses. Participation in disciplinary conferences (poster or oral presentation) resulting in official recognition [award/honor] from professional organization for participation. Thesis outline, preliminary draft and final draft submitted to graduate committee submitted in a timely fashion. Regular meetings to discuss thesis progress with graduate committee held. Thesis complete including a highly comprehensive review of prior research; describes the research design; materials and methods used in the research; the findings in the described research; a summary of the findings with conclusions and implications for further research. Significance of findings clearly stated and highly relevant. Thesis well written, error free with no revisions needed. Final thesis approved by Advisor. Portion of thesis accepted for publication in a peer-reviewed journal. Able to critique/justify research with ease during exit interview demonstrating a mastery of the research topic.
[for Goal 3] A) Teach an undergraduate lab section/course in the department for at least one semester. B) Present findings orally in a public format accepted by research committee members. C) Critique and justify research to the Chair.	Teaching assistantship not completed. Unsatisfactory teaching evaluations by students and supervisor. No presentation practice session held with committee members. No presentation performed, data not presented. Unable to critique/justify research during exit interview.	Sub-standard teaching evaluations by students; supervisor reports that the instructor needs improvement. Committee members recommend major changes at practice session prior to final presentation. Presentation performed at unsatisfactory level, lasting too long or not long enough. Unsatisfactory amount of background information, materials and methods and/or conclusions provided. Speech and/or slides difficult for the audience to understand. Poor critique/justification of research during exit interview.	Satisfactory teaching evaluations and report from supervisor. Prior practice session for committee members acceptable. Presentation performed to the department, with enough time given to adequately present the information in a basic scientific format. Background information, objectives, materials and methods, findings and conclusions clearly described. Presentation is clear and concise and understood by the audience. Satisfactory critique/justify research during exit interview.	Above average teaching evaluations; supervisor notes above average teaching ability. Presentation performed in front of the department. Presentation is captivating and easily understood, while maintaining a scientific format. Background information, objectives, materials and methods, findings, conclusions and relevance described in a highly informative and engaging manner. Material presented is shown to be relevant to the current field of research. Data presented at a scientific meeting (oral presentation). Critique/justification of research is thoroughly discussed during exit interview.	Excellent teaching evaluations; highest remarks from supervisor regarding teaching ability. Thesis presentation is outstanding, student demonstrates an excellent ability to convey the research at both the scientific and general public level. Audience able to grasp the significance of the research and how it adds to the current body of science in the particular field. Data presented at a scientific meeting, (oral presentation) generating inquiry from peers. Able to critique/justify research with ease during exit interview demonstrating a mastery of the research topic.

E. Appendix E: Student Learning Assurance Report - Academic Year 2012-2013

Report Date: 1 October 2013
School/College: Arts and Sciences
Department/Program: Biology
Person completing the Report: Scott Nunes, Juliet Spencer

1. **Overview Statement**: Briefly summarize the student learning assurance activities that were undertaken this academic year, indicating:
    a. which program learning outcomes were assessed this year.
    b. who in your department/program was involved in the evaluation of the above learning outcomes

    Assessment was led by the Biology Department chairs with input from Biology faculty members. The program learning outcomes assessed this year are listed below.
    Upon completing the Biology B.S. degree program, students will be able to
    1. Demonstrate both in-depth and broad knowledge of the concepts that comprise the biological sciences.
    2. Apply the scientific process, including designing and conducting experiments and testing hypotheses.
    3. Perform laboratory techniques (such as light microscopy, gel electrophoresis and keeping a laboratory notebook and understanding of principles of laboratory safety).
    4. Demonstrate the ability to read, understand, and critically review scientific papers and prepare oral and written reports in a standard scientific format.
    5. Express an awareness of the careers and professions available in the biological sciences and an understanding of the significance ethics plays in the field.

2. **Please Answers the Following Questions for Each of the Student Outcomes Assessed:**
    a. <u>What did you do?</u>
    Describe clearly and concisely how you assessed the learning outcomes that were evaluated this year (e.g., measures, research methods, etc.). [please use bullet points to answer this question]
    - *Focus Groups.* The department conducted two focus groups in April, 2013 to gather feedback from students specifically related to program outcomes #2, #4, and #5 above. One focus group included three students, and the other included seven. A facilitator from outside the Biology Department was present during discussions to help keep them on track.
    - *Survey of graduating seniors.* The department administered an anonymous survey to graduating seniors to gauge their perceptions of whether the program's outcomes were being achieved. Results of the survey are included in Appendix 1.
    - *Departmental discussions and faculty retreat.* In department meetings and at a day-long faculty retreat in January, 2013, faculty members discussed the curriculum and possible ways it might be modified to better meet program goals and outcomes.

    b. <u>What did the faculty in the department or program learn</u>?
    Summarize your findings and conclusions as a result of the student learning assurance indicating strengths and weaknesses in student learning demonstrated by this evaluation.
    - *Students feel confident in the breadth and depth of their knowledge of Biology*.

- Results of the survey given to graduating seniors over the past four years indicate agreement to strong agreement among students that the Biology curriculum is effective in providing students with a broad as well as in-depth knowledge of Biology and laboratory techniques used in the biological sciences.

- *Laboratory components of courses provide insight into the scientific method*.
  - Students in focus groups commented that their greatest understanding of the scientific method develops in the laboratory part of courses. They agreed that General Biology labs present the basic concepts of the scientific method and that experiments are done by following a step-by-step list of methods, whereas in upper division labs they apply the scientific process and take a more active role in devising and conducting experiments and evaluating results to reach conclusions. Below are some specific comments from students that sum up the general consensus of focus group participants.
    - *In Gen Bio and Gen Chem labs we did a lot of direction following, but when you get into upper division labs it's so much more interesting! It's more like you're testing things that haven't been done before.*
    - *In Gen Bio and Gen Chem they just told us exactly what to do step by step as where in upper division courses it's more of an independent process. You make your own hypothesis and then you have to justify your results*.
    - *I've learned a lot about the scientific method. We discussed observations and tested them, and I agree that labs are important to understand the scientific method because they force us to do it for ourselves. Our Biology Department has done a good job with keeping all that in mind.*
- *The curriculum helps students develop skills for reading scientific papers.*
  - Students in focus groups commented that they felt competent reading and evaluating the primary literature. They appreciated that reading scientific papers was more relevant in some courses than in others. They also indicated that skills for reading scientific articles would be useful beyond the classroom. Below are comments that summarize students' impressions of the skills they gained for reading the scientific literature.
    - *I didn't learn how to read scientific journals until Genetics when I had to describe figures and explain why certain things happened.*
    - *Once you get comfortable reading a few articles, you gain a skill and can read through many others. It's really helpful to gain those skills.*
    - *I'm in a class now and writing a huge paper about a specific topic. It's really valuable to know how to learn from the journals.*
    - *With my capstone course [Evolution], we have to actually read research articles. I think it depends on the subjects being taught. Some classes more than others have a greater research component that can be worked in, but it's definitely not all classes.*
    - *When I got my summer internship they had me read articles, and I wasn't overwhelmed by the task because I had learned how to do that at USF.*
- *Courses help make students aware of general career options, but students would benefit from help in finding internships and other off-campus opportunities that provide exposure to the scientific method and career pathways.*
  - Students in focus groups commented that the breadth of the Biology curriculum helps make them aware of the general areas in which careers are available. However, they did not think in general that on campus student organizations were

helpful in finding opportunities to gain practical experience. They also commented that they would benefit from greater assistance in finding internships off-campus to provide exposure to career options as well as hand-on experience applying their skills and knowledge. Student comments in the senior survey also reflected these sentiments (see Appendix 1). Below are comments from student in the focus groups.

- *A lot of professors bring up really specific careers that most of us have never heard of, but are really interesting. For example, I'm taking Invertebrate Zoology right now, and they're studying regeneration patterns that apply to studies of cancer and other health issues.*
- *I took Insect Biology, and my professor actually worked at the Cal Academy of Sciences. She gave us a special tour of the Entomology Department, and I would never have thought that entomology was such a big field.*
- *The pre-med track at USF is "do it on your own," but if you need to ask for help you can get it. There aren't too many options outside of USF to work in hospitals or other research options.*
- *I know it's hard to put out the word, but I think they should try a little harder to share opportunities. Even just having more information about why research is important and what resources we have.*
- *I agree that USF has been great with coursework, but they haven't helped prepare me for med school in terms of extra-curricular.*
- *That's how I got my internship. I did my own research online about how to get an internship.*
- *I rarely hear of any opportunities for non pre-med Biology majors. I work for the city and teach kids about Biology as a tutor, and that helps me learn and apply my classwork to the real world. So opportunities like that would even be helpful.*
- *I joined Pre-AMSA to help me, but that wasn't helpful at all.*
- *I'm not pre-med, but I'm in Tri-Beta, and I don't feel that's very helpful either. I agree with you all though that it's almost impossible to find internships or research opportunities. Experience counts for so much, and I feel that I'm at a disadvantage. I wish we had an internship course like so many other universities that help link us up with opportunities and help learn what we want or don't want to do.*

- *The curriculum helps make students aware of ethical issues in Biology.*
  - Student comments from focus groups indicated that issues of social responsibility are raised in classes, and in particular evaluation of ethical issues is incorporated into Genetics. Students noted courses such as Biomedical Ethics and Environmental Ethics offered by other departments provide opportunities to examine ethical issues related to Biology. Below are comments from students in focus groups summarizing their familiarity with ethical issues in Biology. Students were able to articulate specific considerations and express appreciation for the importance of discussing ethical issues in biological work.
    - *I think the biggest ethical issue is not altering/faking your data in research.*
    - *In the health care field, doctors and nurses take care of patients and use ethics.*
    - *I think we kind of brush over ethical issues and need to give them more attention, especially in terms of using animals in research.*
    - *We need to engage in ethical discussions. I also keep thinking back to Genetics and our Discussion Section when we really had to think about ethics.*

- *I think it's interesting that people don't associate ethics with Biology, but it's important for us to be aware of them. I think they should require us to take Biomedical Ethics [offered by Philosophy Department] because we need to think more about what we're doing and not just think that anything's okay for science.*
- *[in response to comment above] I think there should be interdisciplinary classes, but honestly this seems pretty case-by-case for specific students. It's important to learn about different topics, and honestly sometimes I need to disconnect from Biology and learn about philosophy, not philosophical Biology.*

- *Students appreciate the breadth of the Biology curriculum, but would like greater access to some classes.*
  - The focus groups and survey of graduating seniors both indicated that students are not always able to take their desired upper division elective courses, and would like a greater range of upper division electives related to molecular Biology. Enrollments in upper division courses are capped to ensure that students receive adequate attention in a small class environment that promotes active learning. However, limits on enrollments have generated problems for some students who need to take specific courses, either for the Molecular Biology or Ecology concentration within the Biology major, or as prerequisites for professional health programs (e.g., dental school, pharmacy school, physician assistant school).

c. <u>What will be done differently as a result of what was learned</u>?

Discuss how courses and/or curricula will be changed to improve student learning as a result of the evaluation. Include a discussion of how the faculty will help students overcome their weaknesses and improve their strengths.

- *The department will strive to make a broad range of upper division electives accessible to students.*
  - When possible, the department will open additional lecture or lab sections of popular upper division elective courses. However, the ability to do so is constrained by limits on resources such as lab rooms and faculty. The department has already added extra lab sections of Immunology, Human Anatomy, and Human Physiology, and an extra lecture section of Neurobiology. The department has also recently increased its offering of field courses for the Ecology concentration, adding Biology of Insects, Invertebrate Zoology, and Botany to the curriculum. The department will also begin discussing the possible addition of upper division elective courses related to molecular Biology to the curriculum, as suggested by student comments.

d. <u>What student learning improvement initiatives did you implement as a result of what was learned from this Year's student learning assurance report</u>?

Discuss how courses and/or curricula were changed to improve student learning as a result of the Year's student learning assurance. Include a discussion of how the faculty has helped students overcome their learning weaknesses and improve their strengths.

- *A laboratory component has been added to Genetics, a required second-year course.*
  - Beginning in Spring 2014, the discussion section of Genetics will be replaced with a laboratory section. The lab include exercises and experiments with fruit flies, prokaryotes, and molecular techniques, and will retain discussion of ethical issues currently in the discussion section. From the labs, students will acquire an increased understanding of the scientific method as well as exposure to lab techniques important in molecular Biology. As indicated by comments from

students in the focus groups, the laboratory element of courses provides valuable exposure to the process of scientific investigation and techniques used in the biological sciences.

- *A required one-unit seminar in Biology has been added to the curriculum.*
  - Currently, a one-unit elective seminar is open to juniors and seniors in the Biology major. The seminar includes guest speakers who talk about their research, reading and evaluation of the primary literature, and discussion of career options in Biology. Beginning in Fall 2013, the seminar will be required for all students, who will be encouraged to take it during their second year, after they have gained some background in Biology but might also be exploring career options. The required seminar will also cover topics such as preparation of resumes and cover letters, and researching and applying for internships and jobs.

3. **Attach a copy of the components of the department/program student learning assurance plan that have been modified since its initial submission:**
   a. Program Mission
   b. Program Learning Goals
   c. Program Learning Outcomes
   d. Program Learning Rubrics aligned with outcomes
   e. Curriculum map that shows the courses that pertain to the outcome

No changes have been made.

Learning Assurance Survey of Graduating Seniors: Summary 2010-2013
USF Department of Biology

Surveys were administered to graduating seniors each academic year in April. Students responded to questions with the following ratings: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree. Students were given the opportunity to provide narrative comments after completing the survey.

Question 1				
I am able to describe structure-function relationships at the	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. molecular level	3.62	3.35	3.55	3.45
b. cellular level	3.76	3.58	3.68	3.50
c. organismal level	3.50	3.35	3.68	3.52
d. ecological level	3.06	3.17	3.32	3.20

Question 2				
I am able to	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
integrate molecular, cellular, organismal, and ecological principles to understand and describe biological systems	3.32	3.33	3.59	3.29

Question 3				
I am able to	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. explain the molecular and chromosomal basis of heredity	3.59	3.58	3.59	3.55
b. explain the genetic basis of evolution	3.38	3.39	3.59	3.52
c. apply evolutionary principles to understanding biological systems	3.35	3.42	3.82	3.58

Question 4				
I am able to	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)

a. understand primary research articles and other scientific publications in Biology	3.47	3.35	3.55	3.61
b. critically evaluate primary research articles and other scientific publications in Biology	3.32	3.10	3.45	3.35

Question 5				
I am familiar with	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. laboratory techniques used in Biology	3.68	3.39	3.55	3.29
b. field methods used in Biology (answer only if you took one or more field Biology courses)	3.52	3.14	3.55	3.14
c. how to apply the scientific process to test hypotheses through experimentation	3.47	3.35	3.64	3.45

Question 6				
I am aware of	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a variety of careers and professions in the biological sciences	3.29	3.03	3.59	3.03

Question 7				
The following courses prepared me for the Biology courses that followed them:	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. General Biology	3.53	3.59	3.62	3.32
b. Cell Physiology	3.44	3.59	3.71	3.58
c. Genetics	3.21	3.28	3.48	3,58

Question 8

The following courses provided a foundation for my understanding of Biology	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. General Chemistry	3.03	3.07	3.43	2.89
b. Organic Chemistry	3.32	3.18	3.43	3.03
Question 9				
The upper-division Biology courses I took	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. enhanced my breadth in Biology	3.88	3.67	3.86	3.77
b. were relevant to my career goals	3.47	3.37	3.52	3.19
c. were courses that I wanted to take	3.68	3.27	3.43	3.48
d. were chosen from among a sufficient number of options	2.97	2.57	2.90	2.88

Question 10				
The following enhanced the breadth and depth of my understanding of Biology	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. the laboratories associated with upper division courses	3.61	3.47	3.67	3.47
b. the posters, projects and presentations associated with upper division courses	3.24	2.97	3.24	3.13
c. the upper division field Biology courses (answer only if you took one or more field courses)	3.59	3.25	3.50	3.46

Question 11				
The Biology courses I took	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. required an appropriate amount of work and effort	3.82	3.63	3.86	3.53
b. addressed underlying evolutionary themes	3.59	3.23	3.81	3.47
c. incorporated USF's Mission and Values	3.26	3.17	3.38	3.07

Question 12				
My grade point average in Biology	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
is the expected result of my ability and effort	2.94	3.07	3.00	3.10

Question 13				
As a Biology major at USF, I	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. participated in biological/scientific clubs and organizations	3.09	3.17	2.76	2.70
b. made friends who share my goals	3.56	3.52	3.57	3.37

Question 14				
Answer this question only if you did research with a Biology faculty member Having participated in a research project,	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. I understand how research is accomplished	3.67	3.29	3.86	3.45
b. I have enriched my understanding of Biology	3.67	3.36	3.86	3.45

Question 15				
My academic adviser	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
was available, informed, and helpful	3.50	3.33	3.33	3.53

Question 16				
The professors in the Department of Biology	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
a. are excellent teachers	3.79	3.63	3.71	3.66
b. have a positive attitude toward students	3.79	3.57	3.67	3.76

Question 17				
My degree in Biology	2010 Average Rating (*n* = 34)	2011 Average Rating (*n* = 31)	2012 Average Rating (*n* = 22)	2013 Average Rating (*n* = 31)
has prepared me for the next step in my life	3.65	3.47	3.48	3.31

Question 18				
In the coming year, I plan to	2010: % yes	2011: % yes	2012: % yes	2013: % yes
a. attend graduate school	40.6	37.9	42.9	32.3
b. attend professional school (e.g., medical, dental, pharmacy)	64.5	28.6	42.9	41.9
c. work in a Biology-related field	71.9	75.9	71.4	61..3
d. work in a field that is not related to Biology	17.9	28.6	9.5	35.5
e. other	29.2	32.0	17.6	32.3

Question 19				
My long-term career goal is to be	2010: % yes	2011: % yes	2012: % yes	2013: % yes
a. a researcher in the biological sciences	33.3	50.0	55.0	45.2
b. a health care professional	85.3	74.1	95.2	77.4
c. a teacher	23.1	23.1	36.8	16.1
d. a laboratory technician	14.8	17.9	31.6	9.6
e. none of the above	0.0	4.5	14.3	12.9

Student Comments: 2013	
1	My upper divisions were really great and my other classes very well prepared me for these upper division classes. I feel like I have a deep understanding of Biology. The only thing I didn't like was that not very many people made it known how to research with a teacher or what teachers even do research. This information should be widely talked about, I should not have learned this from other students in junior year of my career at USF.
2	It would be cool if we had more upper divisions available for the molecular emphasis. One course I really wish had been offered would be nutrition or food and health science. Really love the bio socials, even more would be awesome! One thing I might improve upon is some way to get students within the department to get to know each other better. I have many friends in the department now, but if was a bit harder at first. Maybe some bio student events?
3	I was interested deeply in all of my upper division course but I wish there were more options.
4	Career development support would be much appreciated. I would've liked it if faculty members exposed us to a larger variety of career options in Biology besides the research and research talks.
5	I loved my time at USF and all the professors I came in contact with. My only wish is that I had more time to take more upper division classes and less core or gen requirement classes, but double-minoring made that difficult. Thanks for everything!
6	I would love to see a greater variety of zoological courses offered, if not an actual zoology emphasis.
7	I love the enthusiasm and constant continued support of the teachers even after you have left their class. Keep it up!
8	I love the Biology faculty. All of them are great!
9	More opportunities to take histology! A more broadly advertised Biology Department network for students to become more familiar with health related careers.
10	Need more upper-division sections open for those in molecular emphasis.
11	More classes should have labs. More field trips too.
12	Allow more research opportunities for undergraduate students on and off campus.
13	I wish more upper-division classes were offered in the summer.

F. Appendix F: Student Learning Assurance Report - Academic Year 2011-2012

Report Date: 30 September 2012

School/College: Arts and Sciences

Department/Program: Biology

Person completing the Report: Scott Nunes, Juliet Spencer

1. **Overview Statement**: Briefly summarize the student learning assurance activities that were undertaken this academic year, indicating:
    a. which program learning outcomes were assessed this year.
    b. who in your department/program was involved in the evaluation of the above learning outcomes

Assessment was led by the Biology Department chairs with input from all Biology faculty members. The program learning outcomes assessed this year are listed below.

Upon completing the Biology B.S. degree program, students will be able to

1. Demonstrate both in-depth and broad knowledge of the concepts that comprise the biological sciences.
2. Apply the scientific process, including designing and conducting experiments and testing hypotheses.
3. Perform laboratory techniques (such as light microscopy, gel electrophoresis and keeping a laboratory notebook and understanding of principles of laboratory safety).
4. Demonstrate the ability to read, understand, and critically review scientific papers and prepare oral and written reports in a standard scientific format.
5. Express an awareness of the careers and professions available in the biological sciences and an understanding of the significance ethics plays in the field.

2. **Please Answers the Following Questions for Each of the Student Outcomes Assessed:**
    a. **What did you do?**
    Describe clearly and concisely how you assessed the learning outcomes that were evaluated this year (e.g., measures, research methods, etc.). [please use bullet points to answer this question]

- *Review of grades.* The department reviewed grades of Biology majors in courses required in the major (General Biology I, General Biology II, Cell Physiology, Genetics, Evolution) and laboratory and field components of elective courses to appraise student achievement in the program. A summary of this grade review is presented in Appendix 1.
- *Departmental discussions.* In department meetings, faculty members discussed syllabi from required courses to determine whether program outcomes specified in the

curriculum map were being adequately addressed in the courses. Faculty members also discussed the adequacy of facilities and equipment in laboratory and field courses.

- *Survey of graduating seniors.* The department administered an anonymous survey to graduating seniors to gauge their perceptions of whether the program's outcomes were being achieved. Results of the survey are included in Appendix 2.

b. <u>What did the faculty in the department or program learn</u>?
Summarize your findings and conclusions as a result of the student learning assurance indicating strengths and weaknesses in student learning demonstrated by this evaluation.

- *Student achievement is satisfactory to excellent in first and second year required Biology courses*.
    - Biology majors typically take General Biology I and General Biology II during their first year and Cell Physiology and Genetics during their second year. These courses cover the core fundamentals of the Biology major reflected in learning outcomes 1-3 above, and prepare students for upper division courses. A total of 85.6% of Biology majors in General Biology I and 90.8% in General Biology II earned a C- or higher (Appendix 1, Figure 1). A total of 89.4% Biology majors in Cell Physiology and 90.7% in Genetics earned a C or higher (Appendix 2, Figure 2). Students must earn a C- or higher in General Biology I and General Biology II and a C or higher in Cell Physiology and Genetics for the courses to satisfy major requirements. Students earning lower grades in a course have one opportunity to repeat it to earn the minimum required grade. Thus, all students completing the Biology major must demonstrate satisfactory achievement in these important foundational courses.
- *Student achievement is good to excellent in upper division laboratory and field Biology courses.*
    - Upper division laboratory and field courses promote attainment of the knowledge and expanded development of the important skills reflected in learning outcomes 1-3 above. A total of 90.1% of Biology majors in upper division laboratory courses and 98.5% in field courses earned a B- or higher (Appendix 1, Figure 3). These grades signify strong achievement in these courses and indicate that required first and second year courses successfully prepare students for upper division coursework.
- *Student achievement is good to excellent in Evolution, the Biology capstone course.*
    - All Biology majors take Evolution during their senior year as a capstone course to facilitate higher lever development of the aptitudes reflected in learning outcomes 1-4 above. A total of 87.9% of students earned a B- or higher in Evolution (Appendix 1, Figure 4), demonstrating strong achievement in the more advanced elements of the Biology major. Moreover, responses on the survey of graduating seniors indicate high confidence among students that they are proficient in these elements as well as a solid perception that learning outcomes are being achieved (Appendix 2).

- *Increased inclusion of the primary literature in courses would improve the Biology curriculum.*
    - Review of syllabi for required courses in the major revealed that reading and evaluation of the primary literature, an important component of outcome #4 above, was not covered in Evolution. The curriculum map for the Biology program specifies that examination of the primary literature at a somewhat sophisticated level is an important part of Evolution as a capstone course. Moreover, ratings and comments from the survey of graduating seniors indicated that students might benefit from additional practice in critical evaluation of the primary literature (Appendix 2, Question 4b, 2011 Comment #9).
- *Increased coverage of career options and preparation would enrich the Biology curriculum.*
    - The survey of graduating seniors indicated that some students do not feel that they are well versed in career options for Biology majors (Appendix 2, Question #6 and multiple student comments), which is an important component of outcome #5 above.
- *Updated instrumentation would enhance student learning in the upper division microscopy laboratory class.*
    - Departmental discussions suggested that the transmission electron microscope in the upper division microscopy class was old and somewhat outdated, and that students in the class did not have the opportunity to learn the most current microscopy techniques used in the various fields of Biology. Faculty members concluded that addition of a scanning electron microscope and confocal microscope to the department would enhance exposure to state of the art laboratory techniques, an important component of outcome #3 above, both for students in the microscopy class and for students doing research projects with faculty members.
- *Increased access of students to some upper division elective courses would improve preparedness in their career pathways.*
    - The survey of graduating seniors showed that students are not always able to take their desired upper division elective courses (Appendix 2, Question #9d, multiple student comments). Enrollments in these courses are capped to ensure that students receive adequate attention in a small class environment that promotes active learning. However, limits on enrollments have generated problems for some students who need to take courses such as Human Anatomy and Human Physiology as prerequisites for professional health programs (e.g., dental school, pharmacy school, physician assistant school) but cannot enroll after the classes fill.

3. <u>What will be done differently as a result of what was learned</u>?

Discuss how courses and/or curricula will be changed to improve student learning as a result of the evaluation. Include a discussion of how the faculty will help students overcome their weaknesses and improve their strengths.

- *The upper division microscopy laboratory class will be upgraded.*

- The Biology Department has obtained a grant from the Fletcher Jones Foundation to open a microscopy center with a scanning electron microscope and a confocal microscope in addition to the other microscopes currently in the department. After the center is opened, these instruments will be incorporated into the upper division microscopy class, enhancing student exposure to state of the art laboratory instruments and techniques.

4. <u>What student learning improvement initiatives did you implement as a result of what was learned from this Year's student learning assurance report</u>?

Discuss how courses and/or curricula were changed to improve student learning as a result of the Year's student learning assurance. Include a discussion of how the faculty has helped students overcome their learning weaknesses and improve their strengths.

- *Coverage of the primary literature has been increased in the curriculum.*
  - Reading and discussion of the primary literature are now an integral part of Evolution, the Biology capstone course. Examination of the primary literature has been expanded to additional classes and is now an important component of the required second year Biology courses (Cell Physiology, Genetics) and most upper division elective courses (e.g., Biology of Cancer, California Wildlife, Comparative Animal Physiology, Conservation Biology, Development, Endocrinology, Herpetology, Immunology, Invertebrate Zoology, Marine Biology, Molecular Biology, Neurobiology, Oceanography, Undergraduate Seminar in Biology, Virology). The primary literature is one of the main forums for communicating new ideas and findings in the various fields of Biology, and thus the ability to critically evaluate the literature is a vital skill for biologists and professionals in fields that rely on an understanding of Biology.
- *A seminar focusing on career options and preparedness has been added to the curriculum.*
  - The Biology curriculum now includes a 1-unit elective seminar focusing on exploration of career options, resume preparation, job search strategies, interview preparation, and other skills that can help students choose and prepare for appropriate Biology-related careers. The seminar will be offered at least once per academic year and is open to all Biology majors from first year students to seniors.
- *Additional sections of some upper division courses have been added to the curriculum.*
  - To maintain the learning benefits of a small class experience, the department decided against increasing enrollment caps in popular upper division elective courses. However, additional lab sections of Human Anatomy and Human Physiology have been added to increase access to these courses for students who need them as prerequisites for postgraduate professional health programs. An additional lecture section of Neurobiology has also been added to the curriculum. Neurobiology is a required course in the Neuroscience minor, which is popular among Biology majors and reinforces many of the core elements of the Biology major.

5. **Attach a copy of the components of the department/program student learning assurance plan that have been modified since its initial submission:**
    a. Program Mission
    b. Program Learning Goals
    c. Program Learning Outcomes
    d. Program Learning Rubrics aligned with outcomes
    e. Curriculum map that shows the courses that pertain to the outcome

No changes to these areas have been made since the previous submission.

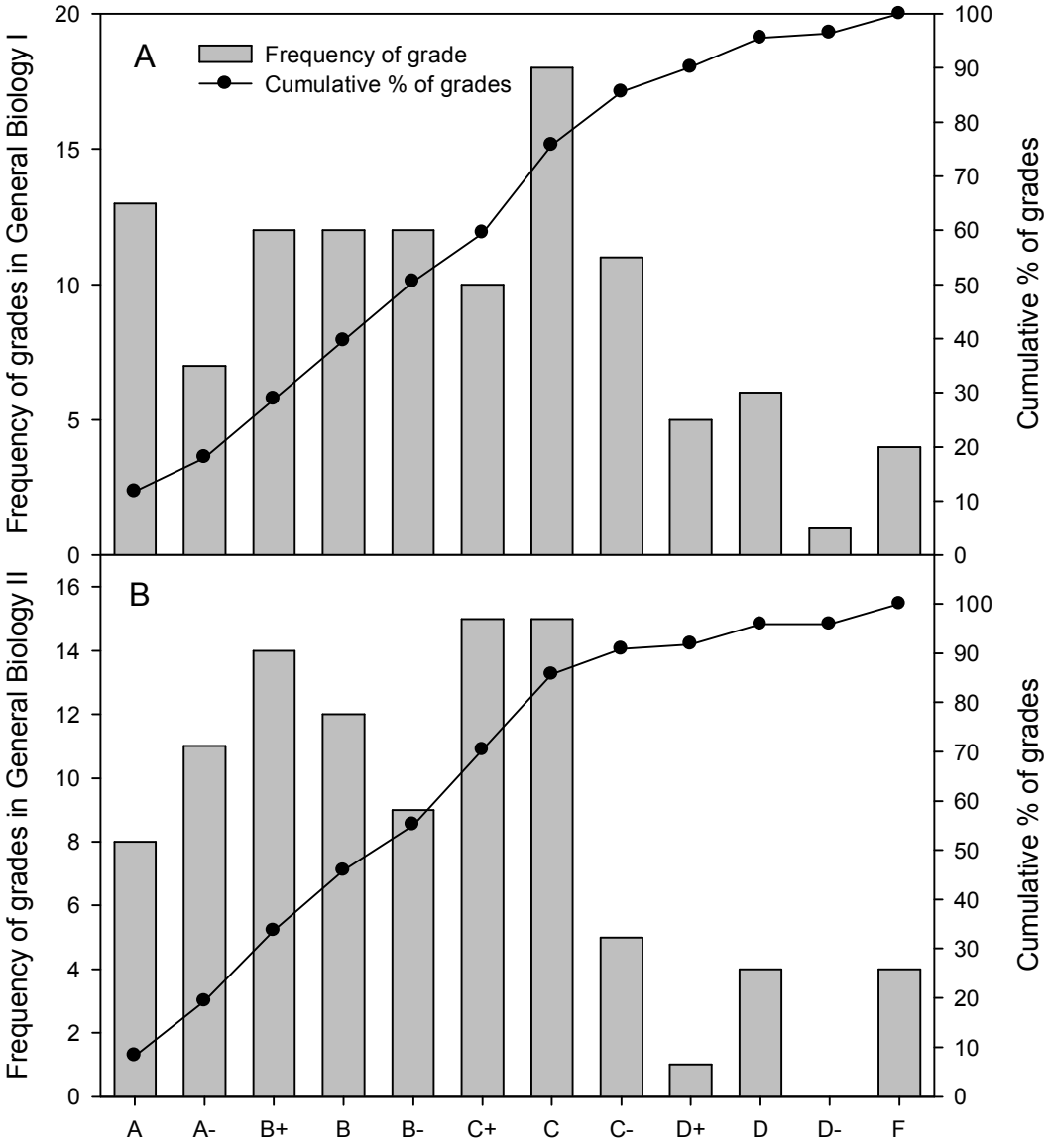

Figure 1. Distrubution of grades in first year courses in the Biology major: A) General Biology I and B) General Biology II. Grades are presented only for Biology majors in the courses.

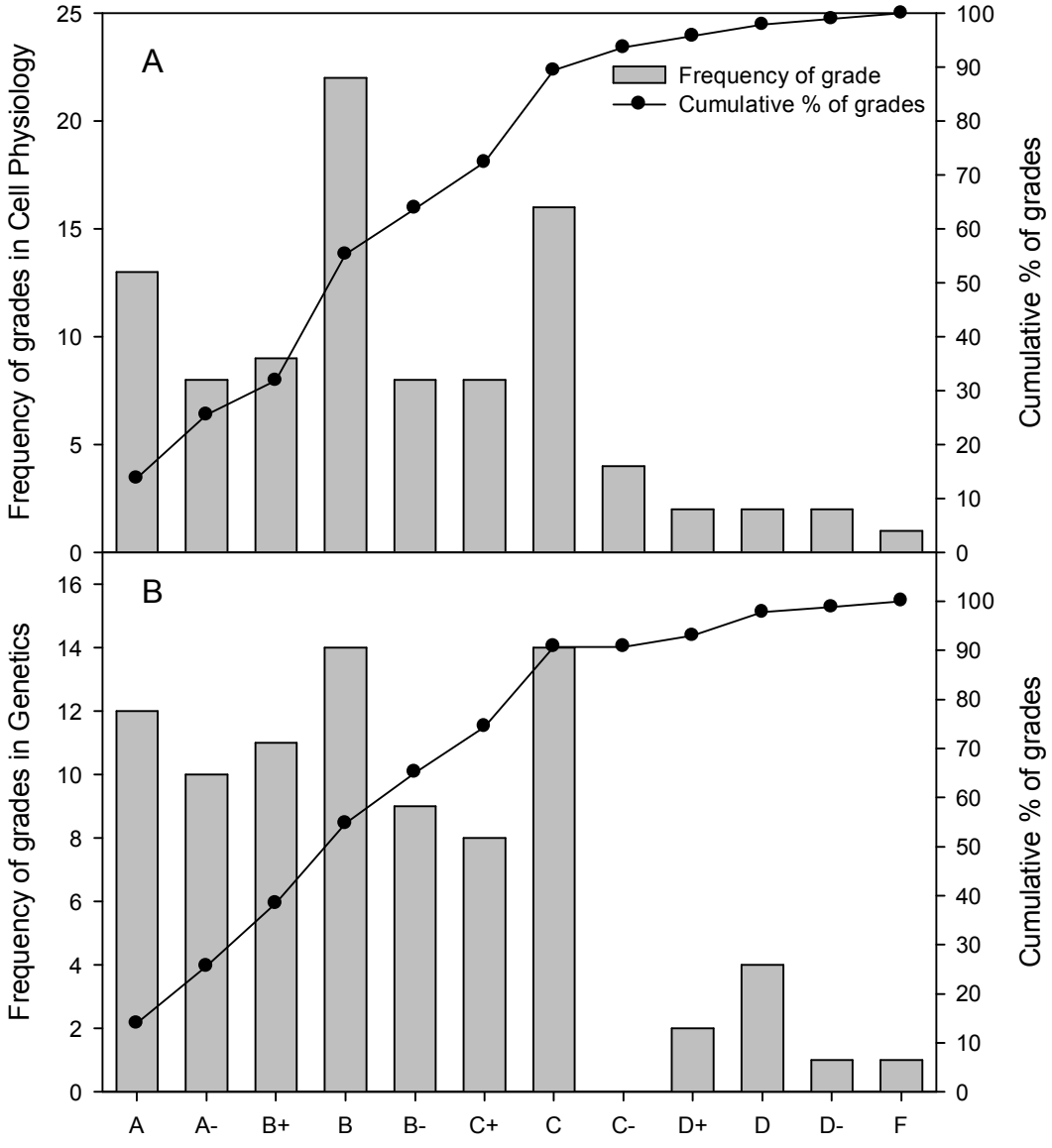

Figure 2. Distrubution of grades in second year courses in the Biology major: A) Cell Physiology and B) Genetics. Grades are presented only for Biology majors in the courses

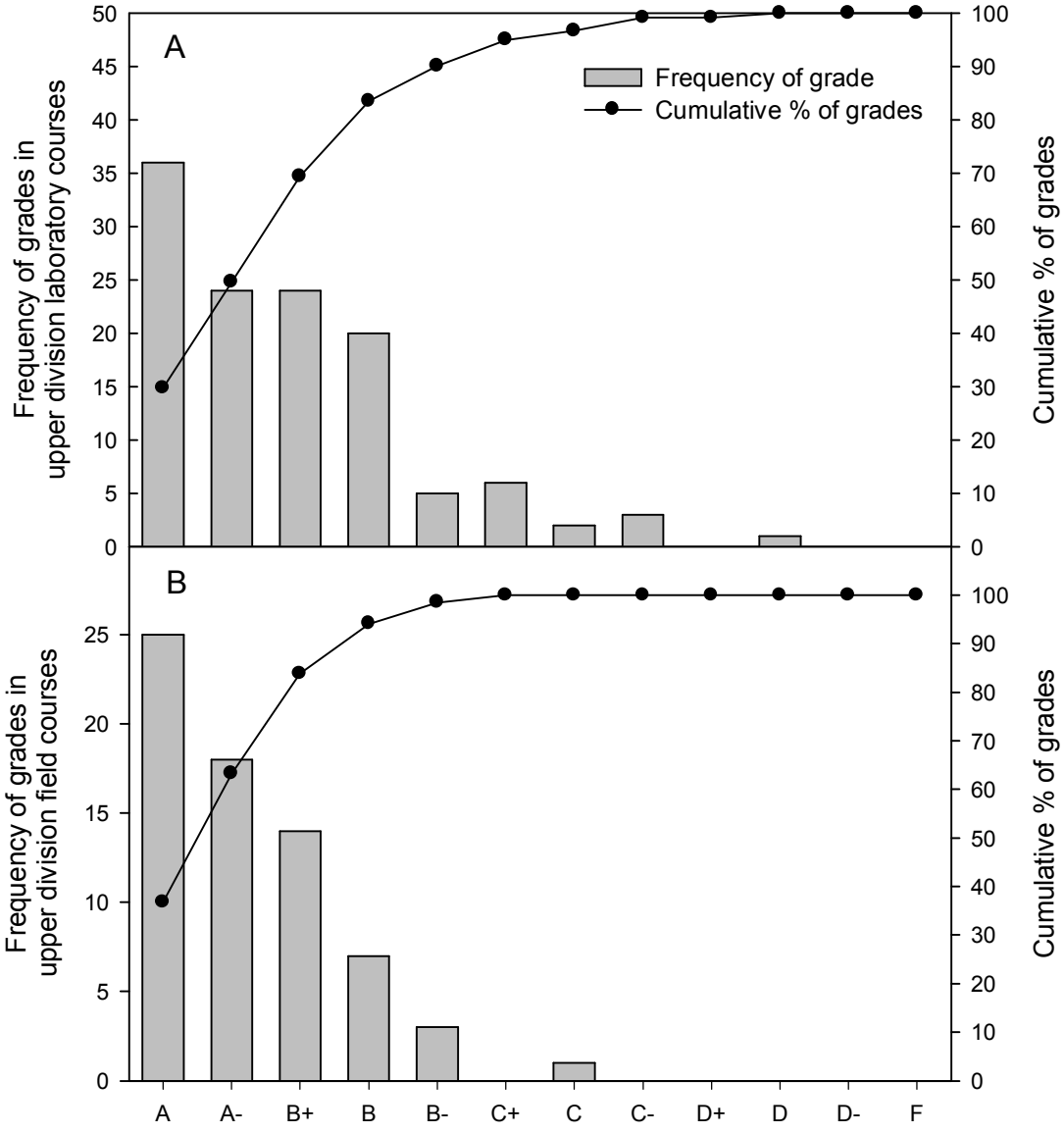

Figure 3. Distribution of grades in upper division A) laboratory and B) field Biology courses. Grades are presented only for Biology majors in the courses.

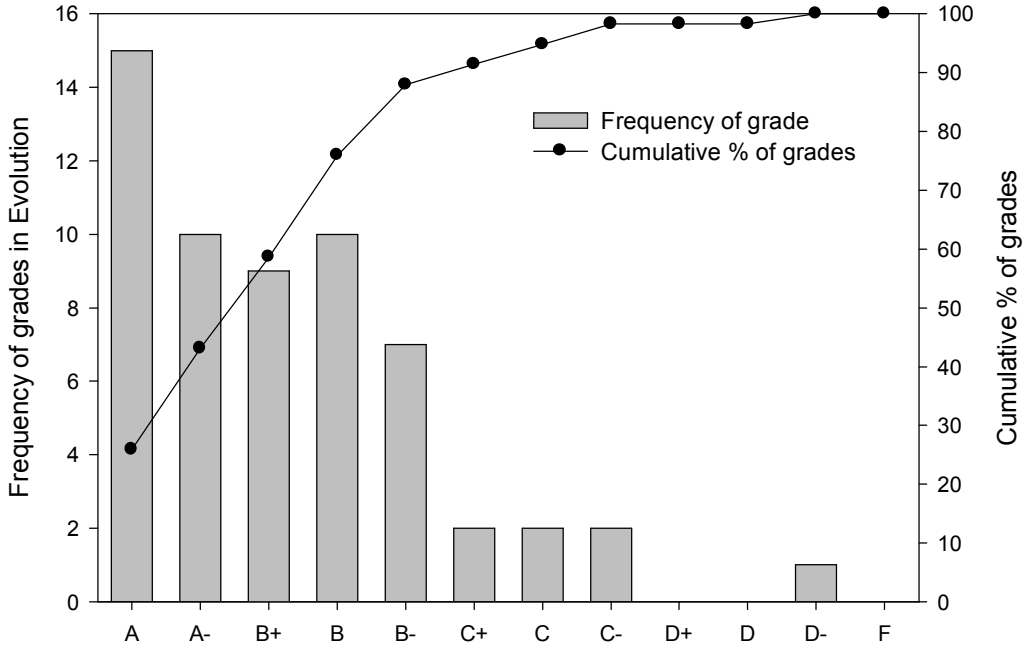

Figure 4. Distribution of grades in Evolution, the Biology capstone course. Grades are presented only for Biology majors in the courses.

Learning Assurance Survey of Graduating Seniors: Summary 2010-2012
USF Department of Biology

Surveys were administered to graduating seniors each academic year in April. Students responded to questions with the following ratings: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree. Students were given the opportunity to provide narrative comments after completing the survey.

Question 1			
I am able to describe structure-function relationships at the	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. molecular level	3.62	3.35	3.55
b. cellular level	3.76	3.58	3.68
c. organismal level	3.50	3.35	3.68
d. ecological level	3.06	3.17	3.32

Question 2			
I am able to	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
integrate molecular, cellular, organismal, and ecological principles to understand and describe biological systems	3.32	3.33	3.59

Question 3			
I am able to	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. explain the molecular and chromosomal basis of heredity	3.59	3.58	3.59
b. explain the genetic basis of evolution	3.38	3.39	3.59
c. apply evolutionary principles to understanding biological systems	3.35	3.42	3.82

Question 4			
I am able to	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. understand primary research articles and other scientific publications in Biology	3.47	3.35	3.55

b. critically evaluate primary research articles and other scientific publications in Biology	3.32	3.10	3.45

Question 5			
I am familiar with	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. laboratory techniques used in Biology	3.68	3.39	3.55
b. field methods used in Biology (answer only if you took one or more field Biology courses)	3.52	3.14	3.55
c. how to apply the scientific process to test hypotheses through experimentation	3.47	3.35	3.64

Question 6			
I am aware of	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a variety of careers and professions in the biological sciences	3.29	3.03	3.59

Question 7			
The following courses prepared me for the Biology courses that followed them:	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. General Biology	3.53	3.59	3.62
b. Cell Physiology	3.44	3.59	3.71
c. Genetics	3.21	3.28	3.48

Question 8			
The following courses provided a foundation for my understanding of Biology	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. General Chemistry	3.03	3.07	3.43
b. Organic Chemistry	3.32	3.18	3.43

Question 9

The upper-division Biology courses I took	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. enhanced my breadth in Biology	3.88	3.67	3.86
b. were relevant to my career goals	3.47	3.37	3.52
c. were courses that I wanted to take	3.68	3.27	3.43
d. were chosen from among a sufficient number of options	2.97	2.57	2.90

Question 10			
The following enhanced the breadth and depth of my understanding of Biology	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. the laboratories associated with upper division courses	3.61	3.47	3.67
b. the posters, projects and presentations associated with upper division courses	3.24	2.97	3.24
c. the upper division field Biology courses (answer only if you took one or more field courses)	3.59	3.25	3.50

Question 11			
The Biology courses I took	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. required an appropriate amount of work and effort	3.82	3.63	3.86
b. addressed underlying evolutionary themes	3.59	3.23	3.81
c. incorporated USF's Mission and Values	3.26	3.17	3.38

Question 12			
My grade point average in Biology	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
is the expected result of my ability and effort	2.94	3.07	3.00

Question 13			
As a Biology major at USF, I	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. participated in biological/scientific clubs and organizations	3.09	3.17	2.76
b. made friends who share my goals	3.56	3.52	3.57

Question 14			
Answer this question only if you did research with a Biology faculty member Having participated in a research project,	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. I understand how research is accomplished	3.67	3.29	3.86
b. I have enriched my understanding of Biology	3.67	3.36	3.86

Question 15			
My academic adviser	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
was available, informed, and helpful	3.50	3.33	3.33

Question 16			
The professors in the Department of Biology	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
a. are excellent teachers	3.79	3.63	3.71
b. have a positive attitude toward students	3.79	3.57	3.67

Question 17			
My degree in Biology	2010 Average Rating (n = 34)	2011 Average Rating (n = 31)	2012 Average Rating (n = 22)
has prepared me for the next step in my life	3.65	3.47	3.48

Question 18			
In the coming year, I plan to	2010: % yes	2011: % yes	2012: % yes
a. attend graduate school	40.6	37.9	42.9
b. attend professional school (e.g., medical, dental, pharmacy)	64.5	28.6	42.9
c. work in a Biology-related field	71.9	75.9	71.4
d. work in a field that is not related to Biology	17.9	28.6	9.5
e. other	29.2	32.0	17.6

Question 19

My long-term career goal is to be	2010: % yes	2011: % yes	2012: % yes
a. a researcher in the biological sciences	33.3	50.0	55.0
b. a health care professional	85.3	74.1	95.2
c. a teacher	23.1	23.1	36.8
d. a laboratory technician	14.8	17.9	31.6
e. none of the above	0.0	4.5	14.3

Student Comments: 2012	
1	I especially appreciated the opportunities provided by the USF PUMPT program. Working in a lab at UCSF has not only been a valuable experience both knowledge and career-wise, but has also helped shape and change my long-term career goals. I have been bitten by the science bug and now hope to participate in a dual MD/PhD program, integrating clinical and laboratory training.
2	I wish more special topic classes were offered! They always seem so interesting and different.
3	It would be nice to have the upper division courses offered more... I had planned to take some upper division courses but they were only offered once or twice and it had conflicted with another required class. Also, I think career options and future directions after graduation should be discussed more during freshmen and sophomore years. Career development support was on the weak side and I wish there were more opportunities to explore career options.
4	It was evident that professors did not enjoy teaching classes like Genetics and Cell Phys
5	Need more medically related classes, need more time options, need better advisors, and ways to hear about Biology opportunities. Putting info up on a board in a hallway is not a sufficient way to spread information.
6	Classes capped at 12 students are not applicable to the class sizes at USF anymore. Either more classes more be offered or classes must grow. Some of the problems encountered with registering for classes are simply unacceptable for a $150,000 education
7	The science department needs to offer more courses that are relevant to the student's interests. Professors also should be more forthcoming/helpful with students seeking internships/research experience. The one great thing about USF is the small classroom size so you get to know your classmates and professors intimately, but many professors don't seem too interested in helping furthering a student's success/career. I wish there was more opportunities to build a repertoire/relationship with the professors aside from office hours which coincided with my work schedule often. If there were more events that were held by the Biology Department to help forge that relationship with faculty in a non-academic or intimidating setting, it'd be great.
8	The Biology program was one of the most rewarding things I've ever done for myself. I came to USF undeclared and have never regretted my decision to declare myself a Biology major. I am proud of what I've accomplished and anxious to use what I've learned in a professional environment.

Student Comments: 2011

1	I feel that USF has an excellent Biology program that is based upon its strong faculty. I am very satisfied with being a Biology major at USF...I can't recall a professor I didn't like. The only complaint I see other people having is registering for classes. As a scholar I never had problems with this, but I do feel bad for my other classmates who can't get the classes they're interested in.
2	This is not really my concern, rather it's for current Biology students. A lot of my fellow Biology peers had a difficult time registering for a class. If there could be any possible way to accommodate for these students because many of them are really passionate to be enrolled in that specific class. I am aware of the CSI being built for future Biology students, but to cater to the growing number of Biology students now, perhaps have some Biology classes in larger classrooms like Kal Hall or Cowell.
3	All I have to say is that in reflecting on the completion of this degree, I see that I have grown tremendously, met wonderful faculty and students, and would not trade the for anything else. Thank You.
4	the upper division classes' time should be arranged better
5	While I have greatly enjoyed my Biology courses overall, there is tremendous variation in quality, particularly in the upper division. Some teachers are great: enthusiastic, current on developments in the field, eager to talk during office hours, organized, realistic about workloads while at the same time sufficiently demanding. Others are teaching from out-of-date texts, do not seem willing to make an effort, and assume that students are only half-interested. Expectations make the reality sometimes. There is not enough discussion in upper level courses. Questioning by students usually seems to be appreciated but not encouraged, so only a handful of students really engage during class. My courses in the organismal/evolutionary part of the major were quite weak—very disappointing, because it is such a vibrant part of the field. I would like to see more attention to the history of science. Some professors incorporate it, but most don't. I also would like to see more seminars. Most classes convey a body of knowledge with only passing reference to the broader consequences of the huge changes that have happened in Biology in the past few decades. I feel like we should have more of a sense of the unfolding of science and its impact on the world. A global health or public health seminar would be one place to start. I think Stanford's human Biology major offers this kind of integrative approach.
6	I would suggest increasing the course offerings as there is a very limited number avaiable particullarly when "the end is near". I have greatly enjoyed my experience here and appreciate the hard work and dedication of the faculty and the things I have learned will be directly applicable to my career.
7	It would be nice if more outreach was made to pre-med students in their Sophomore or Junior year, letting them know about deadlines and the steps required to apply to med school.
8	Keep Human Physiology open because students need that class. And make larger upper division classes or more than one section because it was really difficult for some us to get the classes we needed and wanted.
9	USF Biology Department does not focus enough on peer article reviews and presentations, and practical laboratory research techniques. I feel I was not prepared for the research setting.

Student Comments: 2010	
1	USF has a huge LACK of access to job fairs and opportunities for science majors. There is little help offered unlike the business school or other colleges.

2	More upper division courses should be offered during each semester.
3	I think the academic advisors should be more attentive in knowing the core requirements, since if it weren't for me on a whim checking with the office to add a class I would be one class short of graduating, which could have caused me a lot of trouble in my ability to graduate and receiving financial assistance. It would also be nice to sit in on upper division courses, to help figure out if I want to take the class or if I like the teachers' teaching style. Making it easier for Biology majors to also be Biochemistry majors is also important, and being able to get a Biochemistry and Chemistry minor, and not having to choose just one. More information on different medical fields and what kinds of schools and medical degrees are offered in the US and elsewhere, and what to look for in medical schools to make it easier to practice in the US, since not all students interested in pursuing medicine have parents who are already in the medical field and know this information. More science based volunteer opportunities where we as students get to share our knowledge of science with the public, such as high school and grammar school students, and getting them interested in pursuing science and healthrelated careers. When we have an opportunity to share our knowledge, it reinforces what we already know not just to other students we're in class with, but with the public and feeling confident doing so. I enjoyed my time at USF, I very much wish I could have been able to take all the other classes I am so interested in, and the faculty are phenomenal and were very important in helping me feel confident enough to pursue the health-related fields.
4	In general, labs should be far more specific to what is learned in lecture, especially in upper division molecular emphasis classes. Constant effort should be made both in lecture and lab to relate the things learned in lab to the things learned in lecture. While it is easy to assume that most of the students know what they are doing because they have already read over the procedure, it is hardly ever the case. The educational experience in Biology would be much more effective if lab and lecture could be more seamlessly combined. It has been my experience that most Biology majors at USF know theory, but are particularly incompetent in a lab setting (some seniors don't even know how to use a pipette). It is important to shift the mindset from passive "I know what HAPPENS because of x y and z" to the active "I know how to MAKE this happen and I will DO x y and z". Also, Career Services is lacking in jobs for Biology majors. This is particularly distressing considering the fact that USF is located in one of the most booming centers for Biology in the country. More effort should be made to make connections and to network with local companies and universities to get our graduating students out into the community. Career Services has toted their job search programs and has a sort of "hands-off" attitude once they have given job searching students their information. It would perhaps be in the interest of the Biology Department to network unique opportunities just for USF students instead of throwing them into a database to which many other universities already have access. Lastly, it would be in the interest of the department to offer more classes. As one of the students who went through the student population boom that caused many first semester juniors to be shut out of upper division classes, I saw firsthand the lack of classes offered and the effect it had on students. While the solution (adding new sections to classes that already existed) controlled some of the damage, this could be taken as an opportunity to expand the course offerings. Instead of straining the professors that the department already has, perhaps it could hire adjunct professors from various fields to teach lecture courses on special topics.

Student Comments: 2010 (Continued)	
5	I think students should be encouraged to be able to choose their advisor/switch advisers if they want.
6	I wish the Biology Department offers more upper division courses to increase the choices of field. Also, I hope Biology Department opens some upper division courses on summer. For organizations, they should let all the students know what organizations they can offer

	because some of the transferred student they do not know during orientation. Once they know, it is too late for them to join.
7	I think that it would be great to organize some sort of an internship relationship with UCSF or other research facilities for students to utilize.
8	I wish there were more connections to biotechnology companies outside of the school. Like how career services center offers business majors jobs off campus, I wish the Biology Department could offer students these opportunities too. The education I received here was great, but I still always felt lost in preparations for jobs. If we had a resume workshops for specifically for Biology majors or had on campus interviews for biotech companies in the bay area would be a great.
9	I really enjoyed most of the class I took. It would have been great if we had more ecologically related courses. It would also have been nice if there was more of a community among the Biology Department outside of the classroom.
10	Following the Biology course curriculum for four years at USF, the upper division courses were the most immersive. However, more variety of these courses would have been preferable.
11	My experience at USF has been brief but fulfilling. The professors take an interest in the success of the students which should be expected but has, in my previous educational experience, been rare.

G. Appendix G: Faculty Biographies and CVs

Paul Chien, Professor, grew up in Hong Kong and earned two B.S. degrees in Chemistry and Botany from The Chinese University of Hong Kong. After getting his Ph. D. in Marine Biology from University of California at Irvine, he went on to study the Biology and rehabilitation of giant kelp beds in Southern California at California Institute of Technology. Teaching at USF since 1973, and being a District Director of Beta Beta Beta Biological Honorary Society, he is interested in promoting undergraduate research. Many of his students have published papers with him in international journals. His research interests ranging from cellular structure and function in marine algae and invertebrate animals to effects of heavy metal pollution as well as biological detoxification mechanisms. Paul Chien has also been active in promoting Sino-American academic exchanges. Eight Universities and medical schools in China have honored his services.

Ammon B. Corl is an Assistant Professor (term faculty) in the Department of Biology. He received his B.S. in Biology from Cornell University in 2000 and his Ph.D. in neuroscience from the University of California, San Francisco in 2007. His graduate research focused on studying the behavior altering effects of alcohol (ethanol) on the fruit fly, *Drosophila melanogaster*. A major focus of his thesis project was to identify and characterize specific *Drosophila* mutants that display either increased resistance or increased sensitivity to the intoxicating effects of acute ethanol exposure. He currently teaches General Biology I (BIOL 105) and General Biology II (BIOL 106), as well as an upper division Neurobiology course (BIOL 368).

Jennifer Dever is an Associate Professor. She earned her Ph.D. from Texas Tech University where she studied population genetics of endangered crocodiles in Belize, C.A. and have been at USF for the past 11 years where her research falls under the broad category of conservation genetics. It is her goal to use genetics as a means of better managing threatened wildlife. Projects range from local - working on population genetics of the foothill yellow-legged frog (*Rana boylii*)- to global, identifying new species from Myanmar using both molecular data and morphology. She teaches a wide range of classes at USF including Conservation Biology Herpetology and Evolution.

Deneb Karentz is a marine biologist with expertise in plankton ecology and ultraviolet (UV) photoBiology. She has an MS from Oregon State University and a PhD from the University of Rhode Island. Her graduate work focused on the physiological ecology of phytoplankton and this research initiated an interest in the use of molecular techniques to study ecological questions. She completed post-doctoral training in molecular Biology at the University of California San Francisco Medical Center working on the molecular genetics of an inherited human disorder in DNA repair relative to exposure to UV radiation. Her current research activities include investigations using functional genomics to evaluate responses of Antarctic marine plankton to climate change with a focus on the impacts of ozone depletion and warming, and continuation of work on understanding the molecular basis of DNA repair in the context of human disease. Deneb came to USF in 1992 and has a joint faculty appoint in Environmental Science.

Leslie King, Instructor (term faculty), has a BS degree in Zoology from the University of California at Davis and an MA in Physiology and Behavior from San Francisco State University. Her graduate research focused on adult and fetal hemoglobin-oxygen affinities in the oviparous shark *Cephaloscyllium ventriosum.* In addition, she participated in field studies of shark behavior and feeding in the Bahamas through Mote Marine Laboratory in Sarasota, FL. Although she is still fascinated by shark behavior and physiology, Leslie's interests have shifted to human cardiovascular physiology and exercise physiology,

resulting from teaching human physiology for several years and also from her experience as a distance runner. In addition, she is interested in science and health communication, specifically in exploring the use of in-class technology to teach concepts in physiology. In addition to teaching human physiology courses, Leslie coordinates the laboratory instructors for the General Biology labs. She is also serves as a faculty mentor in USF's University Scholars program. Outside of USF, she is a marathon runner and an active member of the San Francisco Road Runners Club and volunteers at San Francisco S.P.C.A. and Animal Care and Control.

Cary Lai, Assistant Professor (term faculty), majored in Biology and Chemistry at the Massachusetts Institute of Technology in 1998 and received his Ph.D. from the Molecular and Cell Biology Department at University of California, Berkeley in 2003. As a graduate student, he studied the enzyme telomerase using a combination of biochemical and structural studies. For the six years before joining USF, he worked in the biotechnology industry – first in drug discovery research at Genentech and then in commercial operations at the start-up company LakePharma. While working in biotech, he taught part-time as an instructor for UC Berkeley Extension. He joined USF in 2012, hired in part to teach courses in USF's new Biotechnology PSM Master's degree program. In addition to teaching graduate courses in the biotechnology, he has also has taught several undergraduate courses the Biology Department as well.

Mary Jane Niles, Professor, received her Diploma in Nursing in 1978 from Binghamton General Hospital School of Nursing, and worked as an R.N. until 1986. During that time she completed a B.S. in Cell and Molecular Biology at San Francisco State University (1985). She then went on to the University of California at Berkeley, where, in 1992, she completed her Ph.D. in Immunology. During the subsequent 21 years as a faculty member at U.S.F. Mary Jane has served as a research advisor to ten Masters students and numerous undergraduates; Her research addresses IgM synthesis and assembly in terminally differentiated B cells, or plasma cells. In particular, she is working toward the identification and characterization of a rough endoplasmic reticulum (RER)-associated enzyme, which is thought to catalyze the formation of IgM-IgM and J chain-IgM disulfide bridges. Her course repertoire includes Virology, Molecular Biology, Immunology with lab, and Molecular Genetics and Biotechnology with lab (upper-division), and Cell Physiology and General Biology (lower-division). Mary Jane has contributed chapters on immunology to several textbooks: Campbell's *Biology* (editions four through seven), *Human Physiology* by Germann and Stanfield (First edition), *The World of the Cell* by Becker, Reece and Peonie (Third edition), and *Microbiology: A Photographic Atlas for the Laboratory* by Alexander and Strete (First edition). In addition, she co-authored *Laboratory Exercises in Organismal and Molecular Microbiology* by Alexander, Strete, and Niles (McGraw-Hill, 2003, first edition). She currently serves as Sergeant-at Arms of the USF Faculty Association, as Advisor to the U.S.F. Chapter of Beta Beta Beta Biological Honor Society, and as Chair of the Pre-professional Health Committee.

Scott Nunes, Associate Professor, was born in San Francisco and grew up around the Bay Area. He received his bachelor's degree from the University of California at Santa Cruz and Ph.D. from Michigan State University. He did post-doctoral work at Michigan State University and the University of Nebraska at Omaha. His research focuses on behavioral ecology. As an undergraduate, he acquired field experience studying blue monkeys and spotted hyenas in Africa, and Beechey ground squirrels along the California coast. In the past, he has completed research projects examining hormonal and energetic elements of dispersal, play, and maternal behavior in ground squirrels, hormonal correlates of paternal behavior in marmosets, and biological rhythms in ground squirrels and African grass rats. Since starting at the University of San Francisco he has evaluated questions regarding functional benefits of play behavior and behavioral changes associated with increased experience in ground squirrels. His current research involves summer field studies in the Sierra Nevada, and he recently began integrating

microsatellite DNA and GIS analysis into his work. Courses he has taught at the University of San Francisco include General Biology I and II, Human Physiology, Human Anatomy, Neurobiology, Endocrinology, and Biology of Human Aging.

John R. Paul, Assistant Professor, earned his B.S. degree from The Evergreen State College and a Masters in Zoology from the University of Florida. He earned a Ph.D. in Biology from the University of Pittsburgh, working on the phylogenetics and ecology of the tropical plants in the lab of Stephen J. Tonsor. He held two postdoctoral researcher positions at Colorado State University, and also served as a general Biology lecturer there for three semesters. He is starting his first year at USF, where he teaches General Biology II and will develop a Field Botany course in Spring 2014. His research program at USF focuses on the ecology and evolution of plants and integrates molecular phylogenetics, population and functional genomics, and greenhouse and field experiments. He has particular interest in using evolutionary history to help explain variation in the abundance of distribution of plant species. His studies concentrate on the diverse California plant genus *Mimulus*, the model plant for functional genomics, *Arabidopsis thaliana*, and an extremely diverse tropical shrub genus in coffee family, *Psychotria*. He also has a strong commitment to improving science education in underprivileged, urban K-12 schools, an interest developed over three years as a National Science Foundation funded GK-12 Fellow working in some of Pittsburgh's poorest elementary schools during his Ph.D.

James Sikes, Assistant Professor, majored in Biology at Furman University in Greenville, South Carolina. Following five years as secondary education teacher where he taught courses in Biology, marine science, and environmental science, he pursued graduate studies at the University of Maryland, College Park. He earned a Ph.D. in Behavior, Ecology, Evolution, and Systematics in 2009 after researching the evolution of asexual reproduction and regeneration in marine flatworms. After completing his doctorate, he completed a postdoctoral fellowship at the Howard Hughes Medical Institute and University of Illinois, Urbana-Champaign studying the molecular and genetic events that have led to reduction or loss of regenerative abilities in certain flatworm lineages. Research in Professor Sikes's laboratory at the University of San Francisco continues to focus on the evolution and diversification of asexual reproduction and regeneration in both marine and freshwater flatworms. At the University of San Francisco, he has taught General Biology II, Developmental Biology, Invertebrate Zoology, and Evolution. In 2013, he began as Director of the Masters in Science Graduate Program.

Juliet Spencer, Associate Professor, received her B.S. in Biotechnology from Worcester Polytechnic Institute and completed her Ph.D. in Microbiology studying herpesvirus capsid structure at the University of Virginia. After completing a post-doctoral fellowship studying immune response to influenza viruses at UVA, she moved to San Francisco Bay Area and worked in the biotechnology industry, focusing on drug discovery for human and viral G-protein coupled receptor targets. In addition, she taught cell and molecular Biology courses part-time for UC Santa Cruz-Extension's Biotechnology Certificate program. Since coming to USF in 2003, Professor Spencer has developed an NIH-funded research program studying immune evasion strategies of herpesviruses. She enjoys teaching General Microbiology, Medical Microbiology, and a First Year Seminar: Good Germs, Bad Germs.

Gary L. Stevens, Professor, received his B.S. from California State University at Long Beach, and an M.S. in and Ph.D. from the University of California at Davis in Zoology. He began at USF in 1970 after completing the Ph.D. He has studied small mammal demographics in Alaska and Papua New Guinea. He also participated in a multiyear ecological monitoring of the Geothermal Steam Plants in the Geysers, Ca. He has taught a range of courses but is currently teaching human anatomy for non-majors or majors

and a vertebrate ecology field class for Biology majors. He maintains a small vertebrate teaching collection. He is currently interested in how the discovery of "mirror" neurons in humans, other primates and some social mammal species has generated a recurring theme of the importance of empathy in primate evolution and future human cultural interaction and conflict with the looming impacts of global warming.

John Sullivan, Professor, grew up in the Boston area and graduated from Dartmouth College with a Biology degree in 1968. His graduate education at the University of Hawaii, under the direction of the parasitologist Thomas C. Cheng, was interrupted by military service, including 16 months in Vietnam. He completed his Ph.D. in 1976 in Dr. Cheng's lab at Lehigh University. Prior to joining USF as the Fletcher Jones Chair, Dr. Sullivan worked in a variety of research and teaching positions (UCSF's International Center for Medical Research in Kuala Lumpur, Malaysia, Downstate Medical Center, The National Institutes of Health, The Medical University of South Carolina, Lamar University, University of the Incarnate Word) and along the way completed 20 years of service in the Army Reserve, retiring as a lieutenant colonel. He has also taught both nonmajor's and major's Biology summer courses at Stanford University, and parasitology at San Francisco State University. At USF, he has taught General Biology I and II, General Parasitology, Histology, and Animal Toxicology. His research is directed at the role of the molluscan immune system in responding to parasitic infection, foreign tissue transplants, and bacterial lipopolysaccharide, mainly at the organismal and histological levels, and his studies have been supported by grants from WHO, DOE, NIH, NSF, and other agencies. In addition to his teaching and research, he self-publishes a photographic atlas of parasites that has been adopted as a required text in parasitology courses at several major universities.

Brian Thornton, Assistant Professor (term faculty), earned his B.S. degree from the University of California at Davis before working at the Fred Hutchison Cancer Research Center in Seattle, Washington for several years, where he studied genetic interactions with mismatch repair genes. He continued to work in genetics at the University of California at San Francisco, where he earned his Ph.D. in the study of control of cell division in the budding yeast, *Saccharomyces cerevisiae.* He was hired as adjunct faculty at USF in Spring 2008, and began as full-time term faculty in Fall 2009. Brian regularly teaches introductory microbiology for Nursing majors and Genetics for Biology majors, and on occasion has taught upper division microbiology and sophomore year cell physiology courses.

Christina Tzagarakis-Foster, Associate Professor, majored in Biology at the University of San Francisco and received a Ph.D. in Microbiology from the University of California, Davis in 1999, where she studied gene regulation of nuclear hormone receptors in Dr. Martin Privalsky's laboratory. After completing her doctorate, she continued her studies with nuclear hormone receptors in Dr. Dale Leitman's laboratory at the University of California, San Francisco. She specifically studied the role of Estrogen Receptors in breast cancer. During her post-doctoral fellowship, Christina also was an adjunct faculty member at both San Francisco State University as well as Dominican University of California in San Rafael. Hired in 2005, Christina has returned to USF as an assistant professor in the Department of Biology. She teaches Cell Physiology, Endocrinology, Biology of Cancer and co-teaches the Seminar in Biology Series as well as the Biotechnology Internship Seminar. When she is not in the classroom, Christina has a very active laboratory with both graduate and undergraduate students. Her research is focused on studying the Dax-1 (Dosage Sensitive Sex Reversal, Adrenal Hypoplasia Congenita, critical region on the X chromosome, gene 1) protein, an "orphan" receptor of the nuclear receptors. She has found that Dax-1 is a potent transcriptional repressor and is able to block the growth of breast cancer cells using a mouse model system. Currently, research is focused on investigating the mechanism of repression by Dax-1 as well as examining the role of Dax-1 in preventing breast tumor formation in women.

PAUL CHIEN, Professor

Education

1971-73	Post-Doctoral Fellow, Environmental Engineering Kerckhoff Marine Laboratory, California Institute of Technology
1971	Ph.D., Marine Biology, University of California (Irvine, California)
1964	B.S., Botany, The Chinese University of Hong Kong (Hong Kong)
1962	B.S., Chemistry, Chung Chi College (Hong Kong)

Professional Experience

1973- 1978	Assistant Professor, University of San Francisco, Department of Biology
1973-1979	Consultant, Marine Food and Energy Farm Project Kerckhoff Marine Laboratory, California Institute of Technology
1978-1984	Associate Professor, University of San Francisco
1984-present	Full Professor, University of San Francisco
1995-1997	Chairman, Department of Biology, USF
1992-1993	Radio Forum Professor, KUSF-FM 90.3
1999	Arthur Furst Research Award, USF

Named Visiting or Honorary Professor of:

1. North Sichuan Medical College; Nanchong, China
2. Suzhou Institute of Urban Construction & Environmental Protection
3. East China Normal University, Shanghai
4. Second Military Medical University, Shanghai
5. Liaoning Normal University, Dalian
6. Jinan University, Guangzhou
7. Ninbo University, Ninbo
8. Harbin Normal University, Harbin

Key Publications and Presentations

1. Paul **Chien**, Esther Chow and Chi-Hang Lee (Oct 2004)
   Translated: Three Views on Creation and Evolution
   By J. P. Moreland and John Mark Reynolds eds., into Chinese
   Campus Crusade Press, Hong Kong
2. Stephen C. Meyer, Marcus Ross, Paul Nelson, and Paul **Chien**, 2004
   "The Cambrian Explosion: Biology's Big Bang" pp. 323-418, in
   Darwinism, Design, and Public Education eds. John Angus Campbell and
   Stephen C. Meyer, Michigan State University Press
3. Paul **Chien** (Oct 2004 translated into Chinese)
   "The English and American Bible" Chapter 6 in
   The Bible Its Translators and Their Sacrifices
   World Knowledge Press, Beijing
4. Paul **Chien** (May 2005 in Chinese)
   "Creation and Evolution", Part 3, Chapter 14 in
   100 Lessons to Equip the 21st Century Christians,
   Judy Huang ed.

Chinese Coordination Centre of World Evangelism, Hong Kong

5. Paul Chien (2005– 2006)

Invited Lectures given in China at:
Beijing Normal University
Harbin Normal University,
Harbin Institute of Technology
Harbin College
Hei Long Jiang University
Jilin University.
Nanjing University
Zhejiang University
Ninbo University
China Youth Political University
Wanzhou University
South China Normal University

Professional Activities

1975- Director, Western District II, Beta Beta Beta Biological Honor Society

Have served as a reviewer of grant proposals or manuscripts for the following agencies, organizations and journals:

The Templeton Foundation
Zhejiang University Press
Faith Rock Press, Beijing

AMMON BEN CORL, Assistant Professor

Education
2000 Cornell University B.S. Biology
2007 University of California, San Francisco Ph. D. Neuroscience

Professional Experience

Assistant Professor: (University of San Francisco, Department of Biology)

For the past five years, I have been employed as part-time faculty and full-time term faculty in the Department of Biology at the University of San Francisco (USF). Although my teaching responsibilities vary from semester to semester, they have included teaching lecture courses (specifically General Biology I, General Biology II, and Neurobiology) and laboratory courses (specifically General Biology labs and Human Anatomy labs). I very much enjoy teaching at the undergraduate level and look forward to continuing to do so over the next academic year at USF.

Previous Research Activities: (Graduate School: UCSF)
In Dr. Ulrike Heberlein's laboratory at UCSF, I was involved in identifying and characterizing genes and pathways regulating behavioral responses to ethanol in the fruit fly, *Drosophila melanogaster*. One component of my thesis project in the Heberlein lab was to elucidate the role of the insulin signaling pathway in mediating ethanol sensitivity in *Drosophila*. In addition, I was involved in a large-scale forward genetic screen to identify novel genes that regulate the ethanol induced locomotor behavior of *Drosophila*. I extensively characterized one particular screen mutant called *happyhour* which displays a marked resistance to ethanol induced sedation.

Previous Research Activities: (Undergraduate work: Cornell University)
1997–2000 Student Research Assistant, laboratory of Dr. Howard Howland, studying development of amblyopia in children.
1998-2000 Student Research Assistant, laboratory of Dr. Ron Hoy, studying visual development and behavior of the Malayan stalk-eyed fly, *Cyrtodiopsis whitei*.

Teaching Responsibilities
BIOL 105 General Biology
BIOL 368 Neurobiology

Awards
May 2003 and May 2004: Achievement Award for College Scientists (ARCS)

Key Publications
Corl AB, Rodan AR, Heberlein U (2005) Insulin signaling in the nervous system regulates ethanol intoxication in *Drosophila melanogaster*. Nat Neurosci 8:18-19.

Corl AB, Berger KH, Ophir-Shohat G., Gesch J., Simms JA, Bartlett SE, and Heberlein U (2009) Happyhour, a Ste20 family kinase, implicates EGFR signaling in ethanol-induced behaviors. Cell 137: 949-960.

Levin ED, Aschner M, Heberlein U, Ruden D, Welsh-Bohmer KA, Bartlett S, Berger K, Chen L, **Corl AB**, Eddins D, French R, Hayden KM, Helmcke K, Hirsch HV, Linney E, Lnenicka G, Page GP, Possidente D,

Possidente B, Kirshner A. (2009) Genetic aspects of behavioral neurotoxicology. Neurotoxicology 30: 741-753.

Devineni AV, McClure K, Guarnieri D, **Corl A**, Wolf F, Eddison M, Heberlein, U. (2011) The genetic relationships between ethanol preference, acute ethanol sensitivity, and ethanol tolerance in *Drosophila melanogaster*. Fly (Austin) 5(3): 191-199.

JENNIFER A. DEVER, Associate Professor

Education

2000 Ph.D., Zoology, Texas Tech University (Lubbock, TX)
1994 M. A., Biology, Ball State University (Muncie, IN)

Professional Experience

2002 – present Assistant Professor, University of San Francisco, Department of Biology
2006 – present Research Associate of the California Academy of the Sciences
2000 – 2002 Assistant Professor, Lander University, Biology Department

Teaching Responsibilities

Courses Taught
Biotech Internship Seminar – Current Semester
Conservation Biology – Current Fall, 2011, 2010, 2009; Spring 2007, 2006, 2005, 2004 and 2003
Evolution - Fall, 2012, Spring 2012, Fall 2011, current semester
Herpetology – Spring 2013, 2012, 2011, 2010, 2009, Fall, 2007, 2006, 2005, 2004 and 2003
Female Biology – Fall, 2012, 2009, 2006 and 2005
Principles of Genetics – Spring 2007, 2005, 2004 and Fall 2002
Principles of Biology I – Fall, 2010, 2004
Introductory Biology – Fall, 2010, 2003 and 2002

Major Service Contributions to the University

To the Department
- Director, Professional Science Master's in Biotechnology, 2011 – present, Created and direct new integrative Masters degree to prepare students for career in industry
- Chair, Graduate Program, 2003 – 2013 (Spring)
- Chair, Term Faculty Search Committee for Biotech program, 2012
- Search Committee, Molecular Biology, 2004
- Search Committee, Microbiology, 2003

To the University
- University Scholars Program Director, 2007 - 2013, Develop and direct new program to increase retention of the Arts & Sciences University Scholar.
- Member, Policy Board Committee, 2003 – Present, Executive Board Member (Secretary), 2006 - 2009
- Co-Creator, Organizer and Implementer, Teaching Assistantship Workshop, 2003 – 2009: Assist in the development and presentation of an annual workshop for incoming graduate Teaching Assistants.
- Co-Chair, Working Group Three, WASC Task Force Educational Effectiveness Review, Theme I, 2005 -2007
- Member, University Life Committee of the Board of Trustees, 2004 – 2006
- Member, WASC Steering Committee, 2004 – 2005

Awards and Grants

- Best Paper of 2012 – *Copeia*
- University of San Francisco Faculty Development Grants – 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010 , 2011, 2012, 2013

Key Publications

Dever, J. A, Fuiten, A.,Konum, O. and J. Wilkinson (2012). Cryptic Torrent Frogs of Myanmar: An Examination of the *Amolops marmoratus* Species Complex with the Resurrection of *Amolops afghanus* and the Identification of a New Species. *Copeia* 2012(1):57-76.

McVay, J. D., D. Rodriguez, T. Rainwater, **J. A. Dever**, S. G. Platt, S. T. McMurry, M. R. J. Forstner and L.D. Densmore, (2008), Evidence of multiple paternity in Morelet's crocodile (Crocodylus moreletii) in Belize, CA, inferred from microsatellite markers. *J. of Exp. Zool.*

. (2007) Fine-scale genetic structure in the threatened Foothill Yellow-legged Frog *(Rana boylii)*. *Journal of Herpetology* 41:(1)168-173.

Ray, D. A., **J. A. Dever**, S. G. Platt, T. R. Rainwater, A. G. Finger, S. T. McMurry, M. A., Batzer, B. Barr, P. J. Stafford, J. McKnight, and L. D. Densmore (2004). Low Levels of Nucleotide Diversity in *Crocodylus moreletii* and Evidence of Hybridization with *C. acutus*. *Conservation Genetics* 5(4):449-462.

Pepper C., T. R. Rainwater, **J. A. Dever**, S. G. Platt, S. T. McMurry, and T.A. Anderson (2004). Organochlorine pesticides in chorioallantoic membranes of Morelet's crocodile eggs from Belize. *Journal of Wildlife Diseases*40(3):493-500.

Dever, J. A., R. E. Strauss, T. R. Rainwater, S. T. McMurry, and L. D. Densmore (2002). Genetic diversity, population subdivision and gene flow in wild populations of Morelet's crocodile (*Crocodylus moreletii*) in Belize , Central America . *Copiea* 2002 (4):1078-1091.

Dever, J. A. and L. D. Densmore (2001). Microsatellites in Morelet's crocodile (*Crocodylus moreletii*) and their utility in addressing crocodilian population genetics questions. *Journal of Herpetology* 35(3):541-544.

Current research projects

- Collaboration with the Herpetology Department at the California Academy of Sciences: Myanmar herpetological species diversity project to identify *Theloderma* sp. using DNA sequence and morphometrics. Examination of specimen collected from Myanmar and direct comparison with known species combined with DNA sequence analysis for species identification.

- Population genetics study of Belding's ground squirrels near Yosemite National Park: using microsatellites to determine genetic structure and relatedness. Parentage and sib-ship identification combined with a long-term play behavior study.

DENEB KARENTZ, Professor

Education

1982 Ph.D., Biological Sciences, University of Rhode Island (Kingston, Rhode Island)
1976 M.S., Botany and Plant Pathology, Oregon State University (Corvallis, Oregon)
1973 B.S., Biology, University of Rhode Island (Kingston, Rhode Island)

Professional Experience

1997-now	Professor, Department of Biology and Department of Environmental Science, USF
2007-now	Coordinator, USF/UCSF Partnership for Undergraduate Teaching and Mentoring
2006–2009	Chair, Department of Biology, USF (also 2003–2004, 1998-2001)
2004-2012	Visiting Professor, Dept. of Dermatology, University of California San Francisco (UCSF)
2001-2003	Associate Program Manager, National Science Foundation, Office of Polar Programs
1992-1997	Associate Professor, USF
1987-1992	Research Biologist, UCSF, Laboratory of RadioBiology and Environmental Health (DOE)
1983-1986	National Research Service Award Post-Doctoral Fellow, UCSF
1982-1983	Research Biologist, Graduate School of Oceanography, University of Rhode Island

Major Service Contributions to the University (PARTIAL LIST)

2013-now	Member of committee designing an electronic Change of Academic Program form
2010-2011	Provost's Center for Excellence in Research and Scholarship Task Force
2010-2011	College of Arts and Sciences Sustainability Task Force
2008-now	Faculty mentor, University Scholars Program
2005-now	College of Arts and Sciences Writing Retreat Selection Committee
2005-2008	Office of Undergraduate Admissions Advisory Board
2004-2009	Strategic Enrollment Council for Undergraduate Admissions
2003-2009	Faculty advisor, EnVision (student environmental club)
1999-2001	Administrative Representative, General Education Curriculum Committee
1998-2000	Chair, College of Science Executive Committee
1998	Arts and Sciences Task Force on the USF Student Information System
1996-1999	Achievement Rewards for College Students (ARCS) Scholarship Selection Committee
1994-1995	Writing Across the Curriculum Committee
1992-now	Have mentored >20 undergraduate students in research
1992-1994	General Education Curriculum Course Development Committee

Awards and Honors

2009 USF College of Arts and Sciences Collective Achievement Award
2008 USF College of Arts and Sciences Frank L. Beach Award for Outstanding Leadership
2005 Lake Karentz (77°15'48''S, 161°48'30''E) designated by the US Board on Geographic Names
1999 USF Distinguished Research Award
1993 Arthur Furst Award for Outstanding Research Advancing Science for the Betterment of Humanity, USF
1992 Luigi Provasoli Award for Outstanding Paper in the Journal of Phycology, Phycological Society of America (awarded every two years)
1987 Research article selected for inclusion in the Yearbook of Cancer

Key Publications (TOTAL = 64)

Articles in journals*:* American Zoologist, Antarctic Journal of the United States, Antarctic Science, Aquatic Microbial Ecology, Archiv für Hydrobiologie, BioEssays, Comparative Biochemistry and Physiology Part C, DNA Repair Reports, Earth System Science Data, Environmental Health Perspectives, EOS, Ergebnisse der Limnologie, Journal of Invertebrate Pathology, Journal of Parasitology, Journal of Phycology, Journal of Plankton Research, Journal of Protozoology, Limnology

and Oceanography, Marine Biology, Marine Ecology - Progress Series, Marine Pollution Bulletin, Molecular and Cellular Biology, Nature, Neuroscience, Oncogene, Photochemistry and PhotoBiology, Science, Somatic Cell and Molecular Genetics
Book chapters in: Antarctic Research Series, DNA Repair Mechanisms, Effects of Solar Ultraviolet Radiation on Biogeochemical Dynamics in Aquatic Environments, Encyclopedia of Ecology, Environmental UV PhotoBiology, Marine Chemical Ecology, Phycotalk, Proceedings of the 8th Congress of Radiation Research, Proceedings of the National Institute of Polar Research Symposium on Polar Biology, Proceedings of the VIII SCAR International Biology Symposium, Stratospheric Ozone Depletion/UVB Radiation in the Biosphere: Proceedings of NATO Advanced Research Workshop
GenBank co-author on three protein and seven nucleic acid sequence entries
25 invited presentations at US and international meetings (since 1992)
8 plenary presentations at US and international meetings (since 1992)

External Grants

pending National Science Foundation Office of Polar Programs ($215,343)
Collaborative research: Biological adaptations to environmental change in Antarctica – An advanced training program for early career scientists
Co-PI: Donal Manahan, University of Southern California ($793,511)
current National Science Foundation Office of Polar Programs ($229,625) (2011-2014)
Collaborative Research: Functional Genomics and Physiological Ecology of Seasonal Succession in Antarctic Phytoplankton - Adaptations to Light and Temperature
Co-PI: Joe Gryzmski, Desert Research Institute, Reno, NV ($484,562)
1986-2009 NSF grants ($630,000), Toxic Substances Program University of California ($15,000)

Professional Activities (PARTIAL LIST)

2012-now Second US Delegate to the Scientific Committee on Antarctic Research (SCAR) Appointment by the US National Academies, Polar Research Board
2011-now Private Sector Advisor to the US State Department Delegation, Antarctic Treaty Consultative Meeting (ACTM) and Committee on Environmental Protection (CEP)
2006-now US representative, SCAR Life Sciences Standing Scientific Group, served as secretary 2008-2012
1994-now Instructor, *Integrative Biology and Adaptation of Antarctic Marine Organisms*, an advanced graduate course taught at McMurdo Station, Antarctica (sponsored by NSF)
1996-now Member of various users committees for the US Antarctic Program logistics contractor
1992-now Reviewer of grant proposals (for >40 agencies and organizations)
1992-now Reviewer of manuscripts (for >35 journals)
2005-2011 Associate Editor, *Phycologia*, International Phycological Society (Blackwell Publishers)
1997-2012 Science advisor (script review) for the internationally syndicated *Earth & Sky* radio series
1993-1996 Member, Editorial Board for the Journal of Phycology, Phycological Society of America

Society Memberships

American Association for the Advancement of Science (since 1991)
American Society of Limnology and Oceanography (since 1982)
American Society of PhotoBiology (since 1993)
International Phycological Society (since 1984)
Phycological Society of America (since 1975)

LESLIE A. KING, Instructor

Education

1993 M.A., Physiology and Behavioral Biology, San Francisco State University
1989 B.S., Zoology, University of California, Davis; graduated *cum laude*, June 1989.

Professional Experience

August 1992-August 2000; January 2002-present	Biology Instructor and Laboratory Coordinator, University of SanFrancisco
January 2001-December 2001	Bioinformatics Technician, University of California, San Francisco
July 1999	SAT Preparation Course Instructor, Ivy West Educational Services/Foothill College
July 1992	Instructor, California Academy of Sciences/Steinhart Aquarium,Golden Gate Park
January 1991-July 1992	Research Assistant, San Francisco State University
June 1990-May 1992	Laboratory Instructor, San Francisco State University

Teaching Responsibilities
Biology 115: Survey of Human Physiology (service course for Nursing and Kinesiology majors)
Biology 116: Survey of Human Physiology Lab
Biology 105: General Biology 1
Biology 106: General Biology 2
Biology 320: Human Physiology (Spring 2014)
Biology 321: Human Physiology Lab (Spring 2014)

Major Service Contributions to the University
Faculty mentor, University Scholars Program
Academic Advisor to 45 students
WebTrack summer adviser and student schedule reviewer
Participant in teaching panel as part of UCSF's BEST (Becoming an Effective Science Teacher) course
Journal Referee for *Writing for a Real World*, An annual multidisciplinary anthology by USF students
Discussion facilitator for incoming freshman at freshman orientation
Term Faculty Task Force member
Co-developer of and leader of workshops for graduate student teaching assistants in the College of Arts and Sciences

Awards
2013 U.S.F. Disability Issues Committee Award
1993 San Francisco State University Distinguished Graduate Award
1992 Best Student Poster, American Society of Zoologists Annual Meeting

Key Publications

King, L.A. (2012) *Integrating Lecture and Lab: A General Biology Laboratory Manual,* 1st Ed. Cognella Academic Publishing /University Readers, Inc.

Stryke D., Kawamoto M., Huang C.C., Johns S.J., **King L.A.**, Harper C.A., Meng E.C., Lee R.E., Yee A., L'Italien L., Chuang P.T., Young S.G., Skarnes W.C., Babbitt P.C., Ferrin T.E. 2003. BayGenomics: a resource of insertional mutations in mouse embryonic stem cells. Nucleic Acids Res. Jan 1;31(1):278-281.

Rat specimen preparation and dissection for:
Marieb, E.N. 2001. Exercise 2, Organ Systems Overview. In *Human Anatomy Laboratory Manual with Cat Dissections, Third ed.* San Francisco: Benjamin Cummings, an imprint of Addison Wesley Longman, Inc.

King, L.A. 1994. Adult and fetal hemoglobins in the oviparous swell shark, *Cephaloscyllium ventriosum*. Comp. Biochem. Physiol. 109B(2-3): 237-243.

King, L.A. and A.J. Arp. 1992. Adult and fetal hemoglobins in the shark *Cephaloscyllium ventriosum*. Amer. Zool. 32: 55A.

Professional Activities
2013-present Affiliate Member, American Physiological Society
Manuscripts reviewed recently
2011 Selected chapters in *Visual Anatomy and Physiology*, 1e, Benjamin Cummings Publishing

Community Activities
January 2011 Volunteer, San Francisco S.P.C.A.-present
2006-2009 Pace group leader, San Francisco Marathon
2005-present Active Member, San Francisco Road Runners Club
1999-2000 Volunteer, San Francisco School Volunteers

CARY LAI, Assistant Professor

Education

2003 Ph.D., Molecular and Cell Biology
University of California at Berkeley (Berkeley, CA)

1998 B.S., Biology and Chemistry
Massachusetts Institute of Technology (Cambridge, MA)

Professional Experience

2012 - present Assistant Professor, University of San Francisco, San Francisco, CA

2011 – 2012 Head of Commercial Operations, LakePharma, Inc., Belmont, CA

2011 – 2012 Instructor, UC Berkeley Extension, Berkeley, CA

2006 – 2010 Postdoctoral Research Fellow, Genentech, Inc., South San Francisco, CA

2003 – 2006 Postdoctoral Fellow, Massachusetts Institute of Technology, Cambridge, MA
Lab of Professor Stephen Bell

1998 – 2003 Graduate Researcher, University of California at Berkeley, Berkeley, CA
Lab of Professor Kathleen Collins

1996 – 1998 Undergraduate Researcher, Massachusetts Institute of Technology, Cambridge, MA; Lab of Professor Terry Orr-Weaver

Teaching Responsibilities

BIOL 345: Virology
BIOL 395: Drug Discovery in Biotechnology
BIOL 420: Molecular Biology
BIOL 490/600: Seminar: Topics in Molecular Biology
BTEC 620: Molecular Biology
BTEC 685: Molecular Genetics and Biotechnology Lecture
BTEC 686: Molecular Genetics and Biotechnology Laboratory

Key Publications

Lai CK, Gupta N, Rangell L, Wen X, Chih B, Peterson AS, Bazan JF, Li L, and Scales SJ. Functional characterization of putative cilia genes by high-content analysis. *Molecular Biology of the Cell* 22: 1104-1119 (2011).

Wen X, **Lai** CK, Evangelista M, Hongo J, de Sauvage FJ, and Scales SJ. Kinetics of Hedgehog-dependent full-length Gli3 accumulation in primary cilia and subsequent degradation. *Molecular and Cellular Biology* 30: 1910-1922 (2010).

O'Connor CM, **Lai** CK, and Collins K. Two purified domains of telomerase reverse transcriptase reconstitute sequence-specific interactions with RNA. *Journal of Biological Chemistry* 280: 17533-17539 (2005).

Lai CK, Miller MC, and Collins K. Telomerase RNA motifs govern nucleotide and repeat addition processivity. *Molecular Cell* 11: 1673-1683 (2003).

Balicky EM, Endres MW, **Lai** C, and Bickel SE. Meiotic cohesin requires accumulation of ORD on chromosomes before condensation. *Molecular Biology of the Cell* 13: 3890-3900 (2002).

Kashevsky H, Wallace JA, Reed BH, **Lai** C, Hayashi-Hagihara, A, and Orr-Weaver TL. The anaphase promoting complex/cyclosome is required during development for modified cell cycles. *Proceedings of the National Academy of Sciences* 99: 11217-11222 (2002).

Lai CK, Miller MC, and Collins K. Template boundary definition in *Tetrahymena* telomerase. *Genes and Development* 16: 415-420 (2002).

Lai CK, Mitchell JR, and Collins K. RNA binding domain of telomerase reverse transcriptase. *Molecular and Cellular Biology* 21: 990-1000 (2001).

Bickel SE, Moore DP, **Lai** C, and Orr-Weaver TL. Genetic interactions between *mei-S332* and *ord* in the control of sister-chromatid cohesin. *Genetics* 150: 1467-1476 (1998).

Key Presentations

February 2010, Keystone Symposia: Cilia, Signaling, and Human Disease, Monterey, CA

December 2009, American Society for Cell Biology: Annual Meeting, San Diego, CA

April 2001, Telomeres and Telomerase: Cold Spring Harbor Laboratory, Cold Spring Harbor, New York

MARY JANE NILES, Professor

Education

1992 Ph.D., Immunology
University of California at Berkeley (Berkeley, CA)

1985 B.S., Cell and Molecular Biology
San Francisco State University (San Francisco, CA)

1978 Diploma, Nursing
Binghamton General Hospital School of Nursing (Binghamton, NY)

Professional Experience

2005-present Professor, University of San Francisco, Department of Biology
1998 – 2005 Associate Professor, University of San Francisco, Department of Biology
1992 – 1998 Assistant Professor, University of San Francisco, Department of Biology
1978 – 1986 Registered Nurse, Garden Sullivan Hospital of California Pacific Medical Center, San Francisco, CA

Teaching Responsibilities

BIOL 212 Cell Physiology
BIOL 345 Virology
BIOL 420 Molecular Biology
BIOL 443/444 Immunology and Lab
BIOL 485/486 Molecular Genetics and Biotechnology and Lab

Awards and Grants

2001 Measuring the Activity of Sulfhydryl Oxidase Isolated from an Immunoglobulin (Ig)M-Secreting Mouse Hybridoma. Lily Drake Cancer Research Fund
2001 Measuring the Activity of Sulfhydryl Oxidase Isolated from an Immunoglobulin (Ig)M-Secreting Mouse Hybridoma. Faculty Development Fund
1997 Isolation and Identification of Sulfhydryl Oxidase Enzyme. Faculty Development Fund
1997 Cytosolic and Nuclear Localization of NF-AT by Immunoelectron Microscopy. Lily Drake Cancer Research Fund

Key Publications

Niles, M.J. L. Matsuuchi, and M. E. Koshland. 1995. Polymer IgM Assembly and Secretion in Lymphoid and Nonlymphoid Cell Lines: Evidence that J Chain is Required for Pentamer IgM Synthesis. *Proceedings of the National Academy of Sciences*, 92: 2884-2888

Textbook Authorships and Contributions

"The Immune System" in Biology, 7th edition. 2005. N. Campbell and J. Reece,

The Benjamin Cummings Publishing Co., Inc.

Alexander, S., D. Strete, and M.J. **Niles**. 2003. Laboratory Exercises in Organismal and Molecular Microbiology. McGraw-Hill Higher Education.

Niles, M.J. Instructor's Manual for Laboratory Exercises in Organismal and Molecular Microbiology. 2003. McGraw-Hill Higher Education. Available at www.mhhe.com/alexander1e

"The Immune System" in Human Physiology. 2002. W. Germann and C. Stanfield. The Benjamin Cummings Publishing Co., Inc.

"The Body's Defenses" in Biology, 6th edition. 2002. N. Campbell and J. Reece, The Benjamin Cummings Publishing Co., Inc.

"Host Response to Infection" in Microbiology: A Photographic Atlas for the Laboratory. 2000. S. Alexander and D. Strete. Addison Wesley Publishing, Inc.

"The Body's Defenses" in Biology, 5th edition. 1999. N. Campbell, J. Reece, and L. Mitchell. The Benjamin Cummings Publishing Co., Inc.

"The Body's Defenses" in Biology, 4th edition (1996), N. Campbell. The Benjamin Cummings Publishing Co., Inc.

"Cellular Aspects of the Immune Response", in The World of the Cell, 3rd edition. 1996. W. Becker, J. Reece and M. Peonie. The Benjamin Cummings Publishing Co., Inc.

Professional Activities

2000 – present Member, National Association of Advisors for the Health Professions

Recent Professional Manuscripts Reviewed

2013 *The Lymphatic System and Immunity* in Anatomy and Physiology 1st ed. Benjamin Cummings/Pearson.

2012 *Immune Complexes* in Molecular Biology of Assemblies and Machines 1st ed. Garland Science / Taylor and Francis Group.

2012 *The Lymphatic System and Immunity* in Anatomy and Physiology 1st ed. Words and Numbers; an Open Educational Resources Project.

2011 *Preventing Infectious Disease and STDs* in Personal Health 1st ed. The Benjamin Cummings Publishing Company, Inc.

2010 *The Immune System: Innate and adaptive Body Defenses* in Human Anatomy and Physiology, 8e, The Benjamin Cummings Publishing Co.,Inc.

SCOTT NUNES, Associate Professor

Education

1997 Ph.D. in Zoology, Zoology, Michigan State University
1986 B.A. with Honors in Biology, University of California at Santa Cruz

Professional Experience

University of San Francisco, Department of Biology
Department Chair, 2009-present
Associate Professor, 2006-present
Assistant Professor, 2000-2006
University of Nebraska at Omaha, Department of Psychology
Post-Doctoral Fellow, 1999-2000
Michigan State University, Department of Zoology
Post-Doctoral Fellow, 1998-1999

Teaching Responsibilities

Courses Taught at University of San Francisco
BIOL 105-General Biology I (Lecture and Lab)
BIOL 106-General Biology II (Lecture)
BIOL 108/109-Biology of Human Aging (Lecture and Lab)
BIOL 320/321-Human Physiology (Lecture and Lab)
BIOL 354—Endocrinology (Lecture)
BIOL 365/366—Human Anatomy (Lecture and Lab)
BIOL 368—Neurobiology (Lecture)
BIOL 490/600—Seminar in Biology

Key Publications

Nunes, S. 2007. Dispersal and philopatry. In *Rodent Societies: An Ecological and Evolutionary Perspective*. Edited by Wolff, J. O. and Sherman, P. W. University of Chicago Press, Chicago, pp 150-162.

Nunes, S., Pelz, K. M., Muecke, E.-M., Zucker, I., and Holekamp, K. E. 2006. Plasma glucocorticoid concentrations and body mass in ground squirrels: Seasonal variation and circannual organization. *General and Comparative Endocrinology*.

Nunes, S**.**, Muecke, E.-M., Sanchez, Z., Hoffmeier, R. R., and Lancaster, L. T. 2004. Play behavior and motor development in juvenile Belding's ground squirrels (*Spermophilus beldingi*). *Behavioral Ecology and SocioBiology*, 56, 97-105.

Nunes, S., Muecke, E.-M., Lancaster, L. L., Miller, N. A., Mueller, M. A., Muelhaus, J., and Castro, L. 2004. Functions and consequences of play behavior in juvenile Belding's ground squirrels. *Animal Behaviour*, 68, 27-37.

Nunes, S., Muecke, E.-M., and Holekamp, K. E. 2002. Seasonal effects of food provisioning on body fat, insulin, and corticosterone in free-living juvenile Belding's ground squirrels (*Spermophilus beldingi*). *Can J Zool*, 80, 366-371.

Nunes, S., McElhinny, T. L., Mahoney, M. M., and Smale, L. 2002. Effects of photoperiod on the reproductive condition of Nile grass rats (*Arvicanthis niloticus*) from an equatorial population. *African Journal of Ecology*, 40, 295-302.

Nunes, S., Brown, C., and French, J. A. 2002. Variation in circulating and excreted estradiol associated with testicular activity in male marmosets. *American Journal of Primatology*, 56, 27-42.

Nunes, S., Fite, J. E., Patera, K. J., and French, J. A. 2001. Interactions among paternal behavior, steroid hormones, and paternal experience in male marmosets (*Callithrix kuhlii*). *Hormones and Behavior*, 39, 70-82.

Nunes, S., Fite, J. E., and French, J. A. 2000. Variation in steroid hormones associated with infant care behavior and experience in male marmosets (*Callithrix Kuhlii*). *Animal Behaviour*, 60, 857-865.

Nunes, S., Muecke, E.-M., Ross, H. E., Bartholomew, P. A., and Holekamp, K. E. 2000. Food availability affects behavior but not circulating gonadal hormones in maternal Belding's ground squirrels. *Physiology and Behavior*, 71, 447-455.

Nunes, S., Muecke, E.-M., Anthony, J. A., and Batterbee, A. S. 1999. Endocrine and energetic mediation of play behavior in free-living Belding's ground squirrels. *Hormones and Behavior*, 36, 153-165.

Nunes, S., Duniec, T. R., Schweppe, S. A., and Holekamp, K. E. 1999. Energetic and endocrine mediation of natal dispersal behavior in Belding's ground squirrels. *Hormones and Behavior*, 35, 113-124.

Nunes, S., Ha, C.-D. T., Garrett, P. J., Muecke, E.-M., Smale, L., and Holekamp, K. E. 1998. Body fat and time of year interact to mediate dispersal behavior in ground squirrels. *Animal Behaviour*, 55, 605-614.

Nunes, S., Zugger, P. A., Engh, A. L., Reinhart, K. O., and Holekamp, K. E. 1997. Why do female Belding's ground squirrels disperse away from food resources? *Behavioral Ecology and SocioBiology*, 40, 199-207.

Smale, L., Nunes, S., and Holekamp, K. E. 1997. Sexually dimorphic dispersal in mammals: Patterns, causes, and consequences. *Advances in the Study of Behavior*, 26, 181-250.

Nunes, S. and Holekamp, K. E. 1996. Mass and fat influence the timing of dispersal in Belding's ground squirrels. *Journal of Mammalogy*, 77, 807-817.

Holekamp, K. E. and Nunes, S. 1989. Seasonal variation in body weight, fat, and behavior of California ground squirrels (*Spermophilus beecheyi*). *Canadian Journal of Zoology*, 67, 1425-1433.

Holekamp, K. E., Nunes, S., and Talamantes, F. 1988. Patterns of progesterone secretion in free-living California ground squirrels (*Spermophilus beecheyi*). *Biology of Reproduction*, 39, 1051-1059.

Holekamp, K. E., Nunes, S., and Talamantes, F. 1988. Circulating prolactin in free-living California ground squirrels (*Spermophilus beecheyi*). *General and Comparative Endocrinology*, 71, 484-492.

JOHN R. PAUL, Assistant Professor

Education

2008 Ph.D., Biology, Department of Biological Sciences, University of Pittsburgh
2001 M.S., Zoology, Department of Zoology, University of Florida
1994 B.S., Ecology and Evolution, The Evergreen State College

Professional Experience

2013 – Assistant Professor, Department of Biology, University of San Francisco
2012 – 2013 Lecturer, Department of Biology, Colorado State University
2012 – 2013 Postdoctoral Researcher, Department of Bioagricultural Sciences and Pest Management, Colorado State University
2008 – 2012 Postdoctoral Researcher, Department of Biology, Colorado State University

Teaching Responsibilities (USF)

BIOL106 General Biology II
BIOL395/395L Special Topics: Botany: Field Ecology of California Plants

Teaching Experience (Previous Institutions)

Lecturer, Introductory Biology I (Colorado State University)
Teaching assistant, Ecology, Mammalogy, & Ornithology (Pymatuning Lab of Ecology – University of Pittsburgh)
Teaching assistant, Vertebrate Morphology (University of Pittsburgh)
Teaching assistant, Avian Biology, Introductory Biology I & II (University of Florida)

Awards

2008 Ernst Mayr Award (Society of Systematic Biologists, Evolution 2008, Minneapolis, MN)
2008 Mary Edmonds Award (Department of Biological Sciences, University of Pittsburgh; best graduate-student authored paper)

Grants and Fellowships (since 2005)

2011 National Science Foundation – REU for DEB-0950171
2010 National Science Foundation – "Ecological and evolutionary dynamics of range limits in the scarlet monkeyflower", (DEB-0950171; co-PI with A.L Angert; $620,748)
2005/6/7 Pittsburgh Partnership for ENERGizing Science in Urban Elementary Schools, GK-12 NSF Sponsored Fellowship
2005/6 Botany in Action Fellowship – The Phipps Conservatory

Key Publications

Sedio, B.E., **J.R. Paul**, C.M. Taylor, and C.W. Dick. 2013. Fine-scale niche structure of Neotropical forests reflects legacy of the Great American Biotic Interchange. *Nature Communications 4: 2317*

Paul, J.R., S. Sheth, and A.L. Angert. 2011. Quantifying the impact of gene flow on phenotype-environment mismatch: a demonstration with the scarlet monkeyflower (*Mimulus cardinalis*). American Naturalist 178:S62-S79.

Angert, A.L., S. Sheth, and **J.R. Paul**. 2011. Incorporating population variation in thermal performance into geographic range shift predictions. Integrative and Comparative Biology, *51:733-750.*

Paul, J.R., C. Morton, C.M. Taylor, and S.J. Tonsor. 2009. Evolutionary time for dispersal limits the extent, but not the occupancy of species' potential ranges in the tropical plant genus *Psychotria* (Rubiaceae). American Naturalist 173:188-199.

Paul, J.R., and S.J. Tonsor. 2008. Explaining geographic range size by species age: a test using Neotropical *Piper* species. Pp 46-62 in: *Tropical Forest Community Ecology*, Carson, W.P. and S. Schnitzer, eds. Blackwell Publishing.

Pellathy, S.L., **J.R. Paul**, J.L. Cartier, and J. Wittfeldt. 2007. Developing Investigative Skills Purposefully. Science and Children, November, pp. 46-49.

Hostetler, M., R.S. Duncan, and **J.R. Paul**. 2005. Post-construction effects of an urban development on migrating, resident, and wintering birds. Southeastern Naturalist 4:421-434.
Paul, J.R., A.M. Randle, C.A. Chapman, and L.J. Chapman. 2004. Arrested succession in logging gaps: is tree seedling survival limiting? African Journal of Ecology 42:245-251.

Key Presentations

2013 Evolution 2013, Snowbird, UT
2013 Department of Biology,, University of San Francisco (*invited*)
2013 Department of Biology, University of Puget Sound (*invited*)
2012 Ecological Society of America, 97th Annual Meeting, Portland, OR
2012 Guild of Rocky Mountain Ecologists and Evolutionary Biologists, Ward, CO
2011 Society for Comparative and Integrative Biology, Annual Meeting, Salt Lake City, UT

Professional Service Activities

2010 National Science Foundation – Proposal reviewer (Community Ecology and Population Biology Cluster)
2005–13 Manuscript reviewer: *African Journal of Ecology, American Journal of Botany, American Naturalist, Biodiversity and Conservation, Ecography, Ecology, Ecology Letters, Evolutionary Ecology, Global Ecology and Biogeography*
2005–6 Collaborative science resource specialist at underprivileged urban Pittsburgh public schools ('06: Lincoln Technical Academy; '05: Alleghany Traditional Academy)

JAMES M. SIKES III, Assistant Professor

Education

2009 Doctor of Philosophy in Behavior, Ecology, Evolution, and Systematics
Department of Biology, University of Maryland, College Park, MD
Dissertation title: "Breaking the A-P axis: evolution of diverse asexual reproduction strategies in Convolutriloba acoels"
Dissertation advisor: Dr. Alexandra Bely

1998 Bachelor of Science in Biology, magna cum laude
Furman University, Greenville, SC
Phi Beta Kappa, gamma chapter of South Carolina

Professional Experience

2012-present	Assistant Professor, Department of Biology, University of San Francisco,
2009-2012	Postdoctoral Researcher, Howard Hughes Medical Institute & University of Illinois, Urbana, IL 61801
2006-2007	Instructor in Marine Biology, Duke University Talent Identification Program, Beaufort, NC 28516
1998-2003	High School Science Teacher, Eastside High School / School District of Greenville County, Taylors, SC 29615

Grants and Awards

NIH National Research Service Award (NRSA) Postdoctoral Fellowship (National Institute of General Medical Sciences), 2011-2013
"Characterizing the permissive and inhibitory factors in planarian regeneration"
Best Research Talk Award, Annual Postdoctoral Research Symposium, University of Illinois at Urbana-Champaign, 2012
Best Poster Presentation Award. Cell and Molecular Biology and Molecular Biophysics Annual Research Symposium, University of Illinois at Urbana-Champaign, 2011
Graduate Student Abstract Award, Integrating Evolution, Development, and Genomics Biannual Conference, University of California at Berkeley, 2008
Graduate Student Research Presentation Award, Program in Behavior, Ecology, Evolution and Systematics, University of Maryland, 2007
Darwin Graduate Research Fellowship Award, Graduate School, University of Maryland, 2003-2005
Departmental Teaching Award, Department of Biology, University of Maryland, 2005
Distinguished Teaching Assistant Award, Graduate School, University of Maryland, 2004-2005
Jane Prichard Memorial Teaching Award, Department of Biology, University of Maryland, 2004
Teacher of the Year, Eastside High School, Taylors, SC, 2002-2003
Who's Who Among America's Teachers, 1999-2001

Key Publications

Sikes, J.M. and P.A. Newmark. 2013. Restoration of anterior regeneration in a planarian with limited regenerative ability. Nature 500: 77-80.

Sikes, J.M. and A.E. Bely. 2010. Making heads from tails: development of a reversed anterior-posterior axis during budding in an acoel flatworm. Developmental Biology 338 (1): 86-97.

Bely, A.E. and J.M. Sikes. 2010. Latent regeneration abilities persist following recent evolutionary loss in asexual annelids. Proceedings of the National Academy of Sciences 107: 1464-1469.

Bely, A.E. and J.M. Sikes. 2010. Acoel and platyhelminth models for stem-cell research. Journal of Biology 9: 14.

Sikes, J.M. and A.E. Bely. 2008. Radical modification of the A-P axis and the evolution of asexual reproduction in Convolutriloba acoels. Evolution and Development 10 (5): 619-631.

Key Presentations

Sikes, J.M., "Exploring the evolutionary loss of regeneration: a comparative genomics study in planarians." Invited Talk, Annual Postdoctoral Research Symposium, University of Illinois, January 2012, Urbana, IL.

Sikes, J.M. "Breaking the A-P axis: evolution of diverse asexual reproduction strategies in Convolutriloba acoels." Invited Talk, Department of Biology, Wabash College. February 2010, Crawfordsville, IN.

Sikes, J.M. and P.A. Newmark, "Exploring the evolutionary loss of regeneration: a comparative transcriptomics study in planarians." Abstract for contributed talk, Society for Integrative and Comparative Biology Annual Meeting, January 2012, Charleston, SC.

Sikes, J.M. and P.A. Newmark. "Exploring the evolutionary loss of regeneration: a comparative genomics study in planarians." Abstract for poster presentation, Society for Developmental Biology Annual Meeting. July 2011, Chicago, IL.

Professional Memberships

Society for Developmental Biology, 2010-present
Society for Integrative and Comparative Biology, 2005-present

JULIET V. SPENCER, Associate Professor

Education

1998 Ph.D., Microbiology, University of Virginia (Charlottesville, VA)
1993 B.S., Biotechnology, Worcester Polytechnic Institute (Worcester, MA)

Professional Experience

2013 - Director, Fletcher Jones Microscopy Center
2012 - Chair, University of San Francisco, Department of Biology
2009 - Associate Professor, University of San Francisco, Department of Biology
2003 – 2009 Assistant Professor, University of San Francisco, Department of Biology
2002 – 2004 Adjunct Professor, Department of Natural Sciences, UC Santa Cruz-Extension
2002 - 2003 Senior Scientist, Ceretek, LLC, South San Francisco, CA
2001 - 2002 Scientist, Ceretek, LLC, South San Francisco, CA
2000 – 2001 Senior Postdoctoral Fellow, ChemoCentryx, Inc., MountainView, CA
1998 – 2000 Postdoctoral Fellow, University of Virginia, Department of Microbiology
1995 – 1997 Instructor, Piedmont Virginia Community College, Department of Natural Sciences, Charlottesville, VA

Teaching Responsibilities

BIOL 134 Microbiology
BIOL 134 Microbiology Lab
BIOL 195 Good Germs, Bad Germs
BIOL 341 Medical Microbiology
BIOL 342 Medical Microbiology Lab
BIOL 346 General Microbiology
BIOL 347 General Microbiology Lab

Major Service Contributions to the University

Chair, Department of Biology
Chair, University-Wide Peer Review Committee
Chair, Science Peer Review Committee
Co-Chair, Deans Scholars Committee
Academic Advisor

Awards and Fellowships

Deans Scholar Award, University of San Francisco, 2013
Arthur Furst Award for Outstanding Research, University of San Francisco, 2009
Ellen Weaver Award for Mentoring Women in Science, NCC-AWIS 2009
Parker B. Francis Fellowship in Pulmonary Research, 1999
NIH Training Grant Fellowship in Immunology, 1998
Graduate Student Alumni Dissertation Fellowship, University of Virginia, 1997
The Salisbury Prize, Worcester Polytechnic Institute, 1993
The Two Towers Award for Theory and Practice, Worcester Polytechnic Institute, 1993

Key Publications

*Lares, A.P., C.C. Tu, and **J.V. Spencer**. 2013. The Human Cytomegalovirus US27 gene product enhances cell proliferation and alters cellular gene expression. Virus Research 176:312-320.

*Arnolds, K.L., A.P. Lares, and **J.V. Spencer**. 2013. The US27 Gene Product of Human Cytomegalovirus Enhances Signaling of Host Chemokine Receptor CXCR4. Virology 439:122-131.

*Shin, H., Whitehead, H., Zhou, X., Banta, K.L., **Spencer, J.V.,** Cho, M.K. and S.-K. Kim. 2013. Synthesis and Evaluation of Ornithine Decarboxylase Inhibitors with Oxime Moiety and MCF-7 Breast Cancer Cells. Biochemical Pharmacology 2:1.

*Stapleton, L.K., A. P. Lares, K.L. Arnolds, T.M. Devito, and **J.V. Spencer**. 2012. Receptor chimeras demonstrate that the C-terminal domain of the human cytomegalovirus US27 gene product is necessary and sufficient for intracellular receptor localization. Virology Journal, 9:42

Spencer, J.V. 2012. Trojan Horses and Fake Immunity Idols: Molecular Mimicry of Cellular Immune Mediators by Human Cytomegalovirus. In Herpesviridae - A Look Into This Unique Family of Viruses, edited by G.D. Magel and S. Tyring, Intech Publishing: Rijeka, Croatia.

*Brodeur, N.D. and **J.V. Spencer**. 2010. Antibodies to human IL-10 neutralize ebvIL-10-mediated cytokine suppression but have no effect on cmvIL-10 activity. Virology Research, 153:265-268.

Slobedman, B., P.A. Barry, **J.V. Spencer**, S. Avdic, and A. Abendroth. 2009. Virus-encoded homologs of cellular interleukin-10 and their control of host immune function. Journal of Virology 83:9618-9629.

*Nachtwey, J.N. and **J.V. Spencer.** 2008. HCMV IL-10 Suppresses Cytokine Expression in Monocytes through Inhibition of NF-κB. Viral Immunology 21:477-82.

***Spencer J.V**., J. Cadaoas, P.R. Castillo, V. Saini, and B. Slobedman. 2008. Stimulation of B lymphocytes by cmvIL-10 but not LAcmvIL-10. Virology 374:164-169.

Jenkins C., W. Garcia, M.J. Godwin, **J.V. Spencer**, J.L. Stern, A. Abendroth, and B. Slobedman. 2008. Immunomodulatory Properties of a Viral Homolog of Human Interleukin-10 Expressed by Human Cytomegalovirus During the Latent Phase of Infection. Journal of Virology 82:3736-3750.

*Indicates publication includes USF students as co-authors.

Key Presentations

2013 A Viral Cytokine Stimulates the Invasive Potential of Human Breast Cancer Cells. 38th International Herpesvirus Workshop, Grand Rapids, MI.

2013 Modulation of Host Cytokines and Chemokines by Human Cytomegalovirus. Invited Talk, Children's Hospital of Oakland Research Institute.

2012 The US27 gene of human cytomegalovirus enhances signaling of host chemokine receptor CXCR4. 37th International Herpesvirus Workshop, Calgary, Canada.

2012 Manipulation of Host Immune Responses and Oncomodulation by Human Cytomegalovirus. Invited talk, 3rd Annual World Congress of Virus and Infection, Guangzhou, China.

Professional Activities

2013 - Academic Editor, PLoS One

2005 - Reviewer, National Institutes of Health (Special Emphasis Panels)

2003- Reviewer (Journal of Virology, Journal of General Virology, Archives of Virology)

GARY L. STEVENS, Professor

Education

1961. Associate in Arts; Cerritos College, Cerritos, CA
1964. Bachelor of Science in Biology; Calif. State University at Long Beach
1966. Master of Science, Dept. of Zoology, University of California, Davis
1970. Ph.D. Dept. of Zoology, University of California, Davis

Professional Experience

1990-present: Professor, University of San Francisco
1997-1998: Professor and Chair, Biology Department.
1990-1997: Professor and Editor of the Wasmann Journal of Biology.
1988-1989: Associate Professor and Chair, Biology Department.
1987-1988: Associate Dean, College of Arts and Sciences.
1984-1987: Associate Professor, Biology Department.
1983-1984: Sabbatical leave, Visiting Associate Professor, U.C. Davis;
Research Associate, Wau Ecology Institute, Papua New Guinea.
1979-1980: Acting Dean, College of Liberal Arts and Sciences.
1977-1983: Associate Dean, College of Liberal Arts and Sciences
1971-1977: Assistant Professor and Chair, Biology Department.
1970-1971: Assistant Professor, Biology Department.

Teaching Responsibilities

Ecology, vertebrate zoology, environmental science, human anatomy, general Biology, natural science, comparative anatomy, mammalogy

Major Service Contributions

University Service

1971-1975: University Senate
1972-1993: Chief Health Professions Advisor
1976-1993: Chair, Pre-professional Health Committee
1977-1979: Chair, University Disciplinary Hearing Committee
1987-1988: Steering Committee, United Way Campaign
1987-1995- Faculty liaison to the Health Professions Society
1987-1988: WASC Standard VII Self-Study Committee; Authored the Standard IV, graduate program;
University Space and Facilities Committee
1989-1993: Joint University General Education Committee
1993-1995: Co-chair of Joint University Curriculum Committee
1998: University Steering Committee for the 2005 Plan College Service
1986: Co-Chaired the Science Open House Committee
1988: General Education Task Force, secretary.
1988-1989: Chair of the Science Council
1991-1992: Member to the School of Nursing assoc. dean search committee.

Department Service

1974-1990: Associate Editor, Wasmann Journal of Biology
1988: Facilitated and directed the budget for the first NSF-sponsored Biotechnology workshop for high school teachers

1988: Co-authored a successful proposal to the Fletcher Jones Foundation for a biotechnology lab ($150,000)
1990-present: I have not kept a chronological list of committee service but they include: Departmental search committees for two faculty, as a member of the Environmental Science Dept search committee, two terms as a Science Peer Review Committee [Chair twice] which continues, current faculty representation to the University Budget Committee and a continuing member of the Pre-professional Health Committee.
Community Service
1980: Member of Mt. Diablo Montessori School Board
1983-present: "President of our homeowners' association"
1987-1990: Charter member of the Northern California Homeschoolers Association
1989-1993: 4H leader

Awards and Honors
1979- University Merit Award
1988- Elected to Alpha Sigma Nu Honorary Society
1989- College Merit Award
1998- College Outstanding Leadership award

Key Publications
Density and biomass comparisons of small mammal populations in Papua New Guinean and Malaysian montane wet forests. (With R.L. Rudd). Wasmann Journal of Biology, 51:1,2: 1-8. 1994.

A capture-mark-release (CMR) and removal study of a small mammal population in montane rain-forests in Papua New Guinea (With R.L. Rudd). Wasmann Journal of Biology, 50:1,2: 39-51. 1992.

A long-term capture-mark-release (CMR) and removal study of small mammals in Malaysian sub-montane rain-forests (With R.L. Rudd). Wasmann Journal of Biology, 50:1,2: 96-150. 1992.

Element content in tissues of four rodent species sampled in the Geysers geothermal steam field. (With E.A. Fendick, R.J. Brown and W.P. Jordan). Environmental Pollution 58:155-178. 1989.

An analysis of a small mammal community in a Papua New Guinea mid-montane rain forest. (With M.S. Willett and R.L Rudd). Wasmann Journal of Biology, Vol. 47, 1-67, 1989.

A parasite survey of black-tailed deer at the Geysers Geothermal Steam Field. (With J.M. Boss, W.P. Jordan and R.J. Brown). Institute of Chemical Biology, 1987. Report to Sonoma County and the California Energy Commission.

Element content of the Western Fence Lizard (*Sceloporous occidentalis)* in the Geysers, California. (With K.D. Jennings, R.J. Brown and W.P. Jordan). Institute of Chemical Biology, 1987. Report to Sonoma County and the California Energy Commission.

Element content in seven tissues from black-tailed deer and black-tailed jackrabbits collected from the Geysers Geothermal Steam Fields and Hopland Field Station, California. (With R.J. Brown, W.P. Jordan, K.D. Ward, and R.L. Banks). Institute of Chemical Biology, 1987. Report to Sonoma County and the California Energy Commission.

The following three articles are cited in S.J. Sharpe (ed.), Investigations on Chemical Elements in the Geysers, California, Sonoma County, California Energy Commission, 1985.

A comparative study of the element content of trout and suckers in Big Sulphur Creek, California, a geothermally altered stream. (With R.J. Brown and W.P. Jordan).

JOHN T. SULLIVAN, Fletcher Jones Professor

Education

1976 Ph.D., Biology, Lehigh University, Bethlehem, PA
1974 M.S., Biology, Lehigh University, Bethlehem, PA
1968 A.B., Biology, Dartmouth College, Hanover, NH

Professional Experience

2000-present Professor and Fletcher Jones Chair, University of San Francisco, Department of Biology
1995-2000 Professor and Sr. Joseph Marie Armer Chair, Biology Department, University of the Incarnate Word, San Antonio, TX
1994-1995 Professor, Department of Biology, Lamar University, Beaumont, TX
1988-1994 Associate Professor, Department of Biology, Lamar University, Beaumont, TX Assistant Professor, Department of Biology, Lamar University, Beaumont, TX
1980-1984 Assistant Professor, Department of Anatomy (Cell Biology), and Assistant Director, Marine Biomedical Research Program, Medical University of South Carolina, Charleston, SC
1978-1980 Guest Worker, Laboratory of Parasitic Diseases, NIAID, National Institutes of Health, Bethesda, MD
1977-1978 Research Associate, Department of Surgery, Downstate Medical Center, Brooklyn, NY
1975-1977 Assistant Research Parasitologist, University of California San Francisco, Intrnational Center for Medical Research, Kuala Lumpur

Major Service Contributions

Department Chair, 2001-2003, 2004-2006
Member, Biology Search Committee (6, Chair for 4)
Member, College Science Executive Committee (while Chair)
Core Curriculum Committee 2001
Biology Graduate Committee
College of Arts and Sciences Peer Review (Promotion and Tenure) Committee 2008-2010 (Chair 2010), 2011-2013
College of Arts and Sciences Academic Excellence Task Force, 2012-2013
Member, Provost Search Committee 2010-2011

Teaching Responsibilities

General Biology I lecture
General Biology II lecture and laboratory
General Parasitology with Laboratory
Animal Toxicology
Histology with Laboratory

Key Publications (most recent, out of 79)

Sullivan, J. T., Bulman, C. A., and Salamat, Z. 2011. Effect crude of lipopolysaccharide from *Escherichia coli* O127:B8 on the amebocyte-producing organ of *Biomphalaria glabrata* (Mollusca). Developmental and Comparative Immunology 35: 1182-1185.

Sullivan, J. T., and Yeung, J. T. 2011. Tissue invasion of laboratory-reared *Biomphalaria glabrata* by a harpacticoid copepod. Journal of Invertebrate Pathology 107: 159-160.

Sullivan, J. T., and Yeung, J. T. 2011. Incompatibility between *Schistosoma mansoni* and *Helisoma duryi* occurs at two stages: miracidial penetration and intramolluscan survival. Journal of Parasitology 97: 743-745.

Ruelas, D. S., Karentz, D., and **Sullivan** J. T. 2009. Effects of UVB on interactions between *Schistosoma mansoni* and *Biomphalaria glabrata.* Journal of Invertebrate Pathology 101: 140-142.

Salamat, Z., and **Sullivan**, J. T. 2009. Involvement of protein kinase C signaling and mitogen-activated protein kinase in the amebocyte-producing organ of *Biomphalaria glabrata* (Mollusca). Developmental & Comparative Immunology

Salamat, Z., and **Sullivan**, J. T. 2008. In vitro mitotic responses of the amebocyte-producing organ of *Biomphalaria glabrata* to extracts of *Schistosoma mansoni.* Journal of Parasitology 94: 1170-1173.

Ruelas, D. S., Karentz, D., and **Sullivan** J. T. 2007. Sublethal effects of ultraviolet B radiation on miracidia and sporocysts of *Schistosoma mansoni*: intramolluscan development, infectivity, and photoreactivation. Journal of Parasitology 93: 1303-1310.

Sullivan, J. T. 2007. Mitotic responses to injected extracts of larval and adult *Schistosoma mansoni* in *Biomphalaria glabrata*: Effects of dose and colchicine treatment. Journal of Parasitology. 93: 213-215.

Ruelas, D. S., Karentz, D., and **Sullivan** J. T. 2006. Lethal and sub-lethal effects of UVB on juvenile *Biomphalaria glabrata* (Mollusca: Pulmonata). Journal of Invertebrate Pathology. 101: 140-142.

Sullivan, J. T., and Castro, L. 2005. Mitotic arrest and toxicity in *Biomphalaria glabrata* (Mollusca: Pulmonata) exposed to colchicine. Journal of Invertebrate Pathology 90: 32-38.

Sullivan, J. T., Pikios, S. S., and Alonzo, A. Q. 2003. Mitotic responses to extracts of miracidia and cercariae of *Schistosoma mansoni* in the amebocyte-producing organ of the snail intermediate host*, Biomphalaria glabrata.* Journal of Parasitology 90: 92-96.

Sullivan, J. T. and Farengo, D. A. 2002. Survival of heterotopic heart xenografts from *Helisoma duryi, Planorbula armigera*, and *Planorbarius corneus* in *Biomphalaria glabrata* (Pulmonata, Basommatophora, Planorbidae): Evidence for phylogenetic relatedness? Invertebrate Biology 121: 38-46.

Vasquez, R. E. and **Sullivan**, J. T. 2001. Further characterization of passively transferred resistance to *Schistosoma mansoni* in the snail intermediate host *Biomphalaria glabrata*. Journal of Parasitology 87: 1360-1365.

Vasquez, R. E. and **Sullivan**, J. T. 2001. Hematopoietic tissue allografts in *Biomphalaria glabrata* (Mollusca: Pulmonata) induce humoral immunity to *Schistosoma mansoni*. Developmental and Comparative Immunology 25: 561-564.

Vasquez, R. E. and **Sullivan**, J. T. 2001. Effect of miracidial dose on adoptively transferred resistance to *Schistosoma mansoni* in the snail intermediate host, *Biomphalaria glabrata*. Journal of Parasitology. 87: 460-462.

BRIAN R. THORNTON, Assistant Professor

Education

2005	Ph.D., Genetics University of California San Francisco (San Francisco, CA)
1994	B.S., Genetics University of California Davis (Davis, CA)

Professional Experience

2009-present	Assistant Professor (term), University of San Francisco Department of Biology
2008-2009	Assistant Professor (adjunct), University of San Francisco Department of Biology
2008-2009	Post Doctoral Fellow, Stanford University Department of Microbiology and Immunology
1996-1998	Research Technician, Fred Hutchison Cancer Research Center (Seattle, WA)
1995-1996	Research Technician, University of Washington (Seattle, WA)

Teaching Responsibilities

BIOL 134 Microbiology
BIOL 135 Microbiology Lab
BIOL 212 Cell Physiology
BIOL 310 Genetics
BIOL 346 General Microbiology
BIOL 347 General Microbiology Lab

Awards and Honors

Richard Fineberg Memorial Student Teaching Award, UC San Francisco, 1999
Howard Hughes Medical Institute Pre-doctoral Fellowship, 1998-2003
Highest Honors, UC Davis, 1994
Departmental Award for Genetics, UC Davis, 1994
Regent's Scholarship, UC Davis, 1990-1994
Alumni Scholarship, UC Davis, 1990

Major Service Contributions

Academic Advisor to 62 students
Kessel Award Committee, 2012 and 2013
Chihara Award Committee, four times from 2010-2013
Speaker, USF Admitted Student Visit Program, 2012
Summer Advising, 2012

Key Publications

Thornton B.R., Chen K.C., Cross F.R., Tyson J.J., and Toczyski D.P. (2004) "Cycling without the cyclosome: modeling a yeast strain lacking the APC." Cell Cycle 3:629-33

Thornton B.R. and Toczyski D.P. (2003) "Securin and B-cyclin/CDK are the only essential targets of the APC." Nature Cell Biology 5:1090-4

Thornton B.R., Ng T.M., Matyskiela, M.E., Carroll C.W., Morgan D.O., and Toczyski D.P. (2006) "An architectural map of the anaphase promoting complex" Genes Dev 20:449-60

Leticia R Vega, Jane A Phillips, Brian R **Thornton**, Jennifer A Benanti, Mutiat T Onigbanjo, David P Toczyski, Virginia A Zakian (2007) "Sensitivity of Yeast Strains with Long G-Tails to Levels of Telomere-Bound Telomerase" PLOS Genetics 3(6):e105

Key Presentations

2003 "Cycling without the cyclosome: securin and Clb/CDK activity are the only essential targets of the APC" (Salk Institute Cell Cycle Meeting, 2003)

2002 "Essential substrates of the APC in *S. cerevisiae*" (Cold Spring Harbor Meeting on the Cell Cycle, 2002)

CHRISTINA TZAGARAKIS-FOSTER, Associate Professor

Education

1999 Ph.D., Microbiology, University of California, Davis, CA
1990 B.S., Biological Sciences, University of San Francisco, San Francisco, CA

Professional Experience

- Associate Professor, Department of Biology, USF (August 2012 – Present)
- Associate Director, Professional Masters in Biotechnology Program, USF (August 2012 – Present)
- Assistant Professor, Department of Biology, USF (August 2005 – July 2012)
- Adjunct Professor, Department of Mathematics and Natural Sciences, Dominican University of California, San Rafael, CA (August 2002 – March 2005)
- Faculty, Department of Biological Sciences, San Francisco State University, San Francisco, CA (January 2002 – May 2002, September 2000-May 2001)
- Post-doctoral Fellow, Department of Reproductive Endocrinology, University of California, San Francisco, San Francisco, CA (February 1999 - February 2005)

Teaching Responsibilities

Freshman Seminar: Human Biology lecture and laboratory (BIOL195/BIOL195L)
Cellular Physiology (BIOL212)
Biology of Cancer – service learning course (BIOL370)
Endocrinology lecture and laboratory (BIOL333/BIOL334)
Seminar Series in Biology (BIOL490/BIOL600)
Biotechnology Internship Seminar (BTECH601)

Major Service Contributions

Committee member: Search Committee for Dean of Arts and Sciences
Committee member: PPHC (Pre-Professional Health Committee)
Committee member: College and Arts and Sciences, Dean's Medal of Excellence Award.
Committee member: Tenure Track Faculty Searches for the Departments of Mathematics, Analytics, and Biology.
Undergraduate and Graduate Academic Advisor
Faculty Liaison to the Center for Science and Innovation Building
Undergraduate and Graduate Thesis Committees (Biology and Chemistry)
Reviewer, Textbook: "An Introduction to Cell Biology" by Janicke, Kreuzer and Karp, Wiley and Sons, Inc.
Reviewer, Molecular Cancer Research (select manuscripts)
Reviewer, Journal of Rheumatology
Reviewer, PLOS ONE

Key Publications

Cvoro, A., Paruthiyil, S., Jones, J.O., Tzagarakis-Foster, C., Clegg, N.J., Tatomer, D., Medina, R.T., Tagliaferri, M., Schaufele, F., Scanlan, T.S., Diamond, M.I., Cohen, I. and Leitman, D.C. (2007) Selective activation of estrogen receptor-beta transcriptional pathways by an herbal extract. *Endocrinology* 148(2):538-47.

Culjis, C. and Tzagarakis-Foster, C. (2007) Utilization of siRNA Mediated Knock-Down to Investigate the Role of DAX-1 in the Expression of Steroidogenic Enzymes in Human Adrenal Cells. *The Proceedings of the Twenty Second National Conference on Undergraduate Research*. Published by UNC Asheville.

Cvoro, A., Tzagarakis-Foster, C., Tatomer, D., Paruthiyil, S. and Leitman, D.C. (2006) Distinct Roles of Unliganded and Liganded Estrogen Receptors in Transcriptional Repression. *Mol. Cell 21(4):555-564.*

Tee, M. K., Rogatsky, I., Tzagarakis-Foster, C., Cvoro, A., An, J.P., Christy, R., Yamamoto, K.R. and Leitman, D.C. (2004) Estradiol and Selective Estrogen Receptor Modulators Differentially Regulate Target Genes with Estrogen Receptors □ and □. *Mol. Biol. of the Cell* 15(3):1262-72.

Tzagarakis-Foster, C., Geleziunas, R., Lomri, A., An, J.P. and Leitman, D.C. (2002) Estradiol Represses Human T-cell Leukemia Virus Type 1 Tax Activation of Tumor Necrosis Factor-alpha Gene Transcription. *J. of Biol. Chem.* 277 (47):44772-44777.

An, J.P., Tzagarakis-Foster, C., Scharschmidt, T.C., Lomri, N. and Leitman, D.C. (2001) Estrogen Receptor □ -Selective Transcriptional Activity and Recruitment of Coregulators by Phytoestrogens. *J. of Biol. Chem.* 276 (21):17808-17814.

Tzagarakis, C. and Privalsky M.L. (1998) Phosphorylation of thyroid hormone receptors by protein kinase A regulates DNA recognition by specific inhibition of receptor monomer binding. *J. of Biol. Chem.* 273 (18):10926-10932.

Key Presentations

Baginsky, R., and Tzagarakis-Foster, C. 2010. "Identification and Investigation of the Interaction of Repressor Complex Proteins with DAX-1." Poster presented at the Keystone Symposium: Nuclear Receptors: Signaling, Gene Regulation and Cancer", Keystone, Colorado.

Judge, S., and Tzagarakis-Foster, C. 2010. "Epigenetic Regulation of Human Dax-1 and Breast Cell Tumorigenesis." Poster presented at the Keystone Symposium: Nuclear Receptors: Signaling, Gene Regulation and Cancer", Keystone, Colorado.

Dolores, L., and Tzagarakis-Foster, C. 2010. "The Role of DAX-1 in Regulating Human StAR Gene Expression." Poster presented at the Keystone Symposium: Nuclear Receptors: Signaling, Gene Regulation and Cancer", Keystone, Colorado.

George Tzertzinis, Cathy Shea, Christina Tzagarakis-Foster. 2010. "Comparative Analysis of Elements Controlling Dax-1 Expression in Mouse and Human Cells." Poster presented at the Keystone Symposium: "Nuclear Receptors: Development, Physiology and Disease", Keystone, Colorado.

Boitano, M., and Tzagarakis-Foster, C. 2009. "Epigenetic Regulation of the Human Dax-1 Promoter." Poster presented at the Keystone Symposium: "Deregulation of Transcription in Cancer: Controlling Cell Fate Decisions", Killarney, County Kerry, Ireland.

H. Appendix H: Faculty Teaching Schedules

The attached table presents a tentative workload for the department over 2 years, based on a schedule proposed for 2013-2015. Note that the schedule fully covers the contracted work load of the current faculty, including several cases of overloads to cover courses or administrative duties. Despite this full schedule, some courses that are normally offered by the Department are not included in this schedule, such as the core courses Biology 100 (Science of Life), Biology 103 (Human Biology) Biology of Aging (108/109), or additional sections of high demand courses such as freshmen seminars (195) and upper division electives. To offer these courses, part-time faculty will have to be hired.

On the table, the total teaching units (U) and student credit hours (SCH) are indicated. Although the schedule is tentative it is based on teaching workloads from prior semesters and is a realistic example. Note that John Paul's schedule is more speculative since his position began in Fall 2013, but as stated above there will be no difficulty in finding courses in need of an instructor.

Notes:
• Lab courses count as 4 student credit hours (a 3 unit lecture and 1 unit lab) but count as 6 teaching units.
• Lab coordinators of large lab courses help to prepare materials, meet with lab instructors for training and preparation, and deal with administrative duties associated. They are awarded 0.6 teaching units per lab section coordinated. Although a direct student credit hour equivalence was not included for these coordinator positions, it should be noted that a large number of students are being served indirectly by this work.
• The Department Chair receives a 5 unit course release each semester.
• The Chair of the Biotechnology Masters Program receives a 4 unit course release each semester.
• The Chair of the PPHC receives a 2 unit course release each semester.
• The PUMT Organizer receives a 2 unit course release each semester.

Table 1: Example 2-year teaching grid

Name	Fall yr 1	U	SCH	Spr yr 1	U	SCH	Fall yr 2	U	SCH	Spr yr 2	U	SCH
Paul Chien	BIOL350 BIOL390/ 391	10	8	BIOL390/ 391	6	4	BIOL350 BIOL390/ 391	10	6	BIOL390/ 391 BIOL481/ 482	12	8
Ammon Corl	BIOL105 (x3)	12	12	BIOL106 BIOL368 (x2)	12	12	BIOL105 (x3)	12	12	BIOL106 BIOL368 (x2)	12	12
Jennifer Dever	BIOL379/ 380 BIOL414	10	8	BIOL330 BIOL331/ 332	10	8	BIOL379/ 380 BIOL414	10	8	BIOL331/ 332	6	4
Deneb Karentz	BIOL392/ 393 ENVM671 PUMT	10	6	BIOL414 (x2) PUMT	10	8	BIOL392/ 393 ENVM671 PUMT	10	6	BIOL414 (x2) PUMT	10	8
Leslie King	BIOL105L coord (x13) BIOL115 BIOL116L coord(x4)	12	4	BIOL106L coord (x11) BIOL320/ 321	12	4	BIOL105L coord (x13) BIOL115 BIOL116L coord (x4)	12	4	BIOL106L coord (x11) BIOL115 BIOL116L coord(x7)	12	4
Cary Lai	BTEC610 BIOL212 (x2)	12	12	BTEC685/ 686 BIOL490 BIOL405	12	10	BTEC610 BIOL212 (x2)	12	12	BTEC685/ 686 BIOL490 BIOL405	12	10
John Paul	BIOL106 Botany field	10	8	BIOL106 BIOL319	8	8	BIOL106 Botany/ field	10	8	BIOL106 BIOL319	8	8
Mary Jane Niles	PPHC BIOL443/ 444 BIOL420	12	8	PPHC BIOL485/ 486 BIOL345	12	8	PPHC BIOL443/ 444 BIOL420	12	8	PPHC BIOL443/ 444 BIOL420	12	8
Scott Nunes	sabbatical			sabbatical			Dept Chair BIOL365/ 366	11	4	Dept Chair BIOL320/ 321	11	4
James Sikes	BIOL355/ 356 BIOL414	10	8	BIOL328/ 329 BIOL106	10	8	BIOL355/ 356 BIOL414	10	8	BIOL328/ 329	6	4
Juliet Spencer	Dept. Chair BIOL346/347	11	4	Dept Chair BIOL341/ 342	11	4	BIOL346/ 347 seminar	8	4	BIOL341/ 342	6	4
Gary Stevens	BIOL113 (x2) BIOL114L coord (x6)	12	8	BIOL113 BIOL114L coord (x4) BIOL381 BIOL382	12	8	BIOL113(x2) BIOL114L coord (x6)	12	8	BIOL113 BIOL114L coord (x4) BIOL381 BIOL382	12	8
John	BIOL385/	10	8	BIOL362/ 363	10	8	BIOL385/ 386	10	8	BIOL362/ 363	10	8

Sullivan	386 BIOL105			BIOL106			BIOL105			BIOL106		
Brian Thornton	BIOL134 BIOL135 coord(x3) BIOL310	10	8	BIOL134 BIOL135 coord (x6) BIOL310 BIOL212	14	12	BIOL134 BIOL135 coord(x3) BIOL310	10	8	BIOL134 BIOL135 coord(x6) BIOL310 BIOL212	14	1 2
Christina Tzagarakis -Foster	BIOL195 BIOL370	10	8	BIOL333/ 334 (x2 labs) BTEC600	10	8	BIOL333/ 334 (x2)	12	8	BIOL370	4	4

I. Appendix I: Research Grants Awarded to Biology Faculty, 2009-2013

Year	Name	Grant Title	Funder	Dates	Award
2008	Juliet Spencer	Mechanisms of Cell Signaling by the Human Cytomegalovirus US27 Gene Product	National Institutes of Health	2/1/08-1/31/11	$212,320
2009	Deneb Karentz	Group Travel Award: Xth SCAR International Biology Symposium	National Science Foundation	1/1/09-7/31-09	$15,000
2009	Christina Tzagarakis-Foster	Investigation of the Molecular Determinants of DAX-1 Mediated X-Linked Adrenal Hypoplasia Congenita	National Institutes of Health	1/1/09-12/31/11	$213,235
2011	Deneb Karentz	Functional Genomics of Seasonal Succession in Antarctic Phytoplankton	National Science Foundation	5/1/11-4/30/14	$229,625
2011	Juliet Spencer	A Viral Cytokine as a Promoter of Tumor Progression	National Institutes of Health	3/4/11-2/28/14	$412,652
2012	Juliet Spencer	Research Supplement to Promote Diversity in Health-Related Research	National Institutes of Health	3/1/12-2/28/14	$79,902
2012	John Sullivan	Innate Immune Response to Microbial PAMPs in the Schistosome Transmitting Snail	National Institutes of Health	3/1/12-2/28/14	$296,713
2013	Juliet Spencer	The Fletcher Jones Microscopy Center at USF	The Fletcher Jones Foundation	9/1/2012-8/30/2013	$500,000
				Total	$1,959,447

J. Appendix J: Faculty Research Space

Table 1. Amount of space available for faculty research.

Name	***Room***	***Area (ft^2)***
Paul Chien	306	650
Jennifer Dever	338	300
Deneb Karentz	504/506	680
Mary Jane Niles		0
Scot Nunes		0
John Paul	336	300
James Sikes	317	550
Juliet Spencer	309B	400
Gary Stevens		0
John Sullivan	309A	500
Christina Tzagarakis-Foster	321	270

Note: Room 306 is also used as a teaching lab for Biology 481/482, Techniques in Cell Biology.

K. Appendix J: Issues in LoSchiavo Science

Throughout the planning and building processes, faculty in each science department were consulted numerous times about specific needs in their department's teaching labs. Despite these consultations, there are many requests and recommendations that were not carried out, which in some cases interferes with teaching and learning.

For instance, in the new microbiology lab (LCSI room G-04), the student lab benches are outfitted with movable casters, a feature that was not at all requested; in fact, it was specifically stated that in a lab such as this, movable benches were not desirable. Furthermore, there are no gas lines at student benches, making it more difficult for students to utilize Bunsen burners if necessary (gas lines are all at the sides of the rooms instead). However, in LCSI 208, the new general Biology lab, it was specifically mentioned that gas lines were not needed at student benches and that space for students to work was more important. Despite this, each student bench in that room has three lines: gas, air, and vacuum.

Furthermore, since students sit in a way at the lab benches such they are not facing forward, requests were made for simple pull-outs from the benches so that students could turn in their chairs and face forward during lectures. We were told this could be done, yet it was not. Lab stools in all the new labs are quite small and awkward to sit in, and do not pivot or turn. We currently have better lab stools in Harney. The LCSI general Biology lab also contains a fume hood, an expensive item that was repeatedly deemed unnecessary by faculty for this lab space. Biology faculty were also consulted repeatedly about cabinet types, numbers, and placement in our labs, yet none of our recommendations were followed; in fact, there is not even a microscope cabinet in the general Biology lab. In LCSI 205, the molecular Biology lab, manual controls of exterior windows are not working, making the room extremely warm, there is an insufficient number of outlets, and some of the outlets that are there are not working.

Prep spaces in the new building are new and certainly look better than some of the Harney lab prep spaces, but in several ways are not completely functional. The microbiology lab prep room, a shared, elongated prep space between departments, has a sink far away from the microbiology lab itself. In all prep spaces (for molecular Biology, general Biology, and microbiology), there are insufficient numbers of outlets (the general Biology lab prep space has one outlet) and dishwashers (in those spaces that have them) were ordered without racks in them. Furthermore, the prep spaces for molecular Biology and general Biology have only open shelves, and not cabinets, for chemical and glassware storage. Chemical storage cabinets had to be moved from Harney to accommodate chemicals in those prep rooms, and glassware is being stored on unprotected shelves.

In addition, the department still lacks a classroom ideally suited to teach field courses. Field courses require different arrangements than a classical teaching lab space. This need has been met for many years by the use of a small room (fits 12-15 students) that is awkwardly arranged due to its additional use as a classroom space and meeting space. Although the LCSI has opened up some lab classrooms in Harney as alternatives, these labs are also not ideally suited for the teaching of a field class.

L. Appendix L: Advising

Prior to 2010, the first academic advising experienced by a new freshman Biology major or transfer student was in a group setting during the summer or at the beginning of the semester. This system had a number of inherent issues due to a limited number of faculty and a large number of students. In addition, the students who were unable to come to campus during the summer were often faced with a limited choice of class times due to courses having been filled up at summer registration. In summer 2010, the University implemented Webtrack, an online web tutorial that explains the requirements for earning a degree at U.S.F., including core requirements as well as specific requirements for individual majors. The tutorial also instructs students on how to register online for classes. Incoming freshman and transfer students are required to first watch the tutorial and then they may register online for courses. About a month or so later, they receive a follow up phone call from a faculty member in their specific major to welcome them to USF and their major department and also to help them with any scheduling issues or advising questions. Faculty then record their comments and suggestions made to students in AdvisorTrac, an online advising system accessible by all faculty and staff.

Once students arrive on campus in the fall semester, all Biology majors and many Undeclared Science (UNSC) majors come to a specific Orientation to the Biology major. This is a group setting in which Biology faculty members are introduced, the curriculum is again explained, and students are presented with other information about the Biology Department. At the end, students are able to ask questions of faculty and of a panel of current Biology majors.

Each new student is assigned to an individual adviser in the Department. Freshmen, sophomores, new transfer students, students who are UNSC majors, juniors and senior Biology majors with science GPAs of less than 2.0, and students on probation must meet with an adviser in order to register for classes. While juniors and seniors are not required to see their adviser to register, most do because our majors are accustomed to seeking faculty input and advice. On average, each adviser has 45 advisees (just under half of these students are UNSC majors). As a result, during pre-registration, Biology faculty members have substantial advising responsibilities.

Since the student is ultimately responsible to see that degree requirements are met, each adviser is encouraged to review the curriculum, pre-requisites, and degree requirements with new students, and prepare a four-year plan with the student. In addition, the Department extensively publicizes the advising and registration period. Each advisee receives an email and a letter that identifies their adviser and describes how to sign up and prepare for an advising appointment. In addition, in Spring 2013, the department held pre-registration group advising for first year students to review with them the courses they would need to take the following semester. Faculty noticed that as a result, first-year students came to advising appointments more prepared than in previous years.
Ideally, the student-adviser relationship continues throughout the course of the program, and includes not only academic advising but counseling in matters of personal and professional growth and development (e.g. internships, post-graduate programs, study abroad programs, and career counseling). Pre-health advising primarily falls upon the chair of the Pre-professional Health Committee (PPHC), who is a Biology faculty member. The PPHC is described elsewhere in this study.

In addition to being assigned an academic adviser, students are also assigned (as of Fall 2012) a University Adviser from CASA, the Center for Academic and Student Achievement. The role of the University Adviser is to assist students with primarily non-academic issues, e.g. adjusting to University life, choosing a major or career, and so forth.