SCHOOL OF SCIENCE & TECHNOLOGY

DEPARTMENT OF BIOLOGY

UNDERGRADUATE PROGRAM REVIEW

SELF STUDY

MAY 07, 2010
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I. BASIC INFORMATION

Department or Program: Biology

School or Academic Division: Science and Technology

Date: May 07, 2010

Department Chair: Professor Richard Whitkus

Programs Offered:
  - Bachelor of Arts in Biology
  - Bachelor of Science in Biology
  - Minor in Biology
  - Master of Science in Biology

Number of majors: 368
Number of Minors: 75
Number of permanent faculty: 11
Number of temporary instructors: 3
Number of courses: undergraduate - 58, graduate - 17
Number of GE courses: 15
  - BIOL 110 (Biological Concepts)
  - BIOL 115 (Intro to Biology)
  - BIOL 121 (Diversity, Structure and Function)
  - BIOL 122 (Genetics, Evolution and Ecology)
  - BIOL 123 (Molecular and Cell Biology)
  - BIOL 220 (Human Anatomy)
  - BIOL 224 (Human Physiology)
  - BIOL 308 (Environmental Toxicology)
  - BIOL 309 (Biology of Cancer)
  - BIOL 311 (Sexually Transmitted Diseases)
  - BIOL 312 (Biological Oceanography)
  - BIOL 314 (Field Biology)
  - BIOL 315 (Plants and Civilization)
  - BIOL 318 (Biology of Aging)
  - BIOL 385 (Contemporary Issues in Biology)

Number of Service Courses: 3
  - BIOL 220 (Human Anatomy)
  - BIOL 224 (Human Physiology)
  - BIOL 240 (General Microbiology)

Number of Degrees: 3- B.A., B.S., M.S.

Number of concentrations: 7
  - BA: Botany, Zoology
  - BS: Molecular and Cell Biology; Ecology, Evolution and Conservation; Physiology; Marine Biology; Microbiology
II. INTRODUCTION AND HISTORY

The Department of Biology is undertaking its first Program Review in sixteen years. However, an Interim Program review was conducted seven years ago, which outlined student learning objectives, and a matrix linking them to course offerings. Since then, several faculty mini retreats and department meetings were conducted to construct learning objectives to areas of our undergraduate program for the current program review. The department addressed the issues outlined in the Sonoma State University Program Review Policy approved by the President in March, 2006 (Policy-1).

The Department of Biology, one of the nine departments in the School of Science & Technology, currently has 11 tenure track faculty members (6 full professors, 2 associate professors and 3 assistant professors) and one FERP (Faculty Early Retirement Program) faculty member (0.5 FTE), 1.5 administrative coordinators, and 2 Instructional Support Technicians. In addition, there are three temporary faculty members on 3-year contracts. As of fall 2010, the department serves 368 majors and 75 minors. The department’s faculty of professional scientists and its highly dedicated administrative and support staff strive to provide excellent educational experience to our majors and minors. Over the years the faculty has been working on developing a teacher-scholar model that will embrace the practice of active participation in both teaching and scholarship, with strong student involvement in faculty research, to create and maintain a vibrant learning environment for our majors.

Summary of Programs: The Department of Biology offers two broadly based bachelor’s degree programs (Bachelor of Arts and Bachelor of Science) and a Master of Science degree. Within each undergraduate degree program, there are opportunities for selecting a concentration. A congenial atmosphere allows students to develop a close relationship with peers, graduate students, and faculty. An emphasis is placed on laboratory and field courses, and on participation in research experience. Laboratory instruction provides students with hands-on opportunities with variety of physiological equipment, ultracentrifugation, PCR, electrophoresis, epifluorescence and laser scanning confocal microscopy, and various microbiological techniques. Excellent laboratory and greenhouse facilities, such as the Raymond Burr Greenhouse and orchid collection, exist for maintaining live material for classroom use and student research. A radioisotope laboratory is also available. Field courses draw upon the unparalleled diversity of habitats in the North Bay region. They also capitalize on two spectacular nature preserves: Fairfield Osborn Preserve and Galbreath Wildlands Preserve, both administered by the School of Science and Technology. In addition, the department maintains museum collections of local plants, algae and fungi (North Coast Herbarium of California), vertebrates (Jack Arnold Vertebrate Collection), and insects and other invertebrates.

The Department offers a minor in Biology. The purpose of the minor is to provide the student with a rigorous background in biology that supplements the student’s major. Students must develop a program in consultation with a faculty advisor in the Biology Department.

The Master's program in the Department of Biology is comprised of an active cohort of graduate students engaged in original research with faculty members in all areas of research specialization covered in the department. Graduate research is often supported by external funding. Other
support for graduate students includes teaching assistantships that involve close mentoring relationships with instructional faculty. Many graduates of the masters program go on to pursue doctoral degrees, and others continue in research, biotechnology, resource management, and education. The department just completed its graduate program review, including the visitation of an external reviewer. Copies of the Graduate Program Review Self-Study document, external reviewer’s report and the department’s response to it are attached.

**Mission Statement:** The mission of the Department of Biology is to prepare students to develop a solid foundation of the biological principles, supported by the physical sciences and mathematics. Through a combination of breadth and in-depth instruction, students develop the skills necessary to deal with the specific biological concerns of today and the flexibility to meet the needs of the profession in the future. To achieve this mission, the Biology Department maintains an ongoing culture of planning and development of excellent curriculum to support the development of skills necessary for lifelong learning, to encourage involvement in issues impacting society and the world at large, and to provide opportunities to explore and pursue fulfilling careers in a changing world.

**III. RESPONSE TO PREVIOUS PROGRAM REVIEW**

In 1994, the Department conducted its last program review. By design, the department selected two outside reviewers who provided us with perspectives representing different points of view. One reviewer was from Humboldt State University (Dr. Gary J. Brusca) and the other was from the University of California, Davis (Dr. Sheri Zidenberg-Cherr). Their report (Appendix 1) addressed several issues and the following summarizes the department’s response to many of those issues.

1. **Equipment**

   i. As there has been no change in the equipment budget since the last program review (still remains at $0), the faculty has been forced to utilize external sources of funding to obtain and maintain equipment for instruction. Sources of funding include NSF-CCLI and NSF-MRI for the purchase of DNA sequencers, RT-PCR machine, and PCR machines and service contracts. Additional sources of equipment (and supplies) have been individual faculty’s externally funded research grants. The department has also been active in seeking and accepting donations of equipment from local industries. Through the efforts of the University Administration, a bond issue was submitted and passed to fund a $28 million renovation of Darwin Hall. Included in the bond issue was $1.3 million of Group II funds. In 2006, the Department received $319,000 from Group II funds allocated from the State to equip the renovated Darwin Hall. Approximately $6,500 was used to purchase furniture for the Department (non-instructional material, as necessary). The remaining funds were used to purchase new equipment for laboratory instruction. All purchases of new equipment did not include service contracts.
The generation of a list of equipment needs in the Department has been encouraged by the Dean for the past several years. These lists are collated in the Dean’s office from throughout the School. Aside from emergency equipment replacement (-80 freezers, laser for ABI Genetic Analyzer) no new equipment has been procured in the Department from this effort.

Given the length of time since this recommendation had been made and the major Darwin Hall renovation in 2006, the severity of the situation under which this recommendation was made has not been altered to a large degree. Yet the Department continues to make a unified and vigorous set of arguments to the Dean on resource needs in the Department, mostly in the area of set up funds for attracting new faculty. The Dean then carries the collective needs of the School to the higher administration.

**2. Library Holdings**

i. This recommendation is, on the one hand, somewhat outdated given the widespread use of electronic journals and availability of electronic documents. However, the spirit of the recommendation of insuring graduate students receive guidance on protocols and courtesies of professional practices is a continued concern and practice of our faculty. Individual faculty train their advisees on professional development issues as part of their overall training as scientists. At the program level, graduate seminars (BIOL 500S) are provided on topics related to professional development, and the Department instituted a graduate version of Biology Colloquium (BIOL 590) which requires graduate student to be involved in professional development activities such as hosting speakers and interacting with speakers during lunches/dinners. These are seen as providing graduate students the necessary training in becoming active and successful professional scientists.

ii. The Library has been very active in its attempts to maintain and grow journal subscriptions, especially by electronic access, and it has joined CSU-wide consortia to obtain access to online journals. This has expanded our students’ ability to access the scientific literature in general, but some journal subscriptions appear to have been cancelled in recent years, hampering our faculty members’ ability to make use of the library.

iii. In recent years, the Library has also improved SSU’s access to electronic data bases. Faculty members consult with the library regularly, often through a designated Library Coordinator, to assist the Library in selection of appropriate new books in subjects related to their teaching and scholarship.

**3. Space and Facilities**

Since the last review, space has become a more critical issue with the continued growth of the University. In the 2006 Darwin Hall remodel, the Department lost approximately 2000 sq. ft. of space. As a result, the Herbarium went from a facility in approximately 500 sq. ft. to less than half of that space. Through relentless efforts of our faculty an exploration of a “Diversity Collection” was initiated in 2000.
IV. CURRICULUM

Our current undergraduate curriculum, supported by physical sciences and mathematics, provides students with a well-rounded exposure to the breadth of inquiry in the biological sciences. This combination of breadth and in-depth instruction allows students to develop the intellectual foundations and the skills necessary to deal with the specific biological concerns of today and the flexibility to meet the future needs of the profession. Since the last program review, the Department has introduced several curricular innovations that induced significant changes in student learning objectives and outcomes.

Consistent with the University’s mission, the Department of Biology maintains excellence in its programs of instruction that are grounded in a context of liberal arts and sciences. Our lower and upper division curricula are carefully structured such that students are challenged to develop skills of critical analysis, reasoning, creativity and self-expression. Since the biological sciences encompass a wide variety of specific sub-disciplines, each with its own terminology, research approach, and professional organization, we follow a broad-based curriculum with discipline-based learning objectives [Appendix 2]. Below we provide brief descriptions of our lower and upper division curricula and various categories of student learning objectives as specified in the assessment process.

A. Lower Division Curriculum: In the fall semester of 1997, the Department adopted and implemented a new, concept-based, lower division curriculum that consists of a three-semester sequence of required courses that emphasize a comparative and integrative approach to the study of biology. These courses are: 1) BIOL 121, Diversity, Structure and Function; 2) BIOL 122, Genetics, Evolution and Ecology; and, 3) BIOL 123, Molecular and Cell Biology. All three courses are taught in lecture-lab formats and emphasize major biological concepts that all students of biology should be familiar with: biological diversity in an evolutionary context, the relationship between structure and function in organisms, cellular and molecular basis of life, mechanisms of inheritance and their evolutionary implications, fundamental principles of ecology, and the principle that life obeys the laws of chemistry and physics. These courses are designed to provide our majors with a strong conceptual foundation that prepares them for advanced biology courses (upper division and graduate level courses). In addition, these courses meet the lower division science GE requirement for non-biology majors. All three classes are offered each semester and in most instances they are team-taught by a pair of tenure-track faculty working closely together and with graduate teaching associates throughout the semester.

Lower Division Learning Objectives
Learning objectives for the lower division are based on a set of principles that our majors should fulfill. These principles are:

- Specific knowledge in the breadth of biological science
- Integrative foundational knowledge that prepares students for upper division courses in the major
- Critical and scientific thinking skills
- Laboratory and practical skills
- Integration of content knowledge into a larger biological and societal context
The learning objectives for the three lower division course sequences are listed below [See Appendix 3 for sample syllabi for these courses].

1) **Learning Objectives for BIOL 121 (Diversity, Structure and Function):**

   a) **Content knowledge. A. Specific.** Students will acquire basic scientific vocabulary and knowledge of phylogeny, functional morphology, the origin of life, and how scientists study these phenomena.

   b) **Content knowledge. B. Integrative/foundational.** Students will acquire an understanding of the roles of hypothesis testing and other basic sciences in the study of how organisms function, are classified, and evolve, to prepare them for advanced biological inquiry.

   c) **Critical and scientific thinking.** Students will learn the roles of objective evidence and experimentation in generating and interpreting biological knowledge.

   d) **Laboratory and practical skills.** Students will acquire basic skills of observing, identifying, classifying, and inferring evolutionary relationships among organisms. Students will learn how to use dissecting and compound light microscopes.

   e) **Societal Impacts.** Students will develop an appreciation of human impacts on biodiversity, including evolutionary and climatic change.

2) **Learning Objectives for BIOL 122 (Genetics, Evolution and Ecology):**

   a) **Content knowledge. A. Specific.** Students will understand: the particulate nature of inheritance and how it arises from the structure and replication of DNA and chromosome movement in meiosis; microevolution and its relation to gene organization and transmission; and growth and regulation of populations, the variety of ecological interactions among and within species, fundamentals aspects of community structure and ecosystem functioning and basic principles of conservation biology.

   b) **Content knowledge. B. Integrative/foundational.** Students will understand how an organism’s phenotype is shaped by its genetics and its interactions with the physical and biotic environment. They will also learn how theory, experiments and modeling are integrated in generating new knowledge and understanding of biological systems.

   c) **Critical and scientific thinking.** Students will learn the roles of objective evidence and experimentation in generating and interpreting biological knowledge. Students will learn basic principles of hypothesis testing, including the use of null hypotheses. They will apply simple statistical tests based on these principles.
d) Laboratory and practical skills. Students will acquire basic skills of observing phenotypes, inferring genotypes, experimental design, collecting data, and using computers to interpret and analyze data.

e) Societal Impacts. Students will learn how to read, critically evaluate, and discuss scientific and popular literature on biological issues that concern the public (e.g., genetically modified organisms, endangered species, climate change).

3) Learning Objectives for BIOL 123 (Molecular and Cell Biology):

a) Content knowledge. A. Specific. Students will learn the basic concepts in molecular and cellular biology, incorporating fundamental knowledge of chemical principles and emphasizing emergent properties that impact all levels of biology.

b) Content knowledge. B. Integrative/foundational. The course will lay the foundation for a more detailed understanding of living systems at all functional levels.

c) Laboratory and practical skills. Students will gain practical experience in the use of tools and techniques routinely employed in molecular and cellular biology.

d) Societal Impacts. Students will understand, analyze, and process information to develop an appreciation for the molecular and cellular events that pertain to everyday life.

B. Upper Division Curriculum: After successful implementation of the revised lower-division sequence, the Department developed a new upper division curriculum that presents modern biology in a robust way to provide students with various options to pursue it. It represents four key core areas in biology: organismal biology, physiology, molecular and cell biology, and ecology and evolution (see Appendix 2). The set of courses in each core area, currently at least four in each, give students basic concepts, research approaches, and experience across the breadth of modern biology, and allow them to become experts in a realm within biology. Most biology courses have a strong laboratory and/or field component.

Upper Division Learning Objectives
The Upper Division Core areas in the Biology Program represent the breadth of the sub-disciplines in biology and the scales of biological inquiry. The following guiding principles are common to the Core:

- Continue development of quantitative and analytical tools
- Increase understanding of the critical role of evidence-based hypotheses testing
- Deepen awareness of structure-function relationships and emergent properties at various scales
- Facilitate increasing comfort with and understanding of the dynamic nature and open process of science, as well as technical literacy through exposure to the primary scientific literature.
- Expand understanding of the integrative nature of biology
Brief descriptions of student learning objectives as specified in the assessment process for the four core areas of the upper division curriculum are given below.

1) **Organismal Biology**
   - Structural, developmental, and reproductive diversity of the major groups of taxa
   - Methods of detecting and observing diversity in morphology or other characters and using diversity in classification
   - Evolutionary relationships among taxa and their relevance to organismal functioning

2) **Physiology**
   - Principles of homeostasis and patterns of organisms’ response to the external environment
   - Mechanisms of integration and regulation of physical systems
   - Evolutionary patterns of physiological diversity

3) **Molecular and Cell Biology**
   - Interactions among biological macromolecules
   - Emergent properties of cellular components
   - Signal transduction
   - Regulation of gene expression

4) **Ecology and Evolutionary Biology**
   - Factors influencing the distribution and abundance of organisms
   - Principles of evolution by natural selection
   - Importance of species interactions in structuring ecological and evolutionary processes
   - The breadth and scale (gene to organism to global ecology) of inquiry in ecology and evolution
   - Quantitative and experimental principles applicable to ecology and evolutionary biology.

**Upper Division Concentrations**

In 2007, the Department revised our upper division concentrations, which had been in place since 1992. Our goal was to help student undertake a program of study that matches their educational expectations and provides the necessary knowledge and skills required to begin a path of lifelong learning and success. The rationale for the change grew from a combination of circumstances impacting all concentrations at the time:

- Advancements and changes within the various academic sub-disciplines of biology.
- Faculty replacement, resulting in new courses and new emphases in existing courses.
- Reduction in tenured and tenure-track position in the Department, making it impractical to offer some of the required courses in the previous concentrations with adequate frequency.
- Changing student needs, based both on their interest areas and the growth in numbers of Biology Majors since 2005.
- Increased expectations of student skills, knowledge base and experience by external stakeholders (potential employers and advanced degree programs).

**B. A. Concentration Learning Objectives**
The student learning objectives which guided the formation of the two concentrations in the B.A. (Botany and Zoology) are:
1. Provide greater conformation of courses to current developments and professional standards within the concentrations.
2. Provide increased exposure to concepts and laboratory techniques used by professionals.

**B.S. Concentration Learning Objectives**
The student learning objective which guided the formation of the five concentrations in the B.S. (Microbiology; Marine Biology; Ecology, Evolution and Conservation; Physiology; Molecular and Cell Biology) are:
1. Meeting the same objectives for the B. A.
2. Provide additional laboratory, field, and quantitative training to provide student the necessary preparation for careers in the biological sciences.

**C. Biology Degree Learning Objectives**
The undergraduate degrees in biology provide for the development and refinement of student interest in the Biology Program. This takes the form of integrating and building upon the knowledge from the lower division requirements through various options (concentrations) in the program, and cumulating in two main curricular lines: the B.A. and the B.S. degrees. These degrees provide flexibility to foster individual interest during tenure in program and a foundation for entry to graduate school and health profession programs. Upon graduation, our students are ready to enter the job market in a variety of careers, including teaching, research and government services. In recent years, we have noticed that Biology graduates from SSU have an excellent record of acceptance in advanced degree programs at graduate, medical, dental, veterinary, pharmacy and technical schools. Overall, the degrees in our program have a common set of values:
- Understanding the depth and rigor of active investigation in any skill applied to biological science.
- Evaluate and analyze evidence by understanding the relationship between causality and correlation.
- Understand the context and progression of knowledge in science.
- Appreciate the relationship between science and technology.
- Understand the ethical dimension in the application of science.
- Understand the role of science in informing public debate about different policy decisions.
- Cultivate a balance between openness and skepticism.
Bachelor of Arts in Biology

- Preparation of broadly trained biologists, with skill transferability to multiple career choices in biology.
- Foundation in the liberal arts with an emphasis in biology.
- Exposure to the breadth of biological sciences as a mechanism for becoming a well-rounded citizen and for finding life-long learning area of greatest interest.

Bachelor of Science in Biology

- In addition to B.A.:
- Preparation of more specialized biologists through greater emphasis on coursework, quantitative preparation, and research.
- Requirement of a focus in a functional level in biology (molecular, cellular, organismal, population/ecosystem).

D. Experiences in the Major to Support Learning Objectives

The Department sees the structure of our curriculum aiding our attempts to meet our overall student learning objectives. Specifically, our curriculum is rich in laboratory and field experiences for all our students and research experiences in our upper division.

i. Hands on Laboratory Experiences in the Curriculum: Laboratory courses are designed to provide students with the conceptual framework to understand and participate in scientific developments in diverse areas of biology, and the practical framework to gain hands-on experience in modern laboratory techniques in the biological sciences. Courses emphasize laboratory techniques in recombinant DNA technology; applications of DNA sequence analysis for molecular geneticists, biomedical researchers, and evolutionary biologists; techniques in advanced microscopy; gross anatomical dissection techniques; acquisition and analysis of physiological data; etc. Students also conduct group research projects and independent research as a part of many Biology courses. These projects involve use of various library resources and laboratory facilities made available in the Department. Some courses require that students present their research as a part of the laboratory; others require preparation of an independent research paper. Students also gain hands on experience in experimental design, statistical analysis, and computer-based bioinformatics methods using laptop computers in the classroom. In recent years, several faculty members have obtained educational and research grants from the National Science Foundation, which have been used to modernize and upgrade laboratory facilities for teaching and research. The equipment purchased through this external funding has enhanced the ability of Biology faculty to offer state-of-the-art instruction in modern biological research tools. In addition, the School of Science & Technology has one of the well equipped Microanalysis Laboratory (William Keck Microanalysis Laboratory) available for use in teaching and student research within our curriculum. This laboratory houses a variety of advanced microscopic imaging equipment including, an environmental scanning electron microscope, atomic force microscope, and epifluorescence and laser scanning confocal microscopes.
ii. Field Experiences in the Curriculum: Field courses in our curriculum offer students the opportunity to learn about the high diversity of organisms that live in the rich natural environment surrounding Sonoma State University. Field trips provide students with direct exposure to vernal pools, oak woodlands, coastal marine habitats, thermal springs and geothermal stream fields near campus. Many field trips are taken to the School of Science and Technology's Nature Preserves. In several Biology courses, students also gain experience regarding local environmental problems, including demographic problems associated with the decline of the Western Pond Turtle and the threat of invasive introduced species, the pathogen causing Sudden Oak Death.

The Department maintains extensive collections of vertebrates, vascular plants, insects, algae, fungi, and bacteria. Many of these collections have been entered into searchable databases. Specimens are made available to students, members of the community, and scientific researchers. Collections are also used for outreach purposes. For example, the Entomology Outreach Program, an arm of the Sonoma State University Field Stations and Nature Preserves, brings displays of insects and live insects to public events and classrooms to enhance awareness of the diverse ways that insects interact with humans. This externally supported program promotes more ecologically sound methods for managing insects in ornamental landscapes, and it emphasizes the importance of insect diversity for the health of natural habitats (e.g. streams and vernal pools). Students participate in the program as presenters and are engaged in curriculum development and alignment of offerings to statewide educational standards for K-12 instruction.

iii. Service-Learning: Faculty members are also expanding the use of Service-Learning to achieve curricular objectives. Students receive points for serving a University or community partner for several hours. The Service-Learning activity is designed to help achieve the learning objectives of the course. For example, students in BIOL 122 (Genetics, Evolution and Ecology) work with local community gardens and learn how ecological principles operate in gardens as a consequence. In BIOL 323 (Entomology), students participate in activities organized by the Entomology Program.

iv. Special Courses: A number of course are offered on an “as needed” basis and are open to all qualified students. All faculty are involved in offering one or more of these classes. As such, the offerings vary yearly in content, objectives, and student need. The courses fall into three categories (see Appendix 2 for course descriptions):

a. Specialized classes to cover topics not available in the curriculum (BIOL 385, 390, 497). These one to four unit classes provide opportunities for the department to offer students insights into a broad range of issues in biology. All are open to any faculty member to participate and all can be repeated by students as the topics change. BIOL 385 provides faculty the opportunity to offer a General Education class on a trial basis, while BIOL 497 provides the opportunity to offer a major’s class on a trail basis. The department may decide to incorporate trial classes into the regular curriculum.
b. Professional development style classes (BIOL 395, 498, 499). One to four unit classes that give students the ability to develop professional skills along with the opportunity to apply their knowledge within an academic, professional, or community-based experience.

c. Research courses (BIOL 494, 495 and 496). Students seeking research experience under the guidance of a faculty member take these one to four unit courses. BIOL 494 and 496 are required courses providing the research experience in the B.S. degree.

V. Meeting Learning Objectives

The Department attempts to meet its broad learning objectives in a manner consistent with the University’s mission. The Department seeks excellence in its program of instruction grounded in the context of liberal arts and sciences. Students are challenged to develop skills of critical analysis, reasoning, creativity and self-expression in our General Education, Service Courses, and the Biology Major. Because the biological sciences encompass a wide variety of sub-disciplines, each with its own terminology, research approach, and professional organization, we provide a broad-based curriculum. Therefore, we meet our learning objectives through course-specific methodologies and assessment, and through the structure of the curriculum.

We meet our learning objectives using the following methodologies:

a. Conceptual, factual, and visual lecture content that integrates information from laboratories and other methodologies.

b. Hands-on laboratory experience that feature methodologies and conceptual content that integrates with lecture content.

c. Electronic resources such as course web pages, eReserve or Web CT

d. Computer simulation and modeling

e. Data management, statistical analysis, and results presentation using computer software

f. Experiences at field sites, research facilities or museums.

g. Incorporate, train and mentor paid laboratory instructors.

h. Involvement of undergraduate or graduate student assistants in laboratory or field instruction.

i. Assignments requiring students to draw on external resources (e.g. research literature or community engagement) to satisfy course requirements.
VI. Assessment of Student Achievement

Our faculty utilizes a variety of methods to assess student achievement in individual courses. These embedded assessment methods provide flexibility for faculty to track student achievement in a course, and provide students opportunities to be assessed through objective, subjective, analytical, quantitative, verbal, written, and activity based means.

We assess student achievement using the following methods.

a. Multiple choice examinations.
b. Short-answer, fill-in examinations
c. Lecture or laboratory quizzes
d. Laboratory practical
e. Essay examinations
f. Quantitative examination problems
g. Short in-class written assessments
h. Take-home essays or problem set assignments
i. Laboratory notebooks
j. Laboratory reports
k. Literature search and reference list.
l. Student-generated research proposal
m. Extended laboratory or field project with data analysis
n. Paper summarizing results of original research
o. Oral presentation of research findings (original or based on literature)
p. Community-based learning experience
q. Specimen collection, preparation, and curatorial skills

The table on the next page summarizes examples of meeting and assessing learning objectives. See Appendix 4 for individual course values.
<table>
<thead>
<tr>
<th>Meeting learning objectives</th>
<th>LD GE Non-Major</th>
<th>LD GE Service</th>
<th>LD GE Major</th>
<th>UD GE</th>
<th>UD Core</th>
<th>UD Elective</th>
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<td>a. Lecture content</td>
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<td>b. Hands-on laboratory experience</td>
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<td>c. Course web pages, eReserve or Web CT</td>
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<td>d. Computer simulation and modeling</td>
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<td>e. Data management, statistical analysis</td>
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<td>67</td>
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<td>29</td>
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<td>f. Field sites, research facilities or museums.</td>
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<td>67</td>
<td>100</td>
<td>67</td>
<td>43</td>
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<td>g. Paid laboratory instructors.</td>
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<td>h. UG or grad student assistants</td>
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<td>100</td>
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<td>75</td>
<td>29</td>
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<tr>
<td>i. Assignments requiring external resource.</td>
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<table>
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<tr>
<th>Assessing learning objectives</th>
<th>LD GE Non-Major</th>
<th>LD GE Service</th>
<th>LD GE Major</th>
<th>UD GE</th>
<th>UD Core</th>
<th>UD Elective</th>
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<tr>
<td>a. Multiple choice examinations.</td>
<td>100</td>
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<td>b. Short-answer, fill-in examinations</td>
<td>50</td>
<td>100</td>
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<td>100</td>
<td>83</td>
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<td>c. Lecture or laboratory quizzes</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>--</td>
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<td>d. Laboratory practical</td>
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<td>100</td>
<td>67</td>
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<td>57</td>
</tr>
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<td>e. Essay examinations</td>
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<td>--</td>
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<td>f. Quantitative examination problems</td>
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<td>--</td>
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<td>g. Short in-class written assessments</td>
<td>--</td>
<td>50</td>
<td>100</td>
<td>100</td>
<td>75</td>
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<td>h. Take-home essays or problem sets</td>
<td>50</td>
<td>--</td>
<td>67</td>
<td>--</td>
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<td>i. Laboratory notebook</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>--</td>
<td>75</td>
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</tr>
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<td>j. Laboratory reports</td>
<td>--</td>
<td>50</td>
<td>100</td>
<td>--</td>
<td>67</td>
<td>43</td>
</tr>
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<td>k. Literature search and reference list</td>
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<td>50</td>
<td>33</td>
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<td>l. Student-generated research proposal</td>
<td>--</td>
<td>50</td>
<td>--</td>
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<td>17</td>
<td>14</td>
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<tr>
<td>m. Lab or field project with analysis</td>
<td>--</td>
<td>--</td>
<td>33</td>
<td>--</td>
<td>67</td>
<td>57</td>
</tr>
<tr>
<td>n. Paper summarizing original research</td>
<td>--</td>
<td>--</td>
<td>67</td>
<td>--</td>
<td>33</td>
<td>29</td>
</tr>
<tr>
<td>o. Oral presentation of research</td>
<td>--</td>
<td>50</td>
<td>33</td>
<td>--</td>
<td>42</td>
<td>43</td>
</tr>
<tr>
<td>p. Community-based experience</td>
<td>50</td>
<td>--</td>
<td>33</td>
<td>--</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>q. Specimen collection, curation</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>17</td>
<td>43</td>
</tr>
</tbody>
</table>
Description of the Table:
Methods of instruction in Biology courses vary through the curriculum. All courses include a lecture component, and most courses (except upper division general education) include a laboratory or field experience. Use of course web pages or online posting of course materials is nearly universal throughout the curriculum. Many courses include skills development in data management and analysis; and field trips and visits to museums are included in most majors courses. Graduate teaching associates are employed only in large enrollment, multi section lower division courses. Most courses expect students to obtain information using external resources such as literature searches or contact with community partners.

Methods of assessment in Biology courses also depend on the level of the course and average enrollment. Multiple choice tests are used in lower division GE courses and in most introductory majors courses. However, these are used rarely in upper division core and elective courses, where exams tend to be given in short answer or fill in format. Laboratory notebooks and laboratory reports are assigned in courses throughout the curriculum. Relatively few courses require students to complete an original research project, and more courses require students to present students’ own research or that of others. Community-based Service-learning is employed in a few courses.

VII. STUDENT ADVISING

The Department maintains a web page (www.sonoma.edu/biology) which has useful information for students, including: general information of the department and its programs faculty profile including their research areas, course descriptions, class schedule, updates on, registration, various student resources, departmental news and announcements, and descriptions and links to natural preserves and other programs. The Department strongly encourages its majors to develop an ongoing advising relationship with a faculty member whose area of expertise matches the student’s interest [Appendix 5]. The Department Chair of the department prepares and updates a list of biology majors with their assigned advisors. This list is updated on the University’s Central Management System (PeopleSoft) and is posted on a bulletin board outside the Department office for easy access and reference by students. The Department Chair is available for general advising, including GE advising, throughout the year and participates, along with one or two other faculty members, in freshmen orientation during the summer.

The Biology portion of the University catalog contains advising information such as: list of Biology degree concentrations (for both BA and BS tracks), sample prerequisite courses for applying to various health professions schools, information about degree unit requirements, list of courses within each of the four upper division core areas as well as electives, and a sample four year programs for prospective majors (see Appendix 2). Copies of biology major check list (to be used by students for degree progress check in consultation with faculty advisor, Appendix 6), handouts with information about required course work for various concentrations (Appendix 7), copies of articulation agreements with nearby community and junior colleges are available in the department office.
With support from the Dean’s office, the Department of Biology oversees a Health Professions Advisory Program at Sonoma State University, which is an advising and support system for undergraduate and post-baccalaureate students preparing for careers in various health professions, including: medicine, dentistry, optometry, pharmacy and veterinary medicine. About 85% of the current pre-health professions students are biology majors. Services available through this advisory program include:

- Academic advising, including assistance with major/minor exploration and selection of course work that meet health professional school admission requirements.
- Holding periodic pre-health professions general information sessions and maintenance of resource library.
- Lectures by members of the local health professions community and health professions school admission offices to give students an overview of various health careers and entrance procedures.
- Offering a one credit course (SCI. 150) in Introduction to Careers in the Health Professions.
- Assistance with application and preparation for health professions school interviews.
- Evaluation of candidates’ credentials and preparation and disbursement of committee letters of recommendation.

The committee’s website [http://www.sonoma.edu/hpac] provides other useful information for prospective and current pre-health profession students.

**VIII. DIVERSITY**

The Department is actively involved in increasing the participation of underrepresented groups in our program. This is most effectively carried out through recruitment of students into research, one of the most attractive aspects of our program to most students. Programs in place at SSU that integrate with the Department include the California State University Louis Stokes Alliance for Minority Participation (LSAMP), the McNair Scholars National graduate Student Achievement Program (NoGAP) and the Mathematics, Engineering, Science Achievement (MESA) program. The Department is an active participant in these programs by providing faculty, staff, and facilities to increase research training and life long learning for underrepresented groups. Faculty also rely on minority students for participation in NSF funded RUI research grants. LSAMP is an NSF sponsored program designed to broaden participation in science, mathematics, engineering and technology (STEM) disciplines and contribute to the national agenda to increase the number of underrepresented minorities receiving baccalaureate degrees, and ultimately Ph.D.s in STEM disciplines. Twenty-five LSAMP participants were or are current Biology majors. The SSU NoGAP program began in October 2007 and has hosted 10 low-income and first generation, or African American, Hispanic, Native American, or Pacific Islander students in Biology. To date, five of the recent Biology NoGAP students have been accepted into graduate programs.
IX. FACULTY: PEDAGOGY, UNIVERSITY SERVICE AND PROFESSIONAL ACCOMPLISHMENTS

A. Pedagogy: Our commitment to majors includes preparing them to be capable of pursuing fulfilling careers in biology in a changing and competitive world. With this in mind, we developed a more comprehensive research-based instructional program in scientific inquiry encompassing observation and interpretation of experimental results. In addition, our curriculum is designed to be accessible to California’s growing and diverse student population and meet the occupational needs of the state’s technology-based economy. During the past seven years, the Department has been working its way through major transitions, driven by an enormous turnover of faculty due to retirements, and the desire of new faculty to keep themselves and their students immersed in the excitement of discovery and the active learning of science found only by engaging in the leading edges of research. The Department is comprised of faculty who are actively engaged in relevant, externally funded research and who are extremely competent to train students in scientific methods as well as recent scientific and technological advances. We strive to maintain currency within our discipline through active engagement in our scholarship and professional activities. Outcomes of these activities are typically incorporated into our curriculum planning and individual courses. The department always recruits faculty who are committed to teaching and scholarship in their areas of expertise.

B. University Service: The Department of Biology has a history of active participation in university governance (service, Appendix 8). Within the past 5 years at least four faculty members have been members of the Academic Senate. Others have been elected as representatives of the School of Science and Technology to key standing committees of the Senate such as the University RTP Committee, the Student Affairs Committee, and General Education Subcommittee, Faculty Standards and Affairs Committee and the Structure & Functions Committee. Many faculty have been actively involved in University committees such as the Animal Care Committee, Scholarship Committee, and the Athletic Advisory Council. Several faculty members have also played a leading role in various professional organizations that have direct impact on our campus, department, and faculty professional growth and development. These organizations include COAST (Council on Ocean Affairs, Science and Technology), CSUPERB (California State University Program for Education and Research in Biotechnology) and PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans).

C. Professional Accomplishments: Faculty members in Biology have been extremely active at conducting externally funded research and publishing results in high quality peer reviewed journals. Our faculty maintains close collaborative relationships with numerous local and national institutions. Some faculty members maintain formal research appointments at other institutions. Collaborative grant proposals with other institutions support purchase of equipment used extensively in delivering the undergraduate curriculum. Institutions with strong collaborative relationships with SSU include UC Santa Cruz, UC Davis, UC Merced, UC Berkeley, UC San Francisco, Long Marine Lab, Bodega Marine Lab, Oregon State University, Santa Clara University, US Department of Agriculture, US National Marine Mammal Program, The Nature Conservancy and Point Reyes Bird Observatory. These formal affiliations not only
facilitate research experiences for our graduate and undergraduate students but also play a central role in promoting collaborative research and scholarly achievements.

Our faculty members contribute expertise to educational institutions and community organizations, and serve the academic community through manuscript reviews for scientific journals and participation in grant proposal review panels. Our faculty continues to build local, regional, national and international collaborations. During 2005-2010, more than 100 research papers have been published or are in press in high-quality peer reviewed journals that have a high-impact in our disciplines. In addition, many of our faculty members have contributed book chapters and served on editorial boards for scientific journals. During this same period, faculty has received $7.7 million in external funding to support their own research, departmental educational activities and purchasing new equipment for core facilities. Funding sources include: National science Foundation, National Institutes of Health, US Forest Service, California Sea Grant, CICORE (Center for Integrative Coastal Observation, Research and Education), NURP (National Undersea Research Program), USDA Forest Service, US Fish & Wild Life Service, Ocean Protection Council, and numerous local governments and private agencies.

The department offers several supervision/contract courses which are designed to enhance student professional development, career goals and interest in research. All Biology Department faculty (tenured and tenure-track) participate in these courses with different levels of involvement reflecting student interests, faculty expertise and other aspects of faculty workload. During the last five years, Biology faculty mentored 54 master’s students in thesis research projects (27 completed and 27 currently enrolled), 21 undergraduate students in their independent research design projects, 342 undergraduates in their independent studies, 92 undergraduate senior research, 229 students in biology practicum and 89 students in supervised internship activities. Because of our success in attracting external funding, many opportunities exist for our undergraduate majors to participate in funded, original and publishable research projects through Special Studies electives or paid summer internships. These experiences often lead to placements at research institutions, agencies, or graduate programs.

X. INSTITUTIONAL SUPPORT

A. Physical facilities
The Department consists of 8 teaching laboratories, 10 faculty research laboratories (CSU classification, instructional support space), 2 stock/lab preparation rooms, a combined museum (herbarium, vertebrate, insect), a walk in cold room containing a cold seawater system, a small animal room, and a greenhouse complex of three houses and a combined head house/large animal holding room. Office space consists of a main department office and 16 offices allocated to full time and part time faculty, and one dedicated to graduate student office space.

B. Financial resources
The operating budget for the Department is about $22,000 per year. This is to cover office, laboratory and field supplies. In addition, the Department receives temporary faculty funds of approximately $200,000 per year to cover lecturer and teaching associate salaries. The Office of the Provost provides approximately $9,000 per year for vehicle costs to cover field trips.
Through the Office of Administration and Finance, faculty and staff are provided computer refresh opportunities every 5-7 years, on average, depending on available budget.

C. Human resources
The Department has a workload policy for tenure/tenure track faculty of a minimum of 18 WTU of indirect class instruction per year and a maximum of 6 WTU of supervisory coursework per year (see Appendix 9). The Department Chair and Curriculum Committee are responsible for enforcement of this workload. Faculty often carry several units of assigned time for School and University service, including Radiation Safety Officer (4 WTU/year) Health Professions Advisory Committee Chair (4 WTU/year), and Faculty Research Associate (12 WTU/year), or have buyout from grants. The Chair of the Department receives 16 WTU of assigned time per year. The assigned time is reimbursed to the School and comes back to the Department as part of the temporary faculty budget. Finally, all faculty are assigned 6 WTU per year to cover non-teaching associated workload such as advising and university governance. The table below provides the breakdown for faculty workload over the past 5 years.

<table>
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<tbody>
<tr>
<td>AY 05/06 FTE = 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>173.0</td>
<td>41.5</td>
<td>40.8</td>
<td>255.3</td>
</tr>
<tr>
<td>Aver/FTE</td>
<td>17.3</td>
<td>4.2</td>
<td>4.1</td>
<td>25.5</td>
</tr>
<tr>
<td>AY 06/07 FTE = 8.5</td>
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<tr>
<td>Total</td>
<td>151.0</td>
<td>58.0</td>
<td>60.0</td>
<td>269.0</td>
</tr>
<tr>
<td>Aver/FTE</td>
<td>17.8</td>
<td>6.8</td>
<td>7.1</td>
<td>31.6</td>
</tr>
<tr>
<td>AY 07/08 FTE = 11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>151.7</td>
<td>71.0</td>
<td>72.7</td>
<td>295.4</td>
</tr>
<tr>
<td>Aver/FTE</td>
<td>13.8</td>
<td>6.5</td>
<td>6.6</td>
<td>26.9</td>
</tr>
<tr>
<td>AY 08/09 FTE = 11.5</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>168.5</td>
<td>52.0</td>
<td>86.9</td>
<td>307.4</td>
</tr>
<tr>
<td>Aver/FTE</td>
<td>14.7</td>
<td>4.5</td>
<td>7.6</td>
<td>26.7</td>
</tr>
<tr>
<td>AY 09/10 FTE = 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>161.8</td>
<td>41.5</td>
<td>72.8</td>
<td>276.1</td>
</tr>
<tr>
<td>Aver/FTE</td>
<td>16.2</td>
<td>4.2</td>
<td>7.3</td>
<td>27.6</td>
</tr>
</tbody>
</table>

Instructional workload over five years for full time equivalent faculty (FTE). Required yearly instructional workload is 24 WTU, actual WTU served are in bold. WTU are presented for total and average per FTE for direct (D) classroom instruction, assigned (A) workload for grants or administrative release from classroom instruction, and supervisory (S) workload for research, teaching practicum and internships for undergraduate and graduate student instruction. Yearly totals (T) are also provided.

On a yearly basis, all faculty are expected to account for 24 Weighted Teaching Units (WTU) of instruction. Our Department workload policy is a mechanism to insure a balance between direct instruction, assigned time, and supervision. However, our faculty often carry an excess workload to meet the needs of our program. The combined totals for direct and assigned time should be 18 WTU (according to our Department workload policy). However, our averages are consistently
over this amount. Our workload also allows us to count to a total of 6 WTU per year for supervisory courses. Yet our averages are increasing and there are several faculty who carry a heavy supervisory load to meet the needs of students attracted to their active research programs. Overall, current workload requirements for the Department do not match the workload expectations for full time tenure/tenure track faculty (24 WTU per year per FTE).

The Department has three temporary faculty members on 3-year contracts. These faculty are critical in staffing lower division General Education (BIOL 110, 115) and Service courses (BIOL 220, 224), as have been called on to fill in gaps in our upper division, when possible. All have been with the Department for more than 5 years and have consistently received highly favorable student, peer and annual reviews of their teaching effectiveness. The Department also utilizes graduate student teaching associates in our lower division (BIOL 110, 121, 122, 123) laboratories. The use of TA’s allows an efficiency of offering large lecture sections and smaller laboratory sections. Finally, the Department relies on several part-time lecturers when budgets permit. Like our 3-year contract lectures, they are utilized in lower division courses, and for gaps in the upper division.

The Department has 1.5 Administrative Coordinators to cover all administrative aspects of the Department, and to serve the School’s Health Professions Advisory Program. The Department also has 2 FTE for Instructional Support Technicians who oversee the preparation and set up of over 40 laboratory sections per semester. They are also responsible for general maintenance of the Department’s physical facilities, including safety oversight.

Assessment: The resources of the Department are barely adequate to maintain the program. No resources are provided to cover maintenance of or replacement of equipment. Every budget reduction has resulted in reduced course sections and has made the responsibility of provided supplies for courses much more difficult. We rely more and more on faculty using grants and other outside sources of funding for research to supplement equipment and supplies for teaching. We also are dependent on donations of surplus materials from the community to cover course materials. Faculty and staff workload associated with delivering our program (teaching, research, service) is only sufficient to meet our current commitment and inadequate to meet enrollment growth or new initiatives.

XI. PROGRAM ASSESSMENT STRATEGIES

The Department of Biology uses several instruments for assessing student learning at the program level. These instruments include faculty retreats, course-embedded assessments, and graduating student surveys. We anticipate adding a fourth [alumni surveys] to better assess long-term outcomes. The large numbers of Biology Majors, the diversity of their interests within biology (for the bachelors degrees, 7 concentrations and a general degree without concentration) and the range of their intended use of their degrees (from life enrichment to advanced degrees in the life sciences and health care professions) make assessment challenging. Further, our program is charged with meeting the needs of at least four other large student populations with distinctly different needs and expectations:
1. Requirements of other majors (courses include Human Anatomy and Human Physiology for Kinesiology, these two and Microbiology for Nursing, Field Biology for some Hutchins students, Environmental Toxicology for some Environmental Studies students);

2. Courses in biological sciences to satisfy general education requirements in categories B2, B3, and E as well as laboratory experience in the natural sciences;

3. Students electing to declare a minor in biology in support of their major (usually Chemistry, Kinesiology or Environmental Studies);

4. Students (biology majors and non-majors) who want to take both lower division and upper division courses to fulfill admission requirements for various health professions programs, such as medicine, veterinary medicine, dentistry and pharmacy.

The department continues to employ assessment strategies appropriate for each of the various groups above, within the context of resources available to administer them

A. Assessment of Biology Majors

i. Exit Survey: All graduating B.A. and B.S. Majors are required to complete the Biology Department Evaluation Questionnaire (see Appendix 10) before getting the Chair’s signature on their Major Requirements Form. The questionnaire has three multiple choices questions addressing aspects of how they came to choose, and how long they attended SSU. The next 55 questions ask them to rate, on a scale of 1-5, various aspects of their overall experiences through their Biology program (applicable to all the concentrations). Finally, there are 5 questions asking for suggestions for and narrative evaluation of the department’s programs.

ii. Written Student Assessment Report: All B.S. students are required to complete an Independent Research Design (BIOL 494) and a Senior Research (BIOL 496). Many more students participate in Special Studies (BIOL 495), including students at sophomore, junior, and senior levels. All Biology Department faculty (tenured and tenure-track) participate in these courses with different levels of involvement reflecting student interests and other aspects faculty workload. These courses require students to apply the knowledge, concepts, and basic technical scientific skills (acquired in the regularly scheduled courses they already completed) in the process of practicing the scientific method. With regard to the Learning Objectives, depending on the specifics of each project, a student will use content from more than one of the Discipline Content areas, develop all of the Skills by practicing them, and reinforce the Values under faculty mentorship. This is assessed by weekly or bi-weekly meetings with faculty, evaluation of the quality of effort and progress as recorded in the laboratory notebook, and a short final research report formatted as a scientific research publication on the project described in the Course Contract. All Senior Research students are required to write up the results of their project as a Senior Thesis using established guidelines. Prior to 2006, senior research students were required to present the results of their project either as an oral presentation or as a poster at a scientific meeting, or written up as a senior thesis following established guidelines. In 2006, the Department revised its requirements for the senior thesis. Current policy requires that senior thesis students enroll in special studies units for one semester (BIOL 494, Independent Research
Design), and then enroll in senior thesis units during the semester prior to graduation to analyze data and write up the thesis. Senior theses are filed at the Biology Department office in a senior thesis binder. Some Special Studies students present posters and some ultimately develop into Senior Research projects in subsequent semesters.

Practicum (BIOL 498), Internship (BIOL 499) require students to share their knowledge, conceptual understanding, and in some cases, technical scientific skills acquired in the regular curriculum in service to others. In Practicum they participate in biology faculty supervised instructional work, gaining experience assisting in instruction in the Biology Department curriculum (helping to teach what they have previously learned to their peers). In Internships, students gain experience under the direct supervision of an off-campus supervisor. Internships involve addressing community issues needing biological expertise or applying biological expertise in a specific setting (both non-profit and business). Faculty negotiate clear expectations and describe the specific relationship between the student and the off-campus supervisor in the Course Contract, and receive and evaluate both the student’s and the off-campus supervisor’s end of semester written reports. The student is required to describe not only what they did but also to explain how the Internship experience relates to their ultimate career goals. Individual faculty retains copies of the reports students submit on the completion of all Contract Courses.

Majors showed substantial growth in discipline content knowledge and skills development evidenced by improvement in student performance as they progressed through the lower division core curriculum (embedded assessment). Those participating in contract courses were all able to successfully complete the requirements of their contracts. For Special Studies and Senior Research students, their written reports were all well prepared, clearly expressed, and demonstrated the ability to apply the scientific method to discover new knowledge. The performance of all Practicum students exceeded the expectations of their off-campus supervisors and all the students found their experiences relevant to the development of choices for the careers after graduation. The graduation exit survey showed our graduating majors to be very pleased with their educational experience in the Biology Department with the exception of budget constrained resources (old equipment, inadequate supplies, loss of diversity in course offerings, limitations of lab facilities).

B. Assessment of Biology Minors
No current formal program assessment exists for these students. Indeed, developing one would seem to require gathering and compiling information as to the reasons students majoring in other programs choose to minor in Biology. Then, appropriate learning objectives for these student populations, distinct from those for the Biology major could be developed. Such objectives would likely focus largely on the applicability of biology course content within a variety of other specific disciplines.

C. Assessment of Majors with Specific Required Biology Courses
No current formal program assessment exists for these courses. Developing one would seem to necessitate creation of appropriate learning objectives for these student populations, distinct from those for the Biology major. Such objectives would likely focus largely on the applicability of biology course content within their specific other discipline and would require consultation with those departments. To date the content objectives are defined only at the time of establishing the
course as a requirement and revised by informal discussion between the faculty teaching these courses, the students, and the chairs of the departments. For Kinesiology majors, passing both Human Anatomy and Physiology is required before graduation. Most take them as juniors and seniors. However Pre-Nursing majors must take both these courses and Microbiology as freshmen and sophomores, maintaining a GPA higher than 3.0 to be competitive for admission into the Nursing major as juniors.

D. Assessment of Graduate School, Summer Research Program and Professional School Acceptance: Our students compete on a national level for admission to many masters and doctoral level graduate programs, as well as to many professional degree programs. Tracking the acceptance rates of our students could provide a means of quantifying how outside evaluators rank our students compared to others in the national pool. This also applies to the offers our not-yet graduating students receive from nationally competitive summer research programs. Such tracking is done on an ad hoc basis by individual faculty members. The department has not collected and compiled that information. The exception is for the students participating in the pre-health professions program. The Health Professions Advisory Program tracks all students in the program and organizes the efforts of the Health Professions Advisory Committee. All qualifying students in the program participate in a practice admissions interview and are guided in the compilation of a competitive portfolio required for application to a variety of health professions programs including medical, dental, pharmacy and veterinary schools. Shown below is a summary of applicant/acceptance data [biology majors only] for various health professions school for the past 5 application cycles (2005-2009).

<table>
<thead>
<tr>
<th>Health Profession</th>
<th># of Students Applied</th>
<th># of Applicants Accepted</th>
<th>% Acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>32</td>
<td>20</td>
<td>62</td>
</tr>
<tr>
<td>Dentistry</td>
<td>7</td>
<td>5</td>
<td>71</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>7</td>
<td>5</td>
<td>71</td>
</tr>
<tr>
<td>Veterinary Medicine</td>
<td>5</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>Physician Assistant</td>
<td>3</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>Other (Chiropractic, Podiatry, Physical Therapy, etc.)</td>
<td>5</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>59</strong></td>
<td><strong>42</strong></td>
<td><strong>71</strong></td>
</tr>
</tbody>
</table>

XII. ACTION PLAN

Identified areas of special concern:
During the Self Study component of the Program Review, which included several faculty meetings, mini-retreats, and committee meetings, the Department of Biology identified a number of topics of special concern. Given our current level of resources, we are not able to consistently deliver our curriculum to support timely graduation of our majors. However, there are several
aspects to this statement which we see falling into two main, but related, components A) Structure and Offering of the Curriculum; B) Staffing.

A. Structure and Offering of the Curriculum:

1. Lower Division
   - Reductions in the state budget continue to force us to cut sections of many of our lower division courses. Reduced sections in the lower division make it difficult for our majors to concurrently complete lower division requirements in biology and chemistry. In addition, a year of general chemistry (CHEM 115A and 115B) is required for students enrolling in our third lower division course (BIOL 123). Since BIOL 123 is a gateway course into the majority of our upper division Biology majors courses, the above situation creates a significant delay in degree progress.
   - In transiting from the lower division to the upper division, faculty often find students do not appear to have retained the information they learned, or are not sufficiently prepared for upper division course work. Often this situation forces faculty in upper division courses to spend more time than we deem necessary to review basic information in biology, chemistry, and mathematics.
   - Basic writing skills, analytical thinking, and deductive logic ability, do not seem to be developed well in the lower division. The faculty are concerned as to whether we need to spend greater effort in developing these skills through our lower division courses or to continue to rely on the General Educational courses our students take.

2. Upper Division
   - We have had an on going problem since the last program review in not being able to offer courses listed in our catalog. As our full time faculty have become fewer in number (due to retirements and resignations), and state budgets reduce our ability to recruit new tenure-track faculty or to hire lecturers, we no longer are able to consistently offer upper division courses, especially in the areas of organismal, molecular and cell biology, and microbiology. In 2006/07 we attempted to address this issue through a reorganization of our concentrations so that we would reduce our upper division course offerings and offer the remaining courses more frequently. Even with this approach courses required in the concentrations for the B.A. and B.S. degrees are not all offered on a regular basis. In a number of cases, insufficient staffing (especially through release time) has prevented offering required courses in several concentrations (see table on following page). As a response to the cutback in course offerings in the upper division, we have been using many course substitutions to help students make progress through their declared concentration, which places a direct negative impact on the quality of our program. With our present staff we are not able to cover (we lack the staff expertise due to retirements/resignation/participation in FERP or our staff are assigned to other teaching responsibilities) 34% (23 courses) of the course in the upper division curriculum (300 through 500 level courses)
Biology courses listed under their core area (bold) and matched to concentrations (columns). Each course is listed as Required (R) or Optional (O) in the concentration. Courses in italics are no longer offered. The bottom of the table shows the total number of required or optional courses no longer available for the concentration. [MB- Marine Biology MCB- Molecular and Cell Biology; EEC- Ecology, Evolution and Conservation Biology; PH- Physiology; MR- Microbiology]

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| Total               | 1         | 4          | 2     | 3      | 2      | 1     | 3     |

* See Appendix 7 for detailed listings of Required, Optional and Recommended upper division courses for various concentrations.
A growing concern among our faculty, and even commented upon by Dr. Connor (external reviewer for the Graduate Program), is that our concentrations appear to be unit heavy in the upper division. This delays timely progress toward graduation. Additionally, we are concerned that the concentrations may be too prescriptive of what courses are required and less flexible than necessary. One outcome of our Department’s mini-retreats has been a discussion of whether we should reorganize or do away with many of the concentrations.

One proposal is to develop a general B.S. degree that students would be able to construct through consultation with a faculty advisor. This would still require the rigorous experiences with foundational support courses, quantitative analysis, and research experience that distinguish the B.S. degree from the B.A. degree, but would also better accommodate the wide range of student interests in preparation for more specialized fields in biology. In addition, this type of degree would provide a greater degree of flexibility to respond to variations in course offerings due to influences of the budget or alterations in the available faculty cohort.

As a separate issue, we note our supervisory course offerings (BIOL 494, 495, 496, 498 and 499) require significant time commitment from faculty. Each faculty member receives 1/3 of a WTU per student in each supervision course. With a large number of students attracted to this form of one-on-one training by faculty, the requirement for completion of BIOL 494 and 496 for the B.S. degree, and with only 11 full time faculty, we often carry instructional overloads. One question that has arisen is whether we should find a more efficient means of offering some of our supervision courses.

3. Other

Our failure to effectively serve our students in lower and upper division courses has led the faculty to unwillingly declare impaction for the 2011/12 academic year. The decision is not driven from a curricular need but solely by budgetary restrictions.

The Reappointment, Tenure, and Promotion (RTP) process on the campus puts a large weight on the assessment of teaching effectiveness. One aspect of this assessment is the use of Student Evaluations of Teaching Effectiveness (SETE) scores. These numerical scores (1 being lowest, 5 highest) in various categories as assessed by students, are typically used in the RTP process to gauge teaching effectiveness of non-tenured faculty in their annual evaluation. However, some of our faculty recognizes an over emphasis on these numerical scores leading newer faculty to feel pressured to reduce the rigor in their courses to gain more favorable SETE scores from their students.

B. Staffing:

1. Faculty Involvement in University Governance and Resource Re-allocation: As our faculty become involved in University governance and receive release time from teaching, or earn sabbaticals, or buyout teaching time using funds from external grants/contracts, the Department does not receive direct replacement of this release time. Instead, the replacement funds are simply added to the overall temporary faculty budget of the School. Although the School attempts to maintain a fairly equitable level of funds from year to year, the funds do not result in a one-to-one replacement of faculty who are involved in non-instructional activities that benefit the university.
2. Faculty Recruitment: Faculty have retired/left over the past five years and have not been replaced. Since 2005 four faculty members have either left the university (Dr. Sakanari), retired (Dr. Northen and Dr. Thatcher) or have taken the Faculty Early Retirement Program (Dr. Christmann). In the same time period we have had three new hires. Of these, two were for faculty positions lost prior to this 5 year period. Thus we are at a deficit of 2-3 positions, mostly in the area of molecular and cell biology, leading to greater reductions in course offering in this area of the curriculum. With current state budget projections and demand for positions across the campus, there are no foreseeable resources to deal with this situation.

Our level of institutional support has effects beyond our curriculum and staffing.

a. One of the most critical issues resulting from insufficient institutional support has been start up funds for new faculty. Average start up funds for new hires in our Department over the past 5 years have been approximately $16K and in most instances, the Department needs to identify our own contribution to these from our operating budget. This level of support makes it very difficult to attract young research productive faculty, especially in instrument intense disciplines such as physiology and molecular cell biology.

b. A second concern is the lack of support for equipment purchase for teaching laboratories. As equipment wears out and/or breaks down, our inability to replace or renew equipment has a negative impact on our ability to prepare students in techniques of modern biological investigation. Thus, students in the lower division are not well prepared for laboratory/field experiences in the upper division, and upper division students inadequately prepared for their careers after graduation. In response, faculty have been using their externally funded research grants for equipment and supplies for our curriculum.

c. Last year, the CSU restricted ‘non-essential’ travel. This has led to the cancellation of the system-wide department chair’s meeting. These meetings have been useful for gathering data about biology programs across the system and exchanging good practices. Some of the topics that have been discussed at these meetings are start up funds and research space for new hires, retention of junior faculty, curricular planning, and student retention and graduation. Some issues that we have not been able to deal with directly in the past year alone include i) successful application for lab fees to cover lab supply costs that cannot be taken from reduced operating budgets; ii) curricular planning, especially on the question of unit requirements in the major; and, iii) dealing with safety issues in teaching labs and on field trips. All of these issues were raised in various emails instead of being carefully considered by the chairs at a common meeting.

C. Other Concerns

One concern that has become apparent is that the level of preparation of students who transfer from the community college is consistently better than those who matriculate as freshmen at SSU. This may be seen as an outcome of transfer students being more mature and thus better prepared for upper division course work, but we feel this difference is the same for our native students coming from the lower division to the upper division. We wonder if this is a difference
in the preparation community colleges provide for beginning students versus how beginning students at SSU, including those in the Biology major, are trained.

D. Action Items

1. Assess, review, and consider the efficacy of the lower division and upper division curriculum to ensure that students acquire a deep and rigorous understanding of various biological principles.

2. Continue to strengthen our program by fostering a climate of excellence in teaching and scholarship.

3. Work with administration to obtain direct replacement of release/buyout time for faculty.

4. Identify specific faculty positions in support of curricular needs based on assessment data.

5. Work towards the rejuvenation of the molecular and cell biology part of the curriculum.

6. Develop specific strategies and opportunities for student and faculty research and professional development to support the department’s mission and curriculum.

7. Find strategies to support our faculty and staff in balancing the demands of contributing to the curriculum, pursuing scholarly activity, serving the University and wider community, and leaving time for personal and familial fulfillment.

Murali C. Pillai, Program Review Coordinator
Richard Whitkus, Department Chair
APPENDIX 1

ATTACHMENT I

To: School of Natural Sciences Review Committee
Sonoma State University

From: Sheri Zidenberg-Cherr
Department of Nutrition
University of California at Davis

and

Gary J. Brusca
Department of Biological Sciences
Humboldt State University

Subject: Sonoma State University Department of Biology Program
Review: Outside Reviewers

INTRODUCTION

_When the need arises - and it does - you must be able to shoot your own dog. Don't farm it out - that doesn't make it nicer, it makes it worse._

_Lazarus Long_

On March 30 and March 31, 1994, we had the opportunity to meet with and interview various members of the Sonoma State University (SSU) campus community to gather their input on the status and future of the Department of Biology. For reference, that meeting schedule is given below.

**Wednesday, 30 March**

- 9:00-10:00: Meeting with Biology Department Chair, Chris Kjeldsen
- 10:00-11:00: Meeting with Anne Swanson, Dean, School of Natural Sciences
- 11:00-11:30: Meeting with the herbarium staff and volunteers
- 11:30-12:00: Meeting with faculty member Eileen Thatcher
- 12:00-1:00: Meeting with Biology majors
- 1:30-2:00: Meeting with Kathryn Crabbe (Academic Programs) and Judith Hunt (Faculty Affairs)
- 2:00-2:30: Meeting with Biology Department temporary faculty
- 3:00-3:30: Meeting with faculty member Jim Christmann
- 3:30-4:00: Meeting with faculty member John Hopkirk
- 4:00-4:30: Meeting with faculty member Bob Sherman
- 4:30-5:30: Meeting with graduate students

**Thursday, 31 March**

- 8:00-8:30: Meeting with faculty member David Hanes
- 8:30-9:00: Meeting with faculty member Colin Hermans
- 10:00-11:00: Meeting with Biology Department staff
- 11:00-11:30: Meeting with faculty member Galen Clothier
- 11:30-12:00: Meeting with faculty member Chuck Quibell
12:00-1:00  Discussion at Biology Department Faculty Meeting
2:00-3:00  Meeting with Donald Farish, Vice President, Academic Affairs
3:00-4:00  Meeting with Biology Department Chair, Chris Kjeldsen

The input we received from these individuals was measured against other sources of information that were supplied to us in advance of our visit. These sources include various comparative numerical data on staffing, enrollment, student:faculty ratios, budget figures, and other routine information. In addition, and perhaps most important, we studied the department's 1988 Program Review and a follow-up report dated 12/8/93. The latter document was most helpful in setting the stage for our evaluation. It presents summaries of how the Department of Biology has responded to issues raised during the 1988 program review in the context of the State of California's budgetary situation during the past few years, and it includes a detailed Mission Statement for the department.

The fundamental questions we asked ourselves during our visit were: 1) Is the Department of Biology presently meeting its goals as presented in its Mission Statement?; and 2) What must the Department of Biology do to meet these goals in the foreseeable future?

Early in our interview schedule, it became abundantly clear that there are a few fundamental problems and issues facing the Department of Biology. None of these problems or issues are surprising when placed in the context of the current financial situation in the State of California, and it is clear that most of them are related to budgetary constraints. Nonetheless, not all of the concerns are strictly financial or mechanical, and we also recognize and address those of a more philosophical nature.

We chose to frame this report around a few of these major issues that seemed to be pervasive at all levels of the campus community. Specific issues are subordinated and discussed under these major headings. While any such organization of complex and interrelate topics is somewhat artificial, we hope this format will facilitate conveying our thoughts. To that end we have organized our report according to the following outline:

I. Non-Salary Budgetary Issues
   A. Equipment
   B. Library Holdings
   C. Space and Facilities
   D. Faculty Development

II. Curriculum Issues

III. Faculty Size and Future Hiring

IV. Staff Size and Future Hiring

V. Student-Faculty Relationship and Student Support

Under each heading we present a synthesis and summary of the information gathered during our interviews, followed by our recommendations where appropriate. We wish to emphasize, and will do so periodically throughout this report, that these recommendations are based on our limited and brief conversations with the groups and individuals listed in the schedule above. We apologize for and ask your indulgence in any misinterpretations of the information we gathered as might be reflected in inappropriate or redundant recommendations.

NON-SALARY BUDGET ISSUES
There is no question that recent budget cuts accompanied with early retirements have drastically affected the department. Over the past 2 years, 5 full time faculty have or will retire. As a result of the consistency of maintenance of the number of Biology majors, the student faculty ratio at SSU has increased and is presently the highest in the system next to San Francisco State University. The Department of Biology is presently allocated 10 tenure track positions plus 0.50 FERP plus 0.66 chair. The department is presently recruiting for two full time tenure-track positions. It is clear that the department has felt the loss of faculty as they are overloaded with teaching responsibilities. These demands simply cannot continue if there is a desire to maintain a strong program.

A. Equipment and Operating Expenses

Based on our discussions with faculty, students, and staff, it is apparent that Biology Department allocation for new and replacement equipment has dwindled from roughly $50,000-60,000 several years ago to zero for the past few years. The department's OE budget has remained at approximately $40,000, but is being utilized to cover more and more different costs as other allocations decline. In spite of the imposition of laboratory fees and field trip transportation fees for some courses, the situation is bad and getting worse.

Below is a sampling of paraphrased comments on this subject that we received during our interviews.
- There is serious concern about the declining level of functional equipment and OE support for maintaining the graduate program (Dean Anne Swanson).
- Designated financial support for graduate student research is gone, and monies for that purpose must come from other sources (Staff).
- Equipment of all kinds is deteriorating and new equipment purchases are essentially nonexistent; these factors are presently having negative effects on the classroom experience (Undergraduate students).
- The lack of equipment is preventing students from acquiring the hands-on experience in modern biological techniques necessary to be competitive in today's market. Some students are convinced that they are unable to compete successfully with applicants from other institutions in their search for certain jobs (Graduate students).
- The equipment budget in all respects - for repair, replacement, and new purchases - is a serious problem; the department is falling behind other institutions in such areas as interactive and inter campus computer software (Faculty).
- There is a critical need to provide every faculty member with a computer workstation and networking capabilities (Faculty and Administrators).
- There is the perception that money presently devoted to some aspects of campus maintenance (e.g., landscaping and remodels) could be better spent on classroom necessities such as equipment repair and purchase (Faculty).
- There is concern over the increasing pressure to pursue outside sources of funding to augment/replace equipment and OE monies. Some faculty variously express the opinions that: 1) they were not hired to engage in such activities; 2) they are not trained to conduct fundraising activities; and 3) they do not have the time to pursue external funding (Faculty).
- If the department is to maintain and ultimately enhance its ability to expose students to modern biological topics and techniques, it must face the fact that these fields are expensive, and the university must be willing to commit the necessary funds to support them (Faculty).

These concerns about equipment money and operating expense allocations were repeated in various ways throughout our two day visit. It is absolutely crucial for the university to recognize and respond to the fact that science curricula are intrinsically much more expensive than are those of many other academic disciplines. In science, the quality and quantity of supplies and equipment are second only to the quality and quantity of the
faculty as a measure of an institution's ability to provide its students with the necessary education and skills to compete and succeed.

We were pleased and encouraged by the Academic Vice President's commitment to request approximately $133,000 for equipment money for the natural sciences, and approximately $100,000 to continue the procurement of faculty computer workstations. This action sends a positive message of academic support to the science faculty. However, the amounts and the nature of augmentation funding is seriously insufficient in the long run. As the budget crisis continues, the gap widens between what is available and what should be available to a department in the biological sciences. The more such a department falls behind in equipment repair and purchase, the less likely it becomes that such a deficit can ever be overcome.

We recommend:

1. Every effort must be made to secure immediate funding to repair and make operational existing equipment and maintain necessary expendable supplies for laboratory courses. In order to prevent further deterioration of classroom equipment, less critical areas of campus maintenance and improvement may have to be deferred.

2. Individual faculty members should prepare two lists for equipment expenditures: A) Essential repair and replacement costs for the next two to three (2-3) years, itemized by course use; B) Essential new equipment purchases to satisfy course requirements over the next five (5) years.

3. The faculty of the Department of Biology should present, in a united fashion, a set of proposals to resource allocation entities in which the gravity of the present situation and its potential impact on the departmental and university missions and the educational integrity of the sciences are clearly and emphatically explained.

B. Library Holdings

Often described as the "heart of a university," the campus library is pivotal to undergraduate and graduate education, and to faculty survival. In spite of the potential for future electronic information services, library holdings, especially journal subscriptions, are an essential part of a sound science program.

Cutsbacks in the Sonoma State library budget are recognized and lamented by faculty and students alike. Some biology faculty have made their personal libraries increasingly available to students, and while we applaud this generosity, it is an unacceptable and insufficient long term remedy to the present trend. The future dangers of continued cuts in journal subscriptions are similar to those outlined above for equipment deterioration. Even if adequate monies are eventually made available for re subscription, it is unlikely that additional funds will be forthcoming to regain lost issues.

The students, especially the graduate students, expressed great frustration over the lack of even some basic and fundamental journals. They acknowledge other avenues to the literature (e.g., interlibrary loan, author requests, visitations to libraries on other campuses), but view the situation as an unnecessary additional hurdle that slows progress toward their degree objective.

Some faculty members were nearly embarrassed by the loss of fundamental subscriptions, which they worry may never be regained.
We recommend:

1. Graduate students should be encouraged to make a concerted effort to begin now to build their libraries by requesting reprints from authors. We encourage the faculty to help their graduate students by outlining the procedures, courtesies, and protocols of this professional practice.

2. Every effort should be made to preserve existing and reestablish important journal subscriptions. In our opinion, maintaining journals must take priority over purchase of new books. When adequate funding resumes, it will be much easier to purchase previously published texts than to acquire back issues of journals.

3. We are well aware that a diverse faculty will produce a diverse "wish list" of journals to retain. As difficult as it may be, the biology faculty must, again, present a united front in its request for subscriptions. Internal divisiveness only weakens the case for everyone concerned.

C. Space and Facilities

In general, space and new facilities on campus were not major issues when compared with other concerns. However, a few suggestions were made, and we include them here for the sake of completeness.

The herbarium manager and several of the volunteers noted the crowded conditions under which they are presently operating. This view was clearly supported by our observations at the time of our visit.

Some of the faculty mentioned and envisioned some sort of "museum" and/or "natural science center" as a future consideration. They cited potential advantages not only to students and faculty of SSU, but as a bridge to the community. Such a center might also serve as a focal organization for contract work that could involve faculty, students, and community members.

Some of the staff members expressed mild concern over the management of the proposed greenhouse addition. It is our understanding from their comments that the new greenhouse is to be built from funds associated with the donation of Mr. Raymond Burr's orchid collection. Furthermore, it was indicated that the new addition will be devoted largely to the maintenance of that collection. There is some question as to the educational value of this endeavor and the workload associated with this new facility.

Several comments from faculty and students focused on the potential use of off campus facilities by SSU students. Of particular interest in this regard is the possibility of enhancing the availability of the Bodega Marine Laboratory for SSU students, by developing some sort of formal arrangement with the University of California at Davis. Other field stations, laboratories, and even libraries at other locations might also be considered.

We recommend:

1. If additional space becomes available, we encourage the Department of Biology to consider enlarging the allocation to the herbarium. Additional storage and table space would clearly enhance the use of this facility.

2. Consideration should be given to the possibility of the joint campus/community development of a Natural History Museum. We view this as a positive idea in many regards, but clearly one that must be associated with long-range planning, for possible consideration under future and less constraining budgetary conditions.
3. Although we are largely ignorant of the conditions under which the new greenhouse has been authorized, we encourage the university to make its use for students and faculty as flexible as possible.

4. We encourage the faculty to enhance the possibilities for SSU biology students to make use of off campus facilities associated with other institutions and agencies. Such experiences have obvious benefits with little or no additional costs to SSU, and could be developed as internships, formal transferable courses, weekend field excursions in existing courses, or other mechanisms. For example, many other campuses in the CSU and UC have marine or inland field stations that could be made available to SSU classes or individual students for weekend, summer, or full academic term experiences.

Such internships would provide students with the background in specific techniques and prepare them for future work and graduate school. At the present time, internships in Biology are not applicable to the Biology major and changing this such that units be applied to the major was discussed and received a positive response from most of the faculty. The internships could be ones which students served as volunteer to allow for the student to benefit from the experience while not costing the participating institution. In addition, this could open doors for future jobs at the institution(s) for the student.

D. Faculty Development

Budget reductions have clearly had a negative impact on the broad issue of faculty development. The 12/8/1993 report from the Department of Biology states that, "In the last decade the professional development funds have been essentially nonexistent."

Faculty and some administrators acknowledge serious restrictions in funding for such things as: faculty travel; incentives for new hires including start-up monies for research; release time for faculty research and other aspects of faculty development, such as grant proposal preparation; and staff development for support of faculty research. We agree with many of the faculty in the Department of Biology, that the department's mission is jeopardized when its faculty is severely restricted in its ability to remain current, to engage in publishable research, and to actively expose students to investigative science.

In addition, some areas of faculty development overlap with comments made above regarding equipment purchase. These include individual faculty computer workstations, and repair and procurement of laboratory equipment. Most faculty in the CSU engage both graduate and undergraduate students in their research, and these activities depend in large part on well equipped teaching labs that double as research facilities.

In addition to the recommendations made under Equipment:

We recommend:

1. Justifiable faculty travel funds for attending professional meetings be given a high priority in the departmental budget, and increased as the financial climate clears. Furthermore, we encourage the continuation of the current method of allocating travel funds, whereby priorities are established on the basis of the faculty member's level of participation in the meetings in question. That is, a faculty member presenting a paper should be given priority over a faculty member simply attending the meetings.

2. We suggest that the entire faculty of the School of Natural Sciences collaborate to develop a program of differential teaching loads to accommodate those faculty engaged in active research programs. We realize that the CSU imposes certain bookkeeping constraints on such matters, and that faculty members cannot be awarded "free" WTU's
for research. However, there are mechanisms to "roll over" overloads from one term to another in order to reduce one's teaching during semesters when research time is most needed.

3. As a practical matter, the Biology Department should consider the following proposal. The various courses offered in so-called S-factor instruction (e.g., Biology 495, 496, 599), could be taken only in 4-unit blocks. That is, a student enrolling in one of these courses would have to take the course for 4 units, rather than for 1, 2, or 3 units. The formula payback to the department at 4 units just exceeds the "break-even" point for single student enrollment.

4. Financial commitments for faculty research and new-hire incentives are virtually impossible under the present budget situation. These items are, however, important to the health of the Biology Department and its mission, and we recommend that they be an integral part of any long-range planning proposal.

CURRICULUM ISSUES

It is clear to us that curriculum is a focal point of concern and some controversy among administrators, biology faculty, and biology students. Comments received during our interviews and statements in the 12/8/1993 document point out that the Biology Department is presently unable to adequately staff the diversity of courses it has traditionally offered, and that certain students are not being afforded the opportunities to take the classes they want or need in a timely fashion. The department's mission and goals are, in this regard, at risk.

In addition to the dilemma of staffing the present array of courses, we received some comments about particular class offerings and degree requirements.

In spite of the fact that a few faculty and students would prefer the Biology Department to emphasize a particular "kind" of biology, virtually all department members recognize the importance of maintaining diversity and breadth. They further recognize that synecology and molecular biology are not two separate fields, but instead are ends of a continuous spectrum of the study of life. We fully agree that any solid biology program ought to afford its students exposure to this range of study, and instill in them an appreciation of the relationships of all levels of investigation.

From 1973 to the present, the size of the biology faculty has been reduced by approximately 50%. This particular issue is addressed in the following section. Here we focus on the impact of faculty reductions in curriculum matters. The present situation forces the faculty and administration to consider two fundamental issues:

1. How should the Biology Department deal with the short-term dilemma of too few faculty to offer the range of courses traditionally presented?

2. What direction should the department take in curricular revisions and in the hiring of new faculty, both in terms of near-future replacements and long-term increases in faculty size?

Possible Curriculum Changes

In our opinion, the department can address the problem of the number of present course listings while at the same time maintain diversity in the biology program. Furthermore, we believe that there are some particular courses and topics that are presently points of faculty and student concern, and that may be addressed by curricular modifications. Below is a list of possible curricular changes that the biology faculty may wish to consider. Since our visit was a short one, and there are undoubtedly many factors of which we are unaware,
these suggestions are simply examples of the kinds of modifications that can be discussed. We in no way wish to convey the impression that we are knowledgeable enough to dictate a major overhaul in the department's programmatic structure.

We recommend consideration of the following:

1. Based on several comments, we encourage the faculty to seriously consider separating majors from non-majors in the present Biology 115 course. The basic and most valid justification for this separation is the fact that majors need a foundation for further study in the biological sciences, while non-majors need a terminal course that prepares them to make informed decisions about contemporary issues.

   There are several ways in which this division could be accomplished. One suggestion would involve only revising course content, not the addition of new courses. The existing Biology 115 could become solely a non-majors, general education course, perhaps with the lab listed as optional. The existing Biology 116, 117, and especially the 215 courses could be used to cover the necessary majors-oriented introductory material. Based on the present course descriptions, this would mean somehow incorporating the basic principles of Mendelian genetics, evolution, and ecology into Bio 116, 117 or 215.

2. Based on the available enrollment data, it appears that some of the General Education courses offered by the Biology Department are much more in demand than are others. The faculty might want to consider the following:

   There are a number of upper division courses that are not applicable to the biology major, refinement could focus on these courses (Bio 303 (Natural History of the North Bay Region--Combine Biology 303 and 314 as a North Bay Ecology general education course), 308 (Environmental Toxicology), 309 (Biology of Cancer), 310 (Human Biology), 311 (Sexually Transmitted Diseases), 312 (Oceanology), 318 (The Biology of Aging). While these courses serve as GE and serve other departments and colleges in the university, there units/numbers may have to be reduced to better meet the needs and goals of the Biology Department.

   One consideration is to allow some of these courses to meet requirements within the Biology major and refine some of the others to fewer hours, etc. Some of the above courses could be strengthened in its science content and fulfill major requirements. For example, Environmental Toxicology could require that students have a stronger chemistry background, especially Organic Chemistry (at least Chem 232--Survey of Organic Chemistry) and Biochemistry. In fact, it is unclear how this subject matter can be taught without these expectations. Presently, the only prerequisite for Environmental Toxicology is Biology 115. A similar argument can be made for the Biology of Cancer and Biology of Aging. Students would gain more from these courses if they had some foundation in Biochemistry. It seems that many of the above mentioned courses are designed to meet the needs of the students outside the major, leaving the majors without courses of substance in these areas. If they are going to be offered they should be providing the information that Biology Majors can utilize in their future endeavors.

3. Currently, Biology 215 (Introduction to Molecular Biology) requires a minimum number of prerequisites: General Botany (Biology 116), General Zoology (Bio117) and General Chemistry (Chem 115A and 115B). It is unclear how a class designed to teach basic cellular biology, including cellular physiology, macromolecular synthesis
and regulation, cellular bioenergetic relationships and molecular genetics can accomplish these objectives without the expectations that students have some foundation in biochemistry such as that provided in Chemistry 340. The department may want to consider making Molecular Biology a 300 level course.

4. Due to recent cuts and retirements, the laboratory time for 8 courses was reduced by substituting an hour of lecture for a three hour laboratory. Historically, the department has prided itself for its "hands on" reputation and dedication to providing this experience to students. The students voiced their regrets concerning this change and would appreciate more laboratory time. Along these lines, however, more laboratory time will not benefit the students unless equipment is in working order and the methodologies used are in line with present expectations in the field.

Deletion and/or consolidation of majors courses is less obvious to us, largely because we are not fully familiar with the mandates for offerings in certain options within the major, how committed the department is to retaining certain low enrollment options (e.g., Medical Technology), or the pending impact on certain courses by the proposed nursing program. Be that as it may, the faculty might consider some of the following suggestions.

5. At the graduate level, Biology 551 and 552 could be combined as a five (5) unit single semester course (three hours of lecture and six hours of lab per week).

6. We also suggest considering the addition of a graduate course, Biology 5XXX as a Special Topics in Advanced Biology, under which faculty teach courses in their specialties as demand warrants.

7. Other curricular matters that were discussed in our conversations are listed below. We suggest that the biology faculty consider these in their long range program planning.

A. Several students indicated that they would like to have available a statistics course directed at the particular problems associated with managing biological data. Such a Biostatistics course might be developed in conjunction with the Mathematics Department to focus on such issues as experimental design, sampling problems, nonparametric statistics, and other topics more directly applicable to laboratory and field investigations in biology.

B. Some faculty mentioned concerns about the Environmental Studies and Planning major in terms of the students' core training in hard sciences. The biology faculty might investigate the development of a formal or informal advisory relationship with that department, and make recommendations about courses that might complement those in Environmental Studies. It seems natural to us that the two departments should cooperate in the shared areas of coverage and interest.

C. It may be worthwhile for the department to examine carefully the actual variety of options it presently offers in concert with the numbers of majors in each option and enrollment data for the courses generally taken by students in those programs. It may be that elimination or consolidation of option avenues that attract very few students could help in making decisions about course reductions and increased efficiency.

Curricular and Program Direction
We have, in part, already addressed this issue in the opening general statements above. A few faculty members and students, and most of the administrators with whom we spoke, suggested that the Biology Department must "pick a direction, and focus on a particular approach to teaching biology." Some suggested emphasizing the established strength of field biology, others indicated a desire to concentrate on "modern" biological disciplines such as cellular and molecular biology. We disagree with these opinions. It is more important than ever before that students be introduced to the range of levels of biological organization and investigation, and to appreciate the relationships of these fields regardless of their own special area of interest.

We recommend:

The department should do whatever it can to maintain and strengthen its commitment to covering all of the major areas of the biological sciences. It should not attempt to become a specialty department in any particular and restricted field. We believe that this goal can be realized with careful curricular and faculty planning, and at the same time bring the number of course offerings into line with the available faculty to teach them.

FACULTY SIZE AND FUTURE HIRING

We have already noted the roughly 50% reduction in tenure-track faculty in the Biology Department over the last few years. In addition, two present faculty members are retiring this year. Taking these factors into consideration, but ignoring hiring efforts that are underway for AY 1994-95, we summarize the present faculty situation as grim.

There are really two issues that need to be addressed: faculty size and disciplines of future hires. Both of these issues are of crucial importance in the department's ability to meet the latter and the spirit of its mission statements.

First is the actual number of faculty members in the Biology Department. Clearly the department needs to increase its faculty size if it is to deal with the large number of students requiring its courses. The data supplied to us on FTE generation and SFR over the past years clearly indicate a disturbing trend in the SSU Biology Department. As faculty size dwindles, the remaining individuals are being asked to service more and more students, both in the various biology majors, and also in general education courses.

We recommend

1. The administration give high priority not only to replacing retiring faculty, but also to adding faculty members to the Biology Department. Assuming that enrollment trends continue, and that state budget constraints relax, the biology faculty-size target should be roughly 20 within the next 6 years.

2. We encourage the department not to promote the use of temporary faculty beyond reasonable and necessary levels. Hiring of temporary faculty should not be viewed as a long-term substitute for requesting and filling permanent, tenure-track positions.
The second issue is related to the curricular direction the department takes over the next few years. Decisions made in that regard will obviously affect the desired fields of expertise when considering faculty hiring. The present faculty is distributed by discipline roughly as follows (allowing for pending retirements).

<table>
<thead>
<tr>
<th>Discipline</th>
<th>No. faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetics, cell/molecular</td>
<td>one</td>
</tr>
<tr>
<td>Animal physiology</td>
<td>one</td>
</tr>
<tr>
<td>Cytology/histology/invertebrates</td>
<td>one</td>
</tr>
<tr>
<td>Vertebrates: anatomy/ecol/behavior</td>
<td>three</td>
</tr>
<tr>
<td>Plant physiol/non vascular plants</td>
<td>one</td>
</tr>
<tr>
<td>Plant tax/vascular plants</td>
<td>one</td>
</tr>
<tr>
<td>Microbiology and related fields</td>
<td>one</td>
</tr>
</tbody>
</table>

Clearly, there is an unequal representation of some fields. In fact certain particular and important course topics are seemingly not covered at all by the faculty listed above. Course information and catalogue listings indicate that the existing faculty members teach a variety of courses, some of which border only marginally on their fields of interest. While we agree that virtually any member of the department ought to feel comfortable teaching one or more of the introductory courses, it is neither reasonable nor academically sound for faculty to attempt specialty courses very far from their area of expertise.

Assuming that the faculty choose to maintain the diverse offerings, both for their majors and for non majors, that have been traditional at Sonoma State University, that goal must be reflected in a diversely trained faculty. Our recommendations below are based on that assumption.

We recommend:

The Biology Department faculty should outline a six-year hiring plan, taking into account predicted retirements, to augment its size and breadth of expertise. Acknowledging our limited information, we suggest that the following fields of specialty be considered separately and, where possible, in combination when conducting faculty searches. These disciplines are not presented in any particular order of preference or urgency of need. In addition, these suggestions in no way reflect deficiencies in the qualifications of existing faculty members presently teaching in these fields.

1. Genetics (perhaps with specialty in molecular or population genetics).
2. Invertebrate Zoology (perhaps with specialty in phylogenetic analysis or development).
3. Human Anatomy and Physiology.
4. General Ecology (perhaps with specialty in freshwater systems, mathematical modeling, or population ecology).
5. Marine Biology (perhaps with specialty in intertidal community ecology or marine mammals).
6. Cell Physiology (perhaps with specialty in comparative physiology).
7. Terrestrial Plant Ecology (perhaps with specialty in ecosystem dynamics).
8. Evolution (perhaps with specialty in molecular techniques).

**STAFF SIZE AND FUTURE HIRING**

The department has one full time secretary. The secretary can hire some part-time clerical help through the use of work study-funded undergraduates. It is clear that the faculty has learned to adapt to the small staff as they all type, collate and duplicate their exams and course materials. Such expectations result in the need for faculty to work extra hours to accomplish these as well as other tasks not previously expected.
Our conversations with faculty and staff indicate that although staff duties are being fulfilled, and things do get done (within the limits imposed by OE and equipment allocations), the present staff are being placed under increasing demands. Some reduction in staff personnel has been eased by increased hiring of work study students. Some staff members expressed concern about a lack of dependability of some students. They also expressed a lack of optimism in terms of ever increasing the present staff size. Some students noted that equipment maintenance and use training are already suffering from lack of knowledgeable personnel.

If the size of the Biology Department remains as it is now, then the present technical and secretarial staff can be viewed as minimally sufficient. We hope, however, that the department will grow in terms of faculty numbers and strength of programs. With that growth will come more demands on the staff, and added support personnel in permanent positions will be essential to maintain the quality of the educational mission of the department and the university.

We recommend:

Any increase in faculty size, equipment purchase (training and maintenance), or facilities (e.g., greenhouse, nature center, museum) must be accompanied by adequate staffing increases to ensure proper support. The biology faculty should plan carefully to request and secure such additional staff positions in concert with growth in faculty, facilities, and services.

STUDENT-FACULTY RELATIONSHIP AND STUDENT SUPPORT

The most encouraging comment we received was repeated frequently and universally by the students with whom we visited. They all expressed the view that the very best attribute of their department is the faculty. Time and again we were told that the faculty are always open, friendly, helpful, and available. The students were doubly appreciative of these attitudes because they realize the increasing demands being placed on their faculty as resources and support decline.

When we mentioned these comments to faculty members, they were - to the person - surprised. We applaud their spirit and dedication to the ideals of education embodied in what "being a bio major" at Sonoma State University once was, and can be again. We want the faculty to know that their efforts are appreciated by their students, and by us. That knowledge may help sustain them.

Student comments also pointed out several areas potential improvement in their relationship with the faculty. Some are concerned that faculty members are so busy with added duties that they do not have time for research in which the students can participate. Several mentioned that the faculty is no longer able to respond to some of the routine needs of the students (e.g., advising has become "haphazard" and should be formalized; students would like more input on the timing of course offerings; biology curriculum needs writing component; students want training in use of specialized equipment, and so on).

The graduate students had some particular concerns. They recognize a developing split in the department between the "cell types" and the "field types" - and they are worried about its impact on departmental morale. Some commented that increasing numbers of undergraduates in graduate courses were causing faculty to "teach down." Nearly all of the graduate students agreed that more support for their education was needed, especially in the form of teaching assistantships.

There was, in addition, an overriding concern voiced by all students: They feel that there is a great need for more efficient transfer of non-classroom information from faculty to students. They want to be made aware of such things as exchange programs, internships, career opportunities, summer field courses, job training programs, skills
development programs, their avenues of input on departmental and university issues including hiring and curriculum matters, and so on.

We discussed these points with some of the faculty, and it appears that two factors contribute to the students' perception. First, the faculty simply do not have the time to devote to gathering and delivering this information in any routine fashion. Second, some of this information is available and posted, but the students are not explicitly made aware of its presence.

We do not know to what degree students are included in departmental proceedings. It seems to us, however, that with minimal effort, major steps can be made to alleviate these various student concerns. If the following recommendations are not already in place, the department should consider implementing some or all of them.

**We recommend:**

1. The department adopt a more-or-less formalized advising program. While students may feel free to visit with any faculty member about their academic careers, each ought to be clearly assigned to a particular advisor responsible for duties of signatures and approvals. The students may feel more "secure" under a more official advisor/advisee arrangement.

2. Faculty members are encouraged to increase their expectations in developing students' writing skills. Such expectations might be addressed in formal term papers, lab write-ups, take-home essays, or a variety of other vehicles. We emphasize that the important aspect of such assignments is the development and refinement of writing skills including grammar, structure, diction, and syntax, as well as content and organization.

3. We encourage the faculty who teach graduate courses to be vigilant in their recognition of the double-edged-sword nature of such classes. Just as those faculty must set and maintain rigorous standards of performance by their graduate students, the students expect an advanced course of instruction from the professor. Undergraduates who enroll in such courses must be made aware of these standards, and should only be allowed into the courses with the expressed permission of the instructor.

4. We recommend that the department develop a one or two page weekly or semi-monthly, in-house "newsletter," for distribution to all faculty, staff, and graduate students, and to be made available in classroom and other places for undergraduates. Such a newsletter is an ideal vehicle for disseminating information quickly and regularly about meetings, seminars, scholarships, internships, summer programs, important dates, social events, job opportunities and virtually any other topics that impact on the department and its students. We know that such newsletters are used in many other departments, some much larger than at SSU, with great success. A catchy, biological name can be given to the paper (Humboldt State's weekly biology newsletter is called the Cloaca), and individuals can submit contributions through the department secretary or a work study student in charge.

5. As financial conditions allow, we encourage an increase in the number of teaching assistant positions for graduate students. To the extent possible, laboratory teaching should be encouraged as an expected component of graduate education. To this end, we support the suggestion of converting temporary help positions to graduate TA assignments, with the condition that such conversions do not have a negative impact on undergraduate course offerings.

6. In order to better ensure sufficient enrollment in graduate courses by graduate students, we suggest polling the graduate students for specific course requests. This can be done each term in advance of course scheduling.
7. Students should have a formal mechanism for providing input on certain departmental matters. For example, when candidates for faculty positions visit the campus and present seminars, students should be encouraged to attend, be afforded an opportunity to visit with the candidates, and be asked for written input expressing their opinions about the candidates.

8. We encourage the faculty to visit with both graduate and undergraduate students about various issues, including the direction the department hopes to move in the future. This can be done informally or by holding open meetings for students (perhaps once each term). Every effort should be made to encourage a feeling of community and cooperation with which the students can feel comfortable. Anything that can be done in this regard will not only improve the educational climate for the students, but will also promote departmental unity and strength.

In summary, it is clear that members of the department, although diverse in their training and some of their ideas, are individuals who are committed to maintaining a department which stands out from the rest. Specifically, they pride themselves in their commitment to student education. Despite the fact that they are teaching excessively high loads, they continually devote themselves to the students. The students are aware of this fact as both undergraduate and graduate students voiced this at our meetings. We feel that it is possible to maintain the diversity of the department while narrowing down some of the elective courses. The department stresses that their mission is to teach students to think and appreciate the science of biology. The fulfill this mission, the department must continue to teach the concepts upon which the science is based. The department is excellent in this area and through their attitudes and commitment, they succeed in igniting interest in their students. However, there needs to be more commitment to the teaching of research methodologies and expertise in modes of inquiry. With their limited budget and time, this is difficult and may become easier as their faculty number increase. But as a number of the administrators mentioned, "The old days are gone" and the department will have to be innovative in their modes for achieving this goal.

AFTERWORD

We visited your campus and department with different perspectives. One of us is a 27 year veteran of the CSU system, the other is a further Sonoma State undergraduate now employed by "the other guys," the University of California. It quickly became apparent that our opinions and perceptions of your department were similar enough that we could write a joint report, rather than separate ones.

We realize also that many of our recommendations border on "pie-in-the-sky" under the present state of financial chaos. However, everyone within the Biology Department conveyed one overriding sentiment: You care deeply about the education of your students, and you envision the circumstances under which your educational mission can be realized. Developing - reclaiming - those circumstances is the fundamental issue addressed in our report.

Finally, we are also fully aware that we have not told you much that you do not already know. Perhaps our report will serve to remind you that prophets are not without honor, save in their own universities, and having a couple of "outsiders" acknowledge your efforts may provide a small measure of encouragement to persevere.

*Freedom begins when you tell Mrs. Grundy to go fly a kite.*

*Lazarus Long*

*nil desperandum*
APPENDIX 2

Department of Biology Catalog Pages and Course Descriptions (2008-2010 Catalog Years)
The Department of Biology offers undergraduates two broadly based bachelor's degree programs and a Master of Science degree. Within each undergraduate degree program, there are opportunities for selecting a concentration. A congenial atmosphere allows students to develop a close relationship with peers, graduate students, and faculty. An emphasis is placed on laboratory and field courses and on participation in research.

The Biology Master’s program is comprised of an active cohort of graduate students engaged in original research with faculty members in all areas of research specialization covered in the department. Graduate research is often supported by external funding and graduate student support includes teaching associateships that involve close mentoring relationships with instructional faculty. Many graduates of the masters program go on to pursue doctoral degrees, and others continue in research, biotechnology, resource management, and education.

Laboratory instruction provides students with hands-on opportunities with physiological equipment, ultracentrifugation, PCR, electrophoresis, light microscopy, immunofluorescence microscopy, and microbiological techniques. Excellent laboratory and greenhouse facilities, such as the Raymond Burr Greenhouse and orchid collection, exist for maintaining live material for classroom use and research. A radioisotope laboratory is also available.

Field courses draw upon the unparalleled diversity of habitats in the North Bay region. They also capitalize on two spectacular nature preserves: Fairfield Osborn Preserve and Galbreath Wildlands Preserve, administered by Sonoma State University. In addition, the department maintains museum collections of local plants, algae and fungi (North Coast Herbarium of California), vertebrates (Jack Arnold Vertebrate Collection), and insects and other invertebrates.

Careers in Biology

Biology graduates are prepared to enter the job market in a variety of careers, including government agencies, park service, biological research, teaching, biotechnology, and medical technology. Students seeking a teaching credential may elect biology as their major within the teaching credential preparation program in science. Graduates from the department have an outstanding record of acceptance in advanced degree programs at technical, dental, veterinary, medical, and graduate schools, as well as in fifth-year hospital traineeships in medical technology.

The biology curriculum, supported by physical sciences and mathematics, is designed to provide students with a strong background in the principles of biology and rigorous upper-division instruction. This combination of breadth and in-depth instruction allows students to develop the intellectual foundations and the skills necessary to deal with the specific biological concerns of today and the flexibility to meet the future needs of the profession.

Biology Degree Concentrations

Many students are well served by the basic B.A. plan without a concentration. Some, however, select one of two concentrations for a B.A. Both the B.A. and B.S. share a common lower-division core, hence beginning students need not select a plan immediately. The B.A. program leaves more flexibility for electives and a minor. The B.S. requires a specific concentration, including more physical science, mathematics, and total units. Upon completion of specified course work, a concentration will be designated on the transcript and diploma. Students should contact the department for specific requirements.

Bachelor of Arts
Botany
Zoology

Bachelor of Science
Physiology
Molecular and Cell Biology
Ecology and Evolution and Conservation
Marine Biology
Microbiology
Preparation for Applying to Health Professions

Students majoring in biology intending to pursue careers in the allied health fields may follow the guidelines for a B.S. degree or a B.A. degree (with the addition of MATH 161, CHEM 335B, and PHYS 210AB and 209AB). They are encouraged to enroll in SCI 150, Introduction to Careers in the Health Professions, during their first fall semester.

For admission to most health profession schools, regardless of major, it is typically recommended or required that specific biology courses be incorporated into the B.A. or B.S. degree. These include:

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<tr>
<th>Premedical</th>
<th>Preveterinary</th>
<th>Predental</th>
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<tbody>
<tr>
<td>BIOL 342 Molecular Genetics (4)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>BIOL 472 Developmental Biology (4)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>BIOL 349 Animal Physiology (4)</td>
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</tr>
<tr>
<td>BIOL 328 Vertebrate Evolutionary Morphology (4)</td>
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<td></td>
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<td>BIOL 344 Cell Biology (4)</td>
<td></td>
<td>x</td>
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<tr>
<td>BIOL 340 General Bacteriology</td>
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<td></td>
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<tr>
<td>BIOL 307 Human Nutrition</td>
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<tr>
<td>BIOL 480 Immunology</td>
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</tr>
</tbody>
</table>

Secondary Education Teaching Credential Preparation in Life Science

Contact the department chair for information on completing a biological sciences concentration for a Single Subject Credential Preparation Program.

Degree Requirements

**B. A.**

General Education (51 units, 12 units covered by major requirements in math and science) 39 39

Lower-Division Biology (BIOL 121, 122, 123) 12 12

Upper-Division Biology Core (1 course from each of 4 areas) 16 16

Upper-Division Biology Electives (as specified by concentration) 15 17-20

Concentration specific physical science -- 3-0

Senior Research (BIOL 495 and 496) -- 3

**B. S.**

Physical Sciences and Mathematics:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>CHEM 335A or 232</td>
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<tr>
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<td>MATH 165</td>
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<td>MATH 161</td>
<td>4</td>
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</table>

| B. A. | 4 or 3 | -- |
| B. S. | | |

| PHYS 210A/209A or GEOL 102 | |

| General Electives | 15-16 | 3 |

Upper-Division Biology Core

Complete one course from each of the following groups (Additional courses from each group may be used as electives or may be required for particular concentrations):

**Organismal Biology (4 Units)**

- BIOL 329 Plant Biology (4)
- BIOL 340 General Bacteriology (4)
- BIOL 322 Invertebrate Biology (4)
- BIOL 327 Vertebrate Biology (4)
- BIOL 382 Parasitology (4)

**Physiology (4 Units)**

- BIOL 349 Animal Physiology (4)
- BIOL 347 Environmental Physiology (4)
- BIOL 348 Plant Physiology (4)
- BIOL 328 Vertebrate Evolutionary Morphology (4)

**Molecular And Cell Biology (4 Units)**

- BIOL 342 Molecular Genetics (4)
- BIOL 343 Molecular Microbiology (4)
- BIOL 344 Cell Biology (4)
- BIOL 383 Virology (4)

**Ecology And Evolution (4 Units)**

- BIOL 333 Ecology (4)
- BIOL 341 Evolution (4)
- BIOL 335 Marine Ecology (4)
- BIOL 337 Behavioral Ecology (4)

Upper-Division Biology Electives

Biology major electives are upper-division courses beyond those used to fulfill the upper-division core and the B.A. or B.S. concentrations. Major electives are used to meet the total upper-division unit requirement for the B.A. (31 units) or B.S. (36 units). Major electives are chosen from among the following:

1. Additional courses from the upper-division core groups and alternative courses in a concentration.
2. Any Biology course numbered greater than 320. This list is subject to revision following this catalog edition. Students should check with their academic advisor for updates. Seniors may also take graduate courses (500 level) with permission of the instructor.
3. Supervisory courses in biology, leading to hands-on experience, extension of knowledge, or research experience. These courses are: BIOL 395, 495, 496, 498, and 499 (see Restrictions, below, for unit limits for these courses).
4. Biology colloquium, BIOL 390, may be taken twice (2 units) for major credit.
5. A maximum of 4 units from courses related to biology from other departments or from the department's non-majors courses. To apply the units to the major, students are required to obtain written permission from their advisor before taking these courses, unless the course is listed as part of a...
concentration. (Obtain forms in department office.) The following is the current list of acceptable courses: ANTH 301, 302, 318, 345, 414; BIOL 220, 224, 243, 307; CHEM 441, 445, 446; ENSP 315, 321, 322, 323; GEOG 416; GEOL 413; KIN 360; PSY 451.

Restrictions

1. A maximum of 4 units taken in the Cr/NC grading mode may be applied to the major from the following courses: BIOL 390, 395, 498, 499.

2. All other courses in the biology major must be taken in the traditional grading mode (A-F).

3. A maximum of 7 units from the following list of courses may be applied to the major: BIOL 390, 395, 495, 496, 498, and 499.

Sample Four-year Program for Bachelor’s Degree in Biology

<table>
<thead>
<tr>
<th>FRESHMAN YEAR: 31-33 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Semester (16 Units)</td>
</tr>
<tr>
<td>ENGL 101 (3)* (A2)</td>
</tr>
<tr>
<td>BIOL 121 or 122 (4) (B2)</td>
</tr>
<tr>
<td>MATH 165* (4) (B4)</td>
</tr>
<tr>
<td>CHEM 115A (5) (B1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOPHOMORE YEAR: 31-35 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Semester (15-17 Units)</td>
</tr>
<tr>
<td>BIOL 123 (4)</td>
</tr>
<tr>
<td>CHEM 232 or 335A (5)</td>
</tr>
<tr>
<td>Electives** (6-8)</td>
</tr>
</tbody>
</table>

Biology majors are expected to complete all of the lower-division core requirements before attaining junior standing (60 units). This maximizes flexibility in upper-division course selection by ensuring that essential prerequisites will have been completed. BIOL 121, 122, and 123 should be completed before taking any upper-division course.

<table>
<thead>
<tr>
<th>JUNIOR YEAR: 28-34 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Semester (14-17 Units)</td>
</tr>
<tr>
<td>Complete Written English Proficiency Test after completing a total of 60 units.</td>
</tr>
<tr>
<td>Two BIOL UD core courses (8)</td>
</tr>
<tr>
<td>Electives*** (6-9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SENIOR YEAR: 30-36 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete the biology requirements by completing required and elective courses in the major and support courses in physical sciences and math.</td>
</tr>
<tr>
<td>Complete general education requirements to a total of 51 units (48 for transfer students), including ethnic studies. All area B GE requirements are met by courses required in the Biology major.</td>
</tr>
</tbody>
</table>

TOTAL UNITS::  FOR B.A. DEGREE, MINIMUM 120  FOR B.S. DEGREE, MINIMUM 126

Bachelor of Arts in Biology: Concentrations

The lower-division core is structured so that switching between the B.A. and B.S. programs in the first two years will not delay completing either degree program. The B.A. does not require a concentration. However, students may wish to focus their upper division course work in a particular area. Botany and Zoology are approved concentrations in the B.A., which may be designated on the diploma. Courses from all 4 core areas are included in each concentration. The upper division major requirements for each are:

**B.A. Botany Concentration (31 units)**

- BIOL 329 Plant Biology 4
- BIOL 348 Plant Physiology 4
- BIOL 330 Plant Taxonomy 4
- BIOL 331 Aquatic Botany 4
- BIOL 333 Ecology 4
- BIOL 341 Evolution 4
- One of the following 2 courses: 4
  - BIOL 342 Molecular Genetics, or  
  - BIOL 344 Cell Biology
- Additional upper division major electives 3

**B.A. Zoology Concentration (31-32 units)**

- BIOL 322 Invertebrate Biology 4
- BIOL 327 Vertebrate Biology 4
- BIOL 328 Vertebrate Evolutionary Morphology 4
- BIOL 323 Entomology 4
- One of the following 2 courses: 4
  - BIOL 347 Environmental Physiology or  
  - BIOL 349 Animal Physiology
- One of the following 3 courses: 3-4
  - BIOL 463 Herpetology, or  
  - BIOL 468 Mammalogy or  
  - BIOL 472 Developmental Biology

Before or during Fall semester of the fourth year, all students planning to graduate that academic year must formally apply to graduate. With their advisor, students will complete the biology requirements form and list any remaining required courses they must complete to graduate.

*If a student is not eligible to take either of these courses in the first semester, that student must be enrolled in the recommended preparatory Courses(s) and complete these courses in the next semester. Students must also delay CHEM 115A until satisfying GE math eligibility. This may extend time to graduation beyond 4 years.

**Electives should include at least one lower-division (100-299) GE course each semester. Electives may include additional physical science and mathematics (consult your biology advisor). Unit total per semester should average approximately 15-16 throughout all eight semesters (8 x 16 = 128) to complete the degree requirements in four years.

***Electives include upper-division BIOL electives and physical science support as well as upper-division (300-499) GE courses. NOTE: Most upper division BIOL electives require completion of BIOL 123. Beginning in the semester in which 60 units total is reached, each student is required to complete 9 units of upper-division GE.
Bachelor of Science in Biology

Students must specify a particular concentration for the B.S. and meet its requirements. The lower-division core is structured so that switching between the B.A. and B.S. programs in the first two years will not delay completing either degree program. Students normally complete the additional physical science and mathematics for the B.S. after the first two years.

Courses from all 4 core areas are included in each concentration. The following are approved concentrations in the B.S., which will be designated on the diploma. The upper division major requirements for each are:

**B. S. Marine Biology Concentration (39 units)**

- BIOL 322 Invertebrate Biology 4
- BIOL 331 Aquatic Botany 4
- BIOL 335 Marine Ecology 4
- BIOL 341 Evolution 4
- BIOL 347 Environmental Physiology 4
- BIOL 485 Biometry 4
- One course from the Molecular and Cell Biology Core Area 4
- Additional upper division major electives 8
- BIOL 495 Special Studies prior to Senior Research 1
- BIOL 496 Senior Research 2

**B. S. Molecular and Cell Biology Concentration (39 units)**

- BIOL 340 General Bacteriology 4
- BIOL 342 Molecular Genetics 4
- BIOL 344 Cell Biology 4
- BIOL 341 Evolution 4
- One of the following 2 courses:
  - BIOL 348 Plant Physiology 4
  - BIOL 349 Animal Physiology 4
- Two of the following 4 courses:
  - BIOL 343 Molecular Microbiology 4
  - BIOL 344 Cell Biology 4
  - BIOL 383 Virology 4
  - BIOL 472 Developmental Biology 4
- BIOL 480 Immunology 4
- One of the following 2 courses:
  - CHEM 445 Structural Biochemistry 4
  - CHEM 446 Metabolic Chemistry 4
- One of the following 3 courses:
  - BIOL 322 Invertebrate Biology 4
  - BIOL 327 Vertebrate Biology 4
  - BIOL 329 Plant Biology 4
- One of the following 3 courses:
  - BIOL 328 Vertebrate Evolutionary Morphology 4
  - BIOL 347 Environmental Physiology 4
  - BIOL 348 Plant Physiology 4
- BIOL 495 Special Studies prior to Senior Research 1
- BIOL 496 Senior Research 2

**B. S. Ecology, Evolution, and Conservation Concentration (39 units)**

- BIOL 333 Ecology 4
- BIOL 341 Evolution 4
- ENSP 322 Conservation Biology 4
- BIOL 342 Molecular Genetics 4
- BIOL 485 Biometry 4
- One of the following 3 courses:
  - BIOL 322 Invertebrate Biology 4
  - BIOL 327 Vertebrate Biology 4
  - BIOL 329 Plant Biology 4
- One of the following 4 courses:
  - BIOL 335 Marine Ecology 4
  - GEOG 416 Biogeography and Landscape Ecology 4
  - BIOL 337 Behavioral Ecology 4
  - BIOL 243 Environmental Microbiology 4
- One course from the Physiology Core Area 4
- Additional upper division major electives 4
- BIOL 495 Special Studies prior to Senior Research 1
- BIOL 496 Senior Research 2

**B. S. Physiology Concentration (39 units)**

- BIOL 344 Cell Biology 4
- BIOL 372 Developmental Biology 4
- CHEM 446 Metabolic Chemistry 3
- Three of the following 4 courses:
  - BIOL 328 Vertebrate Evolutionary Morphology 4
  - BIOL 347 Environmental Physiology 4
  - BIOL 348 Plant Physiology 4
  - BIOL 349 Animal Physiology 4
- One of the following 3 courses:
  - BIOL 322 Invertebrate Biology 4
  - BIOL 327 Vertebrate Biology 4
  - BIOL 329 Plant Biology 4
- One of the following 3 courses:
  - BIOL 495 Special Studies prior to Senior Research 1
  - BIOL 496 Senior Research 2

**B.S. Microbiology Concentration (39 units)**

- BIOL 340 General Bacteriology* 4
- One of the following 3 courses:
  - BIOL 347 Environmental Physiology 4
  - BIOL 349 Animal Physiology* 4
  - BIOL 348 Plant Physiology 4
- One of the following 2 courses:
  - BIOL 333 Ecology* 4
  - BIOL 341 Evolution 4
- Two of the following 3 courses:
  - BIOL 382 Parasitology* 4
  - BIOL 480 Immunology* 4
  - BIOL 481 Medical Microbiology* 4
- One of the following 2 courses:
  - CHEM 255 Quantitative Analysis* 4
  - BIOL 243 Environmental Microbiology 4

*Required or recommended for application to Clinical Laboratory Science Internships

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Sonoma State University 2008-2010 Catalog
Additional upper division major electives  5
BIOL 495 Special Studies prior to Senior Research  1
BIOL 496 Senior Research  2

**Minor in Biology**

The minor consists of a minimum of 20 units in the Department of Biology with a GPA of 2.00 or higher. The purpose of the minor is to provide the student with a rigorous background in biology that supplements the student’s major.

Students must develop a program in consultation with a faculty advisor in the Biology Department. Requirements of the Biology Minor are:

- Take two of the 3 lower-division major’s courses listed below  8
  - BIOL 121 Diversity, Structure, and Function
  - BIOL 122 Genetics, Evolution, and Ecology
  - BIOL 123 Molecular and Cell Biology

- Twelve additional units in Biology  12

At least eight of these units must be upper-division courses for majors and at least one of those must have a laboratory. Only one GE course in biology or a third lower-division biology major’s course can be applied to the minor, as well as one unit of Biology Colloquium (BIOL 390). All courses applied to the minor must be taken for a letter grade, except BIOL 390.

**Master of Science in Biology**

The Master of Science degree in the Department of Biology is a thesis research program. Students complete 30 units of coursework that allows them to master the concepts and techniques of their chosen discipline. They also conduct original research under the direction of a member of the faculty and write up their findings as a Master’s Thesis. Typically, students take two to three years to complete their graduate degree requirements.

Graduate students in the Department of Biology are supported through a variety of sources. The Department has approximately 12 teaching associateships (two laboratory sections) available each semester, and these positions are filled one semester in advance (contact the Graduate Coordinator for details). In addition, students may receive research associateships through individual faculty members and their research grants. The University offers a limited number of tuition fee waivers for qualified teaching associates. Students can also obtain academic scholarships as well as financial aid (usually in the form of low-interest loans).

The Department of Biology permanent faculty are actively involved in a wide range of disciplines, including ecology and evolutionary biology, molecular and cell biology, physiology, functional morphology, and organismal biology. Additional faculty from other departments on campus have expertise in biology and are adjunct members of the graduate program.

Graduates of this program find themselves with an enhanced understanding of biology and first-hand experience in the practice of science. Many of our students go on to doctoral programs; others use their degree to pursue careers in teaching, research, environmental consulting, resource management, industry, and various health professions.

**Admission to the Program**

To apply, you must submit: A) items 1-3 to SSU’s Admissions and Records Office, and B) copies of items 1-3 and originals of items 4 and 5 to the Department of Biology Graduate Coordinator, Dan Crocker. The application deadline in the department is January 31 for the Fall semester and October 31 for the Spring semester. The SSU Admissions and Records Office will notify students about the status of their applications.

1. Complete a University application obtained from the Admissions and Records Office. NOTE: If you submit online, be sure to print a hardcopy to send to the Department of Biology.
2. Provide official copies of all undergraduate transcripts.
3. Provide a one-to-two page Statement of Purpose essay detailing your background in biology, objectives for graduate school, and career goals.
4. Request two letters of recommendation from individuals familiar with the student’s background in biology and able to comment on the potential for conducting original work.
5. Provide Graduate Record Examination (GRE) scores for the General test. Biology Subject scores are strongly recommended, but not required.

**Admission to the program requires:**

I. Meeting California State University admissions requirements.
II. Acceptance by a Biology faculty member (tenure-track or approved SSU adjunct) to serve as a faculty advisor. Students are strongly encouraged to review the information on faculty members and contact them prior to completing an application.

**IMPORTANT:** The above complete application package must be received in the Admissions and Records Office and by the Biology Graduate Coordinator before an applicant will be considered for admission.
III. Approval of the Graduate Committee. Applications will be reviewed for evidence that the prospective student is capable of initiating and performing original research. Students will be admitted into Classified Standing. Applicants deficient in undergraduate course preparation will be expected to demonstrate competency before being advanced to candidacy. As a general guideline, the Department uses the following criteria to determine this potential:

An undergraduate degree in biology or equivalent, including:

A. One course in calculus or statistics;
B. One year of general chemistry and one semester of organic chemistry;
C. At least one other course in physical sciences;
D. Upper division coursework demonstrating competence in three of four core areas (organismal biology; physiology; molecular or cellular biology; ecology or evolutionary biology);
E. GPA of 3.0 or higher in the last 60 units;
F. A score at or above the 50th percentile on each section of the General Examination of the GRE; and
G. Evidence in letters of recommendation of potential for conducting independent and original research in biology.
APPENDIX 3

Examples of Course Syllabi
Biology 110: Biological Inquiry – Spring 2010 – Ives 101  11:00 am.

Instructors:  Julie Bright
Office:  Darwin 216
Phone:  (707) 664-2717
E-mail:  bright@sonoma.edu
Office Hours:  Mon and Wed. 9:20-10:20 am.

Course Introduction
This four-unit course provides a factual and conceptual exploration of the living world through class presentation, student inquiry, and laboratory exercises. Topics are covered in a manner that relates to everyday experiences and include the basic processes of life, organization of living systems, and interactions among those systems. This course satisfies GE, category B2 (Biological Sciences) and the laboratory experience in Natural Sciences. This course is not applicable to the biology major.

Required Texts and Materials:
- **Laboratory** – Biology: Science for Life Laboratory Manual: (Borden & Belk). 2nd ed.
- **I>clicker** – at SSU bookstore.

Lecture outlines and readings are provided on the class WebCT site and are designed to help students follow lecture material with increased comprehension. On their own, lecture outlines are insufficient for understanding lecture material without attending lecture. Note: Visit www.mybiology.com for study aids that accompany the text.

Grading

- **Exams**: Four in-class lecture exams will focus on lecture material and will be in multiple choice, matching, and true/false format. These will require the purchase of the large, blue scantron sheets in the bookstore.

- **Lecture Quizzes**: The online WebCT format will be used to give brief quizzes on lecture and text material. More will be explained in class.

- **On-Line Reading Assignments/Quizzes**: WebCT quizzes will be given for online (media) assignments. One week is given for completion of each reading and quiz.

- **I>clicker Questions**: A few questions will be posed during lecture, and your responses with the clicker will be recorded as points.

- **Laboratory Activities and Assignments**: Students will participate in associated laboratory sections. These activities will account for more than 1/3 of the overall grade in the course. The labs will include in-class activities or demonstrations, readings, discussions, a field activity, and video observation. The details regarding the expectations related to the lab sections will be provided by lab instructors.
Available Points for the Semester:

- Lecture Exams (50 points each)  200
- Chapter Quizzes (5 points each)  50
- On-Line Reading/Activity Assignments (5 points each)  25
- iclicker Responses (1 point each)  40
- Laboratory  185

Total  500

Grades are based on the allotment of points given above. NO EXTRA CREDIT is available in this course.

A = 90-100%  B = 80-89%  C = 70-79%  D = 60-69%  F = Below 60%

Plus and minus grades will be assigned.

STUDENT RESPONSIBILITIES

Completion of all exams and assignments by given deadlines is required. Grades are posted in WebCT throughout the semester, and students should notify the instructor immediately if there is a question. In Email correspondence, write BIOL 110 and a specific phrase (e.g. exam 2) in the subject heading.

Students are expected to review the assigned material in advance of the lectures and bring their full attention to the classroom. (No side-conversations, texting, music, or food.) If you need to leave class early, please notify the instructor at the beginning of class and sit near the door. In the event of an absence, obtain lecture notes and important announcements from classmates. Bring your i>clicker to class and register the clicker online (www.iclicker.com) by using your WebCT login name (instructions in class).

There is no make up for missed lecture exams, chapter quizzes, on-line reading/activity assignments, or laboratory work unless there is a documented serious and compelling reason as defined by the University (See Course Withdrawal Policy, section 8 and 9). Travel plans or other activities for personal reasons will not be accepted. If your computer has a problem, you can complete the online quizzes at the 24-hr. computing lab in Schulz 1058. If you miss your regular biology lab section, contact your lab instructor immediately. With permission from both lab instructors, you may attend another lab section. Please make requests 24 hours in advance. Permission depends on available space, materials, and valid documentation.

The Tutorial Center and Learning Skills Services offer help to students on an individual or group basis. If you have a disability that requires accommodation in this class, you must register with the campus Disabled Student Services located in Salazar Hall 1049, extension 42677.

All students are expected to be familiar with the University Policy on Cheating and Plagiarism: http://www.sonoma.edu/uaffairs/policies/cheating_plagiarism.htm
# Tentative Lecture Schedule

The following are planned dates for lecture topics. Actual dates may change depending on pacing of lectures and discussion in class.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Chapters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Feb. 1</td>
<td>Course Introduction</td>
<td>WebCT</td>
</tr>
<tr>
<td></td>
<td>Feb. 3</td>
<td>The Process of Science, Evaluating Scientific Information</td>
<td>1.1–1.4</td>
</tr>
<tr>
<td></td>
<td>Feb. 5</td>
<td><strong>Furlough Day – campus closed</strong></td>
<td></td>
</tr>
<tr>
<td>2)</td>
<td>Feb. 8</td>
<td>The Common Cold</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>Feb. 10</td>
<td>Cell Structure, Water - iclicker</td>
<td>2.1, 2.2</td>
</tr>
<tr>
<td></td>
<td>Feb. 12</td>
<td>Body Fat and Health</td>
<td>3.4</td>
</tr>
<tr>
<td>3)</td>
<td>Feb. 15</td>
<td>Carbohydrates, Fats, and Proteins</td>
<td>2.1, 3.1</td>
</tr>
<tr>
<td></td>
<td>Feb. 17</td>
<td>Digestion and Metabolism - iclicker</td>
<td>3.2-3.3, 16.2</td>
</tr>
<tr>
<td></td>
<td>Feb. 19</td>
<td><strong>Furlough Day – campus closed</strong></td>
<td></td>
</tr>
<tr>
<td>4)</td>
<td>Feb. 22</td>
<td>Cellular Respiration and the Greenhouse Effect</td>
<td>4.1, 4.3</td>
</tr>
<tr>
<td></td>
<td>Feb. 24</td>
<td>Photosynthesis - iclicker</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>Feb. 26</td>
<td>DNA / Cell Cycle</td>
<td>5.2, 5.3</td>
</tr>
<tr>
<td>5)</td>
<td>Mar. 1</td>
<td>Cancer: Mutations, Risk Factors</td>
<td>5.1, 5.4</td>
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<tr>
<td></td>
<td>Mar. 3</td>
<td>Cancer: Detection, Treatment - iclicker</td>
<td>5.5</td>
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<tr>
<td></td>
<td>Mar. 5</td>
<td><strong>EXAM 1 - Bring Scantron and # 2 pencil</strong></td>
<td></td>
</tr>
<tr>
<td>6)</td>
<td>Mar. 8</td>
<td>Immune System</td>
<td>18.3, 18.4</td>
</tr>
<tr>
<td></td>
<td>Mar. 10</td>
<td>Mad Cow Disease and Pathogens - iclicker</td>
<td>18.1, 18.2</td>
</tr>
<tr>
<td></td>
<td>Mar. 12</td>
<td><strong>Furlough Day – campus closed</strong></td>
<td></td>
</tr>
<tr>
<td>7)</td>
<td>Mar. 15</td>
<td>Meiosis – Passing on the traits</td>
<td>5.6, 6.1</td>
</tr>
<tr>
<td></td>
<td>Mar. 17</td>
<td>Mendelian Genetics, Punnett Squares</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td>Mar. 19</td>
<td>Modes of Inheritance, Quantitative Traits</td>
<td>6.3, 7.3</td>
</tr>
<tr>
<td>8)</td>
<td>Mar. 22</td>
<td>Genes and the Environment, Sex-linked traits, and Pedigrees</td>
<td>6.4, 7.4, 7.5</td>
</tr>
<tr>
<td></td>
<td>Mar. 24</td>
<td>PCR and DNA Fingerprinting - iclicker</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>Mar. 26</td>
<td><strong>Furlough Day – campus closed</strong></td>
<td></td>
</tr>
<tr>
<td>9)</td>
<td>Mar. 29</td>
<td><strong>EXAM 2 - Bring Scantron</strong></td>
<td></td>
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<tr>
<td></td>
<td>Mar. 31</td>
<td>Cesar Chavez Day – campus closed</td>
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<tr>
<td></td>
<td>Apr. 2</td>
<td>Translating the genetic code</td>
<td>8.1</td>
</tr>
<tr>
<td>10)</td>
<td>Apr. 5</td>
<td><strong>Spring Break</strong></td>
<td></td>
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<tr>
<td></td>
<td>Apr. 7</td>
<td><strong>Spring Break</strong></td>
<td></td>
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<tr>
<td></td>
<td>Apr. 9</td>
<td><strong>Spring Break</strong></td>
<td></td>
</tr>
<tr>
<td>11)</td>
<td>Apr. 12</td>
<td>Genetically Modified Organisms</td>
<td>8.3-8.4</td>
</tr>
<tr>
<td></td>
<td>Apr. 14</td>
<td>Evolution (Darwin) - iclicker</td>
<td>9.1–9.2</td>
</tr>
<tr>
<td></td>
<td>Apr. 16</td>
<td>Evidence for Evolution</td>
<td>9.3, 9.4, 10.2</td>
</tr>
<tr>
<td>12)</td>
<td>Apr. 19</td>
<td>Natural Selection</td>
<td>10.3</td>
</tr>
<tr>
<td></td>
<td>Apr. 21</td>
<td>Natural Selection and TB - iclicker</td>
<td>10.1, 10.4</td>
</tr>
<tr>
<td></td>
<td>Apr. 23</td>
<td>The Species Concept</td>
<td>11.1-11.2</td>
</tr>
<tr>
<td>13)</td>
<td>Apr. 26</td>
<td>The Human Race</td>
<td>11.3,11.4</td>
</tr>
<tr>
<td>Date</td>
<td>Event</td>
<td>Sections</td>
<td></td>
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<td>--------</td>
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<tr>
<td>Apr. 28</td>
<td><strong>EXAM 3 - Bring Scantron</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apr. 30</td>
<td>Biodiversity, Classification</td>
<td>12.1-12.2</td>
<td></td>
</tr>
<tr>
<td>14) May 3</td>
<td>Learning about Species, Biopiracy</td>
<td>12.2-12.3</td>
<td></td>
</tr>
<tr>
<td>May 5</td>
<td>Extinction/ Species Interactions - iclicker</td>
<td>14.1-14.2</td>
<td></td>
</tr>
<tr>
<td>May 7</td>
<td><strong>Furlough Day – campus closed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15) May 10</td>
<td>Consequences of Extinction, Saving Species</td>
<td>14.2-14.3</td>
<td></td>
</tr>
<tr>
<td>May 14</td>
<td>Reproduction and Development</td>
<td>20.1-20.2</td>
<td></td>
</tr>
<tr>
<td>16) May 17</td>
<td>Gender and Structure</td>
<td>19.1-19.4</td>
<td></td>
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<tr>
<td>May 19</td>
<td>Endocrine Disruptors</td>
<td>20</td>
<td></td>
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<tr>
<td></td>
<td>Course Evaluation</td>
<td></td>
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<tr>
<td>May 21</td>
<td><strong>Furlough Day – campus closed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17) May 24</td>
<td><strong>Final Exam – bring scantron</strong></td>
<td>11 am–1pm</td>
<td></td>
</tr>
</tbody>
</table>

**Reminder:** Lecture outlines are available on WebCT. Print and bring to class.

*Welcome to Biology, and I hope you have a good semester! By the end of this course, you will better understand major unifying principles of biology and will be able to apply specific information to issues regarding your health and the environment.*

*See additional course information on the following pages.*
Media Assignments & Chapter Quizzes

Chapter quizzes cover material from each chapter that was discussed in lecture. Chapter quizzes count for 50 points of the total course grade. Media assignments are based on internet assignments where you read material from a web site or complete activities on a web site related to material from the lecture. Media assignments count for 30 points of the total course grade. All quizzes and assignments are due by the dates given and will be available for at least one week. **Check WebCT weekly for new assignments, quizzes, and due dates.**

<table>
<thead>
<tr>
<th>WEEK</th>
<th>ACTIVITY</th>
<th>DUE DATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Visit the WebCT page</td>
<td></td>
</tr>
<tr>
<td>2)</td>
<td>Survey 1</td>
<td>Feb 8</td>
</tr>
<tr>
<td>3)</td>
<td>Quiz 1</td>
<td>Feb. 15</td>
</tr>
<tr>
<td>4)</td>
<td>Media Assignment and Quiz 2</td>
<td>Feb. 22</td>
</tr>
<tr>
<td>5)</td>
<td>Prepare for Exam – no online quiz</td>
<td>Mar. 1</td>
</tr>
<tr>
<td>6)</td>
<td>Quiz 3</td>
<td>Mar. 8</td>
</tr>
<tr>
<td>7)</td>
<td>Media Assignment and Quiz 4</td>
<td>Mar. 15</td>
</tr>
<tr>
<td>8)</td>
<td>Quiz 5</td>
<td>Mar. 22</td>
</tr>
<tr>
<td>9)</td>
<td>Prepare for Exam – no online quiz</td>
<td>Mar. 29</td>
</tr>
<tr>
<td>10)</td>
<td><strong>Spring Break</strong></td>
<td>Apr.5</td>
</tr>
<tr>
<td>11)</td>
<td>Media Assignment &amp; Quiz 6</td>
<td>Apr. 12</td>
</tr>
<tr>
<td>12)</td>
<td>Quiz 7</td>
<td>Apr.19</td>
</tr>
<tr>
<td>13)</td>
<td>Quiz 8</td>
<td>Apr. 26</td>
</tr>
<tr>
<td>14)</td>
<td>Media Assignment</td>
<td>May 3</td>
</tr>
<tr>
<td>15)</td>
<td>Quiz 9</td>
<td>May 10</td>
</tr>
<tr>
<td>16)</td>
<td>Media Assignment</td>
<td>May 17</td>
</tr>
<tr>
<td>17)</td>
<td>Quiz 10</td>
<td>May 24</td>
</tr>
</tbody>
</table>
Laboratory Exercises  
Biology Darwin 003

The laboratory portion of this course counts for **185** points of the total course grade. The laboratory is **not** a separate grade. The points earned in the laboratory are included with the lecture portion of the course to calculate the final grade. Participation in the lab is essential for success in the course.

Each lab contributes 10 to 15 points with the following breakdown:
- Quiz – based on information from previous lab and intro. to new lab (5 points).
- Lab Work – based on work completed in lab and written in your lab book or on additional handouts (5 points).
- Discussion – based on end-of-lab discussion of topics covered in lab (5 points).

**Lab quizzes** are given in the **first 10 minutes** of lab (**no makeup for showing up late**). Lab **discussion** is **at the end** of the lab period; points are awarded for participation in the discussion (**0 points for leaving lab early**).

<table>
<thead>
<tr>
<th>Week</th>
<th>Labs</th>
<th>Questions</th>
<th>Lab Work</th>
<th>Discussion</th>
<th>Quiz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>---</td>
<td>---</td>
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</tr>
<tr>
<td>2</td>
<td>Lab Introduction, 1.1, 1.2, 1.3</td>
<td>Topic 1: 1-5</td>
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<td>5</td>
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<tr>
<td>3</td>
<td>1.4, 1.5, 1.6, 1.7, <strong>Microscope primer</strong>*, 2.1, 2.2C, 15.2</td>
<td>Topic 1: 7-10</td>
<td>5</td>
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<td>4</td>
<td>3.1, 3.2 3.3, 3.4, 3.5 Nutrition</td>
<td>Topic 3: 1-10</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td>5</td>
<td>4.1, 4.2, 4.3 Mitosis</td>
<td>Topic 4: 1-10</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td>6</td>
<td>5.1, 5.2, 5.3, 5.4 Inheritance</td>
<td>Topic 5: 1-10</td>
<td>5</td>
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<td>7</td>
<td>6.2, <strong>PCR primer 6.3</strong>*, <strong>PCR and Fingerprinting</strong>*</td>
<td>Topic 6: 2-10, Handout</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td>8</td>
<td><strong>Why Sex</strong>*, Biotech Discussion</td>
<td>Topic 7:1-9, Handout</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>NO LAB – Cesar Chavez</td>
<td>LAB BOOKS DUE</td>
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<tr>
<td>10</td>
<td>SPRING BREAK</td>
<td>LAB BOOKS DUE</td>
<td>---</td>
<td>---</td>
<td>---</td>
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<tr>
<td>11</td>
<td>9.1, 9.2, 9.3 Natural Selection</td>
<td>Topic 9: 1-9</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td>12</td>
<td><strong>Darwin Video, Discussion, and Questions</strong>*</td>
<td>Handout</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>Conservation on Campus*</td>
<td>Handouts</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td>14</td>
<td>12.1, 12.3 Population Growth</td>
<td>Topic 12: 1-10</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<tr>
<td>15</td>
<td>14.1 14.2, (15.2), 15.3, 15.4</td>
<td>Topic 14: 1-4, 6, 9</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>Current Research by TA</td>
<td>LAB BOOKS DUE</td>
<td>---</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Total points for each **60**
Total points for lab **185**

* Additional Material Available from WebCT. Print Handouts and Bring to Lab.
Instructor: Julie Bright      Class Time: 8:00-8:50 am MWF or 4:00–5:15 pm TR
Office: Darwin 216      Hours: MW 9:15-10:15 am.
    Phone: 664-2717      Email: bright@sonoma.edu

* Be sure to get the text supplement with four physiology chapters.

COURSE FOCUS

Biology 115 is an introduction to major biological concepts that provide students with an understanding of everyday life processes. Students will gain a foundation for making informed decisions regarding environmental and health issues. Topics include: the process of science, genetics, natural selection, cell functions, major systems of the human body, biodiversity, ecosystems, and population dynamics. Discussion of biological processes in the context of societal issues is an integral part of this course. Biology 115 fulfills the GE, B2 requirement. This course is not applicable to the biology major.

GOALS

Throughout the course, you will

- become more biologically literate by relating scientific terms and specific information to major concepts and processes.
- understand connections among a variety of topics from the cellular level to the ecosystem level.
- develop a scientific perspective when making observations, evaluating reports, and solving problems.
- be aware of current biological research and applications that cross many disciplines.
- cultivate your sense of curiosity in exploring the natural world around you.

STUDENT RESPONSIBILITIES

Students are expected to read the assigned material in advance of the lecture and bring their full attention to the classroom discussion. Participation by sharing articles and news items in class is encouraged. Questions about the course material are welcomed throughout class. Questions about individual circumstances need to be addressed after class or during office hours. If a student needs to leave class early, please notify the instructor prior to class and sit close to the doorway. In the case of an absence, a student should contact a classmate or meet with the instructor during office hours.

Completion of all exams is required. Exams are objective: multiple choice, matching, and true-false. Answer sheets (large, blue scantrons) are sold in the bookstore. In the case of an absence from a major exam, official documentation must be presented to
verify an emergency or illness. Makeup exams are given at the end of the semester. Quizzes are taken online and are posted for one week. In case of individual computer problems, Information Technology provides a 24-hr. computer lab for the campus community. No makeup quizzes are given.

Web CT course page: Students should check WebCT throughout the semester for topic and exam dates (in the syllabus), announcements, quizzes, documents, and grades. To access WebCT, type your Sonoma username and password (the same information as your Sonoma email). Quizzes can be found under the Assessments tab and appear highlighted during the week they are available. An announcement will be made in class when a quiz is posted. Quizzes can be taken a second time within the week of posting. The higher score appears in the grade sheet.

The Tutorial Center and Learning Skills Services offer help to Biology 115 students on an individual or group basis. If you have a disability that requires accommodation in this class, you must register with the campus Disabled Student Services, located in Salazar Hall 1049, extension 42677.

Students should become familiar with important University policies at the following link: http://www.sonoma.edu/uaffairs/policies/studentinfo.shtml

TESTING AND GRADING

The semester grade is based on three in-class exams (80% of semester grade) and five WebCT quizzes (20%). Each exam is worth 100 points, and each quiz is worth 15 points. See the above section (Student Responsibilities) regarding details on taking the exams and quizzes. Promptly notify the instructor with any questions regarding grades. Do not wait until the end of the semester. There is NO EXTRA CREDIT in this course. No makeup work can be done after finals week.

Grading Scale:

A  90 - 100%    337 - 375
B  80 - 89%     300 – 336
C  70 - 79%     262 – 299
D  60 - 69%     225 – 261
F  Below 60%   below 225

Plus and minus grades will be assigned.
**TENTATIVE SCHEDULE**

The following are planned dates for lecture topics. Actual dates may change depending on pacing of lectures and discussion in class.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction. WebCT. Scientific Thinking</td>
<td>1.1 – 1.10</td>
</tr>
<tr>
<td>Feb. 1-5</td>
<td><strong>Friday:</strong> campus closed</td>
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</tr>
<tr>
<td>Week 2</td>
<td>Experimental Design</td>
<td>1.11 – 1.17</td>
</tr>
<tr>
<td>Feb. 8-12</td>
<td>Chemistry</td>
<td>2.1 – 1.11</td>
</tr>
<tr>
<td>Week 3</td>
<td>Macromolecules</td>
<td>2.12 – 2.21</td>
</tr>
<tr>
<td>Feb. 15-19</td>
<td><strong>Friday:</strong> campus closed</td>
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<tr>
<td>Week 4</td>
<td>Cells: types, characteristics, transport, and organelles</td>
<td>3.1 - 3.21</td>
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<tr>
<td>Feb. 22-26</td>
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<tr>
<td>Week 5</td>
<td>Energy: photosynthesis and cellular respiration</td>
<td>4.1 – 4.17</td>
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<td>Mar. 1-5</td>
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<tr>
<td>Week 6</td>
<td>EXAM 1</td>
<td>5.1 – 5.9</td>
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<tr>
<td>Mar. 8-12</td>
<td>DNA, Gene Expression</td>
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<td></td>
<td><strong>Friday:</strong> campus closed</td>
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<tr>
<td>Week 7</td>
<td>Biotechnology: applications in medicine, agriculture, criminology, and evolution.</td>
<td>5.10 – 5.19</td>
</tr>
<tr>
<td>Mar. 15-19</td>
<td>Chromosomes and Cell Division (mitosis)</td>
<td>6.1 – 6.9</td>
</tr>
<tr>
<td>Week 8</td>
<td>Continue cell division (meiosis)</td>
<td>6.10 – 6.18</td>
</tr>
<tr>
<td>Mar. 22-26</td>
<td>Mendelian Inheritance: genetics</td>
<td>7.1 – 7.8</td>
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<td></td>
<td><strong>Friday:</strong> campus closed</td>
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<tr>
<td>Week 9</td>
<td>Modes of inheritance: translation of genotypes</td>
<td>7.9 – 7.16</td>
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<tr>
<td>Mar. 29-Apr. 2</td>
<td>Evolution: Darwin, mechanisms</td>
<td>8.1 – 8.10</td>
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<tr>
<td>Week 10</td>
<td><strong>Spring Break</strong></td>
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<tr>
<td>Apr. 5-9</td>
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<tr>
<td>Week 11</td>
<td>Natural Selection</td>
<td>8.11 – 8.21</td>
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<tr>
<td>Apr. 12-16</td>
<td>Biodiversity: species, evolutionary trees</td>
<td>10.1 – 10.17</td>
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<tr>
<td>Week 12</td>
<td>Biodiversity continued: classification</td>
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<tr>
<td>Apr. 19-23</td>
<td>EXAM 2</td>
<td>11 – 13, TBA</td>
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<tr>
<td>Apr. 26-30</td>
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<tr>
<td>Week 14</td>
<td>Ecosystems and Communities/Conservation</td>
<td>15 &amp; 16</td>
</tr>
<tr>
<td>May 3-7</td>
<td><strong>Friday:</strong> campus closed</td>
<td></td>
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<tr>
<td>Week 15</td>
<td>Health and Physiology: Circulation</td>
<td>21.1 – 21.10</td>
</tr>
<tr>
<td>May 10-14</td>
<td>Nutrition</td>
<td>22.1 – 22.8</td>
</tr>
<tr>
<td>Week 16</td>
<td>Digestion / Course Evaluation</td>
<td>22.9 – 22.17</td>
</tr>
<tr>
<td>May 17-21</td>
<td><strong>Friday:</strong> campus closed</td>
<td></td>
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<tr>
<td>Week 17</td>
<td><strong>FINAL EXAM</strong> – Mon. May 24, 8 am. OR Thurs. at 5 pm</td>
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</tbody>
</table>
**Diversity, Structure & Function**

**BIOL 121 – Spring 2010 – Sonoma State University**

**Professor**  
Dr. Tom Buckley  
Office: D 217  
Office Hours: M/W 3:50-4:50 or by appt.  
Email: tom.buckley@sonoma.edu  
Phone: 664-3286

Dr. Nick Geist  
Office: D 241  
Office Hours: Fri 10-11 or by appt.  
Email: nick.geist@sonoma.edu  
Phone: 664-3056

**Teaching Assistants**  
Alexandra Dallara (Wed am & evening labs)  
Office: D 240  
Office Hours: M 3-4 pm  
Email: dallara@sonoma.edu

Adele Paquin (Wed afternoon lab)  
Office: D 234  
Office Hours: Tu 11 am-12 pm  
Email: adele.paquin@gmail.com

Segal Boaz (Thursday am lab)  
Office: D 243  
Office Hours: Th 12:20 – 1:20 pm  
Email: boazs@sonoma.edu

**Lecture:**  
1:00-2:15 pm, Mon and Weds (Darwin 103)

**Lab Sections:**  
Darwin 4 (Weds: 0925-1215, 1425-1715, 1800-2050; Th: 0925-1215)

**Required Text:**  

**Course Description:** You will be introduced to the diversity of organisms that exist on Earth. This course will emphasize evolutionary relationships among major groups of organisms, structural and functional traits that distinguish them, and the function and evolution of major organ systems. You will become familiar with the ‘language’ of biology, and learn to use the microscope to identify organisms and study their anatomy in laboratory exercises associated with lecture material. Participation in laboratory is mandatory.

**Relationship to other courses:** This is one of three first year introductory courses for students who plan to take upper division courses in Biology (e.g. Biology majors and minors, Chemistry majors, or Environmental Studies majors). It is part of a three-semester series of courses that cover introductory Biology in depth. Biology 122 (Genetics, Evolution and Ecology) is the other first year Biology course. Biology 121, 122 and two semesters of introductory chemistry are prerequisites for Biology 123. Most students who are not Biology majors should enroll in Biology 110 instead of Biology 121. Biology 110 covers all of introductory biology in one semester and satisfies the B2 and B3 GE requirement (http://www.sonoma.edu/senate/apc/gemgo.html). Students who do not plan to take upper division Biology courses usually find that the scope & depth of Biol 121 or 122 requires much more work than Biology 110, thus students should not view them as substitutes for Biology 110.

**Assigned Readings:** The lecture syllabus lists text pages that must be read for each class. Each laboratory exercise will be posted to course WebCT page (see below). In both cases, students are expected to complete assigned readings BEFORE coming to lecture and the laboratory. Midterm study guides are intended to help direct students to main concepts and important new vocabulary presented in readings and lectures. They are not a substitute for class attendance.

**Course WebCT Page:** The class will have a WebCT page that includes lecture notes, handouts, laboratory exercises, study guides, online quizzes and scores. Access requires your student ID and password, and is available from any computer on campus or connected to the internet. *It is your responsibility to check regularly for updates on the WebCT page.*

**Learning Strategies:** In this course we will ask you to learn many new concepts and biological terms. To do well, you must be intensely involved with the material throughout the semester. You will need to develop studying strategies to understand how details fit into the larger picture of biological diversity. University guidelines and our experience suggest that students need to study outside the classroom at least two hours per week for each unit to earn a satisfactory grade. Plan your course, work and social schedules accordingly!

**Participation:** To do well in this course, you must attend lectures and laboratories and actively participate in all aspects of the course. Late arrivals and early departures are disruptive and will lower your final grade.

**Office Hours:** We encourage students to regularly attend office hours to discuss course material. *Experience shows that students who regularly attend office hours nearly always see a marked improvement in their test scores!* Short questions can also be dealt with by email. Email is the best way to reach us outside office hours. *You MUST put ‘Biol121’ in the subject heading of emails you send us.*
Assignments:

1) Lecture Exams (400 pts): There will be three mid-term and one final exam (not comprehensive), each worth 100 points. Exams will be multiple-choice and focus on material covered in lecture, lab, readings and study guides. No make-up exams will be given without a well-documented excuse (e.g. signed note from doctor or valid documentation of death in the family). If you cannot make it to an exam because of an emergency, notify us before the exam. We do not provide make up exams due to students’ travel plans or scheduling difficulties.

2) Lecture Quizzes (100 pts): Quizzes will be delivered online on WebCT. They will be multiple choice and will be based on reading and lecture materials. We will make these questions similar to and representative of the type of questions you will be given on the midterm exams. You will be able to re-take these quizzes until you receive a perfect score, so there is no excuse for getting fewer than 100 pts for this part of your grade. THERE WILL BE NO MAKE-UP QUIZ QUESTIONS.

3) Laboratory Quizzes (50 pts): There will be quizzes at the beginning of most labs, worth 5 pts. These brief quizzes are designed to ensure that students come to class prepared to participate actively in the lab exercise. Students should carefully read lab handouts prior to class (your lab instructor will give you further details on quizzes). THERE WILL BE NO MAKE-UP LAB QUIZZES. An absence counts as a zero.

4) Laboratory Notebook & Attendance (130 pts): You will keep a notebook recording your activities in laboratory. Your notebook will be a valuable study aid, and you will submit your notebook to your laboratory instructor at the end of the semester. Notebooks will be graded on completeness and adherence to guidelines. We expect all students to actively participate in lab exercises. You will be awarded 10 points for completion of each lab exercise and active participation during the lab. The laboratory is not a separate grade. The points earned in the laboratory are included with the lecture portion of the course to calculate the final grade. Lab quizzes are given during the first 10 minutes of lab. No makeup or extended time for showing up late. Lab discussion occurs throughout the lab period; points are awarded for participation in discussion. Leaving early will result in 0 points.

Come to labs prepared:
- Familiarize yourself with the lab by reading through the handout (available on WebCT) before coming to class. The lab for a particular day is listed on the Laboratory Schedule.
- Bring your lab handout and writing tools (3-ring binder and notepaper)
- Quizzes will cover your pre-lab reading and/or the previous week’s lab

Missing Labs or Quizzes: You will receive zero points for missed labs or quizzes. In special situations, with verification, the possible points from one missed lab will be removed from your grade calculation.

Lab Conduct: Labs are designed to supplement and complement the lecture portion of the course with hands-on exercises. Disruptive behavior ruins the experience for everyone. Disruptive individuals will be dismissed from the lab and forfeit remaining points for that lab period. Food and Drink in lab are unacceptable. Clean up after yourself; credit will be withheld from individuals who leave a mess behind. Respect your classmates and your TAs.

There will be no make-up laboratories. Under exceptional circumstances, you may be able to attend one alternate laboratory session, if seats are available and your lab instructor grants you permission in advance.

Policies about student behavior during lecture and examinations: In a large class like this, we must minimize disruption during lecture. Arrive on time, do not leave early, and turn your cell phone off before entering the classroom or laboratory. You may not use cell phones or other electronic device during an examination or quiz. If we observe you using an unauthorized electronic device during an examination, we will collect the examination and you will receive a zero for it. In addition, you may not leave the room for any reason during an examination or quiz. Use restrooms before the test.

Important University policies you should be aware of: These include the add/drop policy; cheating and plagiarism policy, grade appeal procedures; accommodations for students with disabilities, and the diversity vision statement ([http://www.sonoma.edu/uaffairs/policies/studentinfo.shtml](http://www.sonoma.edu/uaffairs/policies/studentinfo.shtml)). Students caught violating the policy on plagiarism and cheating may receive a zero for the course and the violation will be recorded at the Student Affairs Office.
<table>
<thead>
<tr>
<th>date</th>
<th>day</th>
<th>Lec #</th>
<th>Lecture</th>
<th>Lecture readings</th>
<th>Lab</th>
<th>Lab topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Feb</td>
<td>M</td>
<td>1</td>
<td>Course introduction</td>
<td>1.1, 1.3; 8.1</td>
<td>NO LAB</td>
<td></td>
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<tr>
<td>03 Feb</td>
<td>W</td>
<td>2</td>
<td>History of life</td>
<td>25.1-4, 25.6</td>
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<tr>
<td>08 Feb</td>
<td>M</td>
<td>3</td>
<td>Biological diversity and classification</td>
<td>1.2; 26.1-3, 26.6</td>
<td></td>
<td>I  Basis of determining relationships</td>
</tr>
<tr>
<td>10 Feb</td>
<td>W</td>
<td>4</td>
<td>Prokaryote diversity and metabolism</td>
<td>27.1, 27.3-6</td>
<td>NO LAB</td>
<td></td>
</tr>
<tr>
<td>15 Feb</td>
<td>M</td>
<td>5</td>
<td>Eukaryotes: cells, life cycles</td>
<td>6.2-3; 12.1; 13.1-2</td>
<td></td>
<td>II Protists</td>
</tr>
<tr>
<td>17 Feb</td>
<td>W</td>
<td>6</td>
<td>Protists and algae</td>
<td>28.1,7 [focus: Fig 28.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 Feb</td>
<td>M</td>
<td></td>
<td><strong>EXAM I</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 Feb</td>
<td>W</td>
<td>7</td>
<td>Land plants: origins &amp; seedless plants</td>
<td>29.1-3</td>
<td></td>
<td>III Bryophytes &amp; algae</td>
</tr>
<tr>
<td>01 Mar</td>
<td>M</td>
<td>8</td>
<td>Seed plants: reproduction &amp; diversity</td>
<td>30.1-3; 38.1 (pp 801-6)</td>
<td>IV</td>
<td>IV Ferns &amp; gymnosperms</td>
</tr>
<tr>
<td>03 Mar</td>
<td>W</td>
<td>9</td>
<td>Vascular plant anatomy and growth</td>
<td>35.1-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08 Mar</td>
<td>M</td>
<td>10</td>
<td>Water flow in plants</td>
<td>36.2-4</td>
<td>V</td>
<td>V Monocots</td>
</tr>
<tr>
<td>10 Mar</td>
<td>W</td>
<td>11</td>
<td>Energy flow in plants</td>
<td>10.1-3; 36.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Mar</td>
<td>M</td>
<td>12</td>
<td>Fungi</td>
<td>31</td>
<td>VI</td>
<td>VI Dicots</td>
</tr>
<tr>
<td>17 Mar</td>
<td>W</td>
<td></td>
<td><strong>EXAM II</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>22 Mar</td>
<td>M</td>
<td>13</td>
<td>Animal diversity</td>
<td>32 (626-636); 21 (431-432)</td>
<td>VII</td>
<td>VII Body plans &amp; dichotomous keys</td>
</tr>
<tr>
<td>24 Mar</td>
<td>W</td>
<td>14</td>
<td>Porifera, Cnidaria, Platyhelminthes</td>
<td>33 (638-650)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29 Mar</td>
<td>M</td>
<td>15</td>
<td>Mollusca: Annelida, Nematoda</td>
<td>33 (650-656)</td>
<td>NO LAB</td>
<td></td>
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<tr>
<td>31 Mar</td>
<td>W</td>
<td></td>
<td>NO CLASS - Cesar Chavez Day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05 Apr</td>
<td>M</td>
<td></td>
<td>NO CLASS - Furlough/Spring Break</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07 Apr</td>
<td>W</td>
<td></td>
<td>NO CLASS - Furlough/Spring Break</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Apr</td>
<td>M</td>
<td>16</td>
<td>Arthropoda</td>
<td>33 (656-665)</td>
<td>VIII</td>
<td>VIII Sponges, jellies &amp; molluscs</td>
</tr>
<tr>
<td>14 Apr</td>
<td>W</td>
<td>17</td>
<td>Echinodermata: Invertebrate chordates</td>
<td>33 (665-667)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Apr</td>
<td>M</td>
<td>18</td>
<td>Vertebrate origins: Fishes</td>
<td>34 (671-684)</td>
<td>IX</td>
<td>IX Annelids &amp; arthropods</td>
</tr>
<tr>
<td>21 Apr</td>
<td>W</td>
<td></td>
<td><strong>EXAM III</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 Apr</td>
<td>M</td>
<td>19</td>
<td>Tetrapods: Amphibians and Reptiles</td>
<td>34 (684-700)</td>
<td>X</td>
<td>X Echinoderms</td>
</tr>
<tr>
<td>28 Apr</td>
<td>W</td>
<td>20</td>
<td>Tetrapods: Birds and Mammals</td>
<td>40 (820-827); 41 (853-864)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03 May</td>
<td>M</td>
<td>21</td>
<td>Animal form and function: Digestion</td>
<td>42 (867-871, 884-890)</td>
<td>XI</td>
<td>XI Chordates</td>
</tr>
<tr>
<td>05 May</td>
<td>W</td>
<td>21</td>
<td>Circulation, gas exchange</td>
<td>44 (922-934, 939)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 May</td>
<td>M</td>
<td>23</td>
<td>Excretion</td>
<td>48 (1011-1025)</td>
<td>XII</td>
<td>XII TBA</td>
</tr>
<tr>
<td>12 May</td>
<td>W</td>
<td>24</td>
<td>Nervous System &amp; Muscles</td>
<td>49 (1063-1074)</td>
<td></td>
<td></td>
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<tr>
<td>17-May</td>
<td>M</td>
<td>25</td>
<td><strong>TBA</strong></td>
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<td></td>
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<tr>
<td>19 May</td>
<td>W</td>
<td></td>
<td><strong>EXAM IV (Final)</strong></td>
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</tr>
</tbody>
</table>
Objectives: In this course, students will learn about mechanisms of inheritance (Genetics), how these mechanisms interact with the environment to produce evolutionary change (Evolution), and how individuals and species interact with each other and their physical environment (Ecology). These three disciplines are inseparable and represent fundamental areas of inquiry within biology.

Relationship to other courses: This is one of two first year Biology courses. The other course (BIOL 121) is offered each Fall and Spring semester. BIOL 121 and 122 are prerequisites, along with two semesters of introductory chemistry, for the second year Biology course, BIOL 123. You should apply BIOL 122 to your B2 or B3 GE requirement, if you must take Biology upper-division courses for your major. Otherwise, you should not use this course to fulfill the B2 or B3 GE requirement. Most students who are not Biology majors or minors should enroll in BIOL 110. If you plan to major or minor in Biology, but have not declared your major, you should do so right away!

Assigned Readings: The lecture syllabus lists the text chapters that are associated with each lecture. Students will be expected to download handouts before each lecture or laboratory exercise. In both cases, students are encouraged to review assigned readings before coming to lecture/lab.

Participation: Students must attend lectures and laboratories, as well as actively participate in all aspects of the course. Arrive on time and do not leave early. Late arrivals and early departures are disruptive and will affect your final grade.

Office Hours: We encourage students to attend regularly scheduled office hours to discuss course material. If you cannot make scheduled office hours, arrange an alternative appointment with the staff member in question. Short questions can also be dealt with by email. Email is the best way to reach us outside of office hours. Please put ‘BIOL 122’ in the subject heading of emails you send us.

WebCT Access: To access materials on WebCT go to https://ldaps.sonoma.edu/portal/ and enter your username and password. After entry, click WebCT6 link, then click link for Biol 122-001 for Spring 2010.

Policy about student behavior during lecture: In a large class like this, we must minimize disruption during lecture. Arrive on time, do not leave early, and turn your cell phone off before entering lecture.

University plagiarism policy: Students are expected to be familiar with the policy on plagiarism and cheating and those who violate it may receive a zero for the course. All violations will be recorded at the Student Affairs Office. Please see the policy here: (http://www.sonoma.edu/uaffairs/policies/cheating_plagiarism.htm)
Other policies: add/drop policy, grade appeal procedures, accommodations for students with disabilities, diversity vision statement (http://www.sonoma.edu/uaaffairs/policies/studentinfo.shtml).

Policy about student behavior during examinations: You may not use cell phones or other electronic device during an examination or quiz. You may not use the restroom or leave the room for any reason during an examination or quiz. Use the restroom before the test. If one of us observes you using an unauthorized electronic device during an examination, or conducting any other suspicious behavior, we will collect the examination and you will be subject to charges under the cheating and plagiarism policy.

Assignments:

1) Lecture Exams: There will be 4 midterm multiple-choice exams. All exams focus on material covered in lecture, readings and study guides. No make-up exams will be given without prior notification and proper documentation (e.g. signed note from doctor). If you cannot make it to an exam because of a legitimate emergency, notify me before the exam. I cannot offer make-up exams due to students’ travel plans, scheduling difficulties, or planning errors.

2) Lecture Clicker Questions: During most lectures, I will pose 2-3 questions for you to answer using your iclicker. You will receive ½ credit for answering the question and ½ credit for answering correctly. The questions will be based on assigned readings for that lecture topic or on materials presented during lecture. YOU MUST COME TO LECTURE AND BRING YOUR ICLICKER TO RECEIVE CREDIT FOR LECTURE QUESTIONS.

3) Lab Quizzes: There will be a quiz each week to assess learning of concepts from the previous week and evidence of preparation for the lab to be completed that day. TAs will provide guidance in class regarding preparation for these quizzes.

4) Problem Sets: You will complete 4 problem sets based on material covered in lecture. Each problem set is worth 10 points.

5) Service learning: You will participate in an activity that helps you achieve course objectives and requires your time and expertise. Your activity must be approved in advance, and it may not overlap with coursework you receive in another course. You have four choices: 1) participate in a volunteer restoration activity for the SSU Garden, a local preserve, or other entity; 2) teach elementary schoolchildren about organisms, evolution or ecology; 3) participate as judge in the Sonoma County Science Fair or Science Olympiad with the SSU Biology club; 4) participate in a research project conducted by SSU students or faculty or researchers at other universities; 5) you work out an activity with your instructor that achieves course objectives.

6) Colloquium Seminars: Students are required to attend 2 seminars in Biology Colloquium (Tuesday, 12:00-12:50; Darwin 103). You will be told which specific seminar dates can be used to meet this requirement. In order to receive credit, you must sign the BIOL 122 attendance sheet at the end of the seminar.

7) Research Paper: Students will be required to write a research paper (40 points) in journal format that summarizes the results of the plant competition experiments conducted in the greenhouse during the semester.

8) Lab Notebook: You will keep a notebook recording your activities in laboratory. You can use this notebook to help you study, and you will submit your notebook to your laboratory instructor at the end of the semester. Notebooks will be graded on completeness and adherence to guidelines.

9) Lab Attendance & Participation: You must participate in lab actively. We will take attendance during each lab session and award points for participation. Plan on remaining in lab for the full 3-hour period. Directions for each exercise will be contained in handouts. There will be no make-up laboratories. Under exceptional circumstances, you may be able to attend an alternate laboratory session, if seats are available and you obtain advance permission from your laboratory instructor and the instructor for the laboratory that you wish to attend. Be aware that most lab sections are full and there are often no seats available in other sections.
Problem Set Assignments - You will turn in your answers to problem sets at the beginning of your laboratory section during the week noted below. Show your work in solving the problems. For multiple choice problems, explain why the answer is correct, in one or two sentences. We will grade problem sets according to the following criteria: 10 points for correct answers and complete work shown; 3-9 points for partially completed and partially correct work; 2 points for correct answers that do not show work. Late problem sets will receive a maximum of 6 points.

1. Ch. 14: 1; 2; 3; 4(all); 6(a,b,d,e); 9 (all) - Due Week 3
2. Ch. 14: 16; 19; Ch. 15: 1, 3, 4, 9, 10, 11- Due Week 5
3. Ch. 16: 1, 3, 4, 5, 6, 7, - Due Week 7
4. Ch. 17*: 1, 2, 3, 5, 6, 7, 8 - Due Week 8

Grading: Final grades will be based on the percentage of total points earned on the exams and assignments listed below.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>points</th>
</tr>
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<tbody>
<tr>
<td>4 midterm exams (100 points each)</td>
<td>400</td>
</tr>
<tr>
<td>iClicker lecture questions</td>
<td>100</td>
</tr>
<tr>
<td>4 Problem sets (10 points each)</td>
<td>40</td>
</tr>
<tr>
<td>11 Genetics &amp; Evolution lab quizzes</td>
<td>110</td>
</tr>
<tr>
<td>Attendance at 2 Biology colloquium seminars</td>
<td>20</td>
</tr>
<tr>
<td>Service learning response paper</td>
<td>20</td>
</tr>
<tr>
<td>Research paper</td>
<td>40</td>
</tr>
<tr>
<td>Lab notebook</td>
<td>56</td>
</tr>
<tr>
<td>Lab attendance &amp; participation</td>
<td>28</td>
</tr>
<tr>
<td>TOTAL</td>
<td>814</td>
</tr>
</tbody>
</table>

Supplemental Instruction in Darwin 231, Tues and Thurs 7:00-8:00 pm

Emily Harvey, SI Leader, tel. 707-849-7822

SI is a group study session that meets twice weekly, emphasizing lecture review and examination preparation. Limited one-on-one tutoring is available by request. You can receive one unit of credit for attending 50% of session meetings and writing a short paper about the course.
<table>
<thead>
<tr>
<th>Wk</th>
<th>Date</th>
<th>Lecture Topic</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Feb 2</td>
<td>Course introduction</td>
<td></td>
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<tr>
<td></td>
<td>Feb 4</td>
<td>Mendelian principles – segregation</td>
<td>Chap 14: 262-268</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>Mendelian principles – independent assortment</td>
<td>Chap 14: 268-272</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Multiple alleles &amp; pedigree analysis</td>
<td>Chap 14: 272-279</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>Mitosis &amp; meiosis</td>
<td>Chap 12: 228-236, Ch. 13: 248-261</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>Sex linkage &amp; pedigree analysis</td>
<td>Chap 14: 276-279, Ch. 15: 286-296</td>
</tr>
<tr>
<td>4</td>
<td>23</td>
<td>Autosomal linkage</td>
<td>Chap. 15: 286-296</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>DNA structure &amp; enzymes</td>
<td>Chap 16: 305-323</td>
</tr>
<tr>
<td>5</td>
<td>Mar 2</td>
<td>EXAM 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>DNA replication</td>
<td>Chap 16: 305-323</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Introduction to transcription</td>
<td>Chap 17: 309-317</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>More on transcription &amp; translation</td>
<td>Chap 17: 309-328</td>
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<tr>
<td>6</td>
<td>16</td>
<td>Translation &amp; mutation</td>
<td>Chap 17: 320-331, Ch. 15: 285-288</td>
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<tr>
<td></td>
<td>18</td>
<td>Darwin and microevolution</td>
<td>Chap 22: 438-451, Ch. 23: 454-468</td>
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<tr>
<td>7</td>
<td>23</td>
<td>Microevolution and speciation</td>
<td>Chap 23: 454-468, Ch. 24: 474-482</td>
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<tr>
<td></td>
<td>25</td>
<td>Intro to ecology &amp; global variation in climate</td>
<td>Chap 52: 1148-1171</td>
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<tr>
<td>8</td>
<td>Mar 2</td>
<td>EXAM 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td></td>
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<tr>
<td>9</td>
<td>Apr 1</td>
<td>FURLOUGH DAY (NO CLASS)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Apr 6</td>
<td>SPRING BREAK</td>
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<tr>
<td></td>
<td>8</td>
<td>SPRING BREAK</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>13</td>
<td>Populations &amp; demography</td>
<td>Chap 53: 1174-1179</td>
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<tr>
<td></td>
<td>15</td>
<td>Life history characteristics &amp; allocation</td>
<td>Chap 53: 1179-1182</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>Population growth &amp; regulation</td>
<td>Chap 53: 1183-1190</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>Human population growth</td>
<td>Chap 53: 1190-1195</td>
</tr>
<tr>
<td>14</td>
<td>27</td>
<td>Species interactions</td>
<td>Chap 54: 1198-1203</td>
</tr>
<tr>
<td>29</td>
<td>May 4</td>
<td>Organization of ecological communities</td>
<td>Chap 54: 1204-1211</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>6</td>
<td>EXAM 3</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>11</td>
<td>Trophic structure &amp; energy flow</td>
<td>Chap 54: 1205-1207, Ch. 55: 1228-1230</td>
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<tr>
<td></td>
<td>13</td>
<td>Ecosystem dynamics/nutrient cycling</td>
<td>Chap 55: 1222-1228, 1231-1235</td>
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<tr>
<td>17</td>
<td>18</td>
<td>Human impacts &amp; global climate change</td>
<td>Chap 55: 1236-1242</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Conservation of ecological systems</td>
<td>Chap 56: 1245-1265</td>
</tr>
<tr>
<td>18</td>
<td>27</td>
<td>EXAM 4 (2:00-3:50)</td>
<td>Finals week</td>
</tr>
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</table>

BIOL 122 – Genetics, Evolution and Ecology – Lecture Schedule
# LABORATORY SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Lab Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2/2 – 2/3</td>
<td>NO LAB</td>
</tr>
<tr>
<td>2</td>
<td>2/9 – 2/10</td>
<td>Lab introduction &amp; plant competition experiment</td>
</tr>
<tr>
<td>3</td>
<td>2/16 – 2/17</td>
<td>Mitosis, meiosis, &amp; potato head sex [Problem Set 1 due]</td>
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<tr>
<td>4</td>
<td>2/23 – 2/24</td>
<td>Virtual Fly computer exercise [Online Pre-purchase required]</td>
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<tr>
<td>5</td>
<td>3/2 – 3/3</td>
<td>DNA Extraction [Problem Set 2 due]</td>
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<tr>
<td>6</td>
<td>3/9 – 3/10</td>
<td>DNA forensics lab analysis</td>
</tr>
<tr>
<td>7</td>
<td>3/16 – 3/17</td>
<td>Natural selection &amp; genetic variation for allozymes [view documentary film &amp; score gels] [Problem Set 3 due]</td>
</tr>
<tr>
<td>8</td>
<td>3/23 – 3/24</td>
<td>Natural selection simulation [Problem Set 4 due]</td>
</tr>
<tr>
<td>9</td>
<td>3/30 – 3/31</td>
<td>NO LAB [Cesar Chavez Holiday Week]</td>
</tr>
<tr>
<td>10</td>
<td>4/6– 4/7</td>
<td>SPRING BREAK</td>
</tr>
<tr>
<td>11</td>
<td>4/13 – 4/14</td>
<td>Climate change: evidence &amp; impacts [reading] [view documentary film &amp; discuss journal article]</td>
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<tr>
<td>12</td>
<td>4/20 – 4/21</td>
<td>Assessment of Sudden Oak Death at Fairfield Osborn Preserve</td>
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<tr>
<td>13</td>
<td>4/27 – 4/28</td>
<td>Food web construction</td>
</tr>
<tr>
<td>14</td>
<td>5/4 – 5/5</td>
<td>Harvest of plant competition experiments</td>
</tr>
<tr>
<td>15</td>
<td>5/11 – 5/12</td>
<td>Analysis of plant competition and SOD data</td>
</tr>
<tr>
<td>16</td>
<td>5/18 – 5/19</td>
<td>Observation and analysis of behavior [Plant competition research paper due at beginning of lab]</td>
</tr>
</tbody>
</table>
Sonoma State University
Molecular and Cell Biology (BIOL 123)
Spring 2010

Instructor: Joseph Lin, Ph.D.
Office location: 211 Darwin Hall
Office phone: (707) 664-2931
E-mail: joseph.lin@sonoma.edu
Office hours: Tues. 2:15 pm-3:15 pm, Wed. 3:30 pm-4:30 pm, Fri 1:00 pm-2:00 pm

Lecture: Tues. & Thurs., 8:00 am - 9:15 am, Darwin Hall 107
Laboratory: Section 1: Tues., 9:25 am - 12:15 pm, Darwin Hall 205
Section 2: Thurs., 9:25 am - 12:15 pm, Darwin Hall 205

Course description: Lecture, 3 hours; laboratory, 3 hours. Third in a three-semester series required for biology majors. Introduction to cell and molecular biology, with an emphasis on molecular processes, cellular physiology, and regulatory mechanisms.

Prerequisites: BIOL 121, BIOL 122, and CHEM 115A/B or consent of instructor. Concurrent or prior enrollment in CHEM 335A recommended. Satisfies GE, category B2 or B3.

Course objective: This course is designed to lay a foundation in basic cellular and molecular biology for biology majors. It will cover the chemical basis of life processes, macromolecular processes, cellular physiology and metabolism, and mechanisms of cell regulation and specialization. These concepts will be examined through lectures, independent readings, and laboratory exercises. Laboratory exercises will emphasize basic molecular and biochemical techniques and problem-solving skills.


Grading:

Lecture 65%
Midterms (Can drop 1 of 4) 45%
  Midterm #1 (15%)
  Midterm #2 (15%)
  Midterm #3 (15%)
  Midterm #4 (15%)

Final Exam 20%

Lab 35%
Lab Reports (total) 25%
Lab Exam (May 18 or 20) 10%

Letter grades will be determined relative to the class average and incremental (plus/minus) grades will be given.
**Lecture Exams:** There will be 4 midterm exams (emphasizing material covered between exams). You are allowed to drop 1 of the 4 midterms. **Absolutely no make-up exams will be given.** There will also be a cumulative final.

**Lab Exam:** There will be one exam for the lab portion of the course that will incorporate skills you have learned in the lab portion of the class.

**Expectations:** Attendance and participation in lecture is essential for success in the course since some material covered in class will not necessarily be in the required reading. Please be on time. This course has assigned reading that I expect you to do. As a general rule, if it’s not mentioned during lecture, you don’t need to spend too much time on it for the reading. Conversely, **not all topics covered in lecture will be in your book, so it is in your best interest to come to lecture.**

Attendance and participation in lab is **required** for the lab portion of the course. If there is a known conflict, please contact me as soon as possible.

**Civility:** Please turn off cell phones and pagers during class. Show respect for your fellow students and keep in mind that this is a learning environment. If for some reason issues arise during the semester, please inform me of the situation so that attempts can be made to resolve them.

**Academic Dishonesty:** In all cases of academic dishonesty, for example cheating, plagiarism, or sabotage, the instructor will issue a grade for the work involved. Since the grade is often a “zero”, its assignment can result in a failing grade for the course. The complete campus policy on academic dishonesty may be found at [http://www.sonoma.edu/uaaffairs/policies/cheating_plagiarism.htm](http://www.sonoma.edu/uaaffairs/policies/cheating_plagiarism.htm)

**Learning Disabilities:** Students requiring special accommodations should meet with me during office hours so that we can discuss how to meet your needs this semester. Prior to our meeting, be sure you have met with the SSU Disability Student Services office and are familiar with their policies.
[http://www.sonoma.edu/uaaffairs/policies/disabilitypolicy.htm](http://www.sonoma.edu/uaaffairs/policies/disabilitypolicy.htm)

**Other SSU policies:** Be sure you understand the other policies that affect you as a student at SSU for this course.
Add/Drop Policy: [http://www.sonoma.edu/catalog/08-10/17regulations.pdf#adddrop](http://www.sonoma.edu/catalog/08-10/17regulations.pdf#adddrop)
Grade Appeal Policy: [http://www.sonoma.edu/uaaffairs/policies/gradepolicy.htm](http://www.sonoma.edu/uaaffairs/policies/gradepolicy.htm)
Diversity Vision Statement: [http://www.sonoma.edu/diversity](http://www.sonoma.edu/diversity)
# Molecular and Cell Biology: Lecture Topics and Reading

Spring semester 2010 (subject to modification)

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Textbook Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 2</td>
<td>Course Introduction and overview</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>Feb 4</td>
<td>Chemistry and Water</td>
<td>Chapter 2 &amp; 3</td>
</tr>
<tr>
<td>Feb 9</td>
<td>Lipids and Carbohydrates</td>
<td>Chapter 4 &amp; 5</td>
</tr>
<tr>
<td>Feb 11</td>
<td>Proteins: structure and function</td>
<td>Chapter 4 &amp; 5</td>
</tr>
<tr>
<td>Feb 16</td>
<td>Nucleic Acids and structure</td>
<td>Chapter 4 &amp; 5</td>
</tr>
<tr>
<td>Feb 18</td>
<td>The Cell</td>
<td>Chapter 6</td>
</tr>
<tr>
<td><strong>Feb 23</strong></td>
<td><strong>Midterm #1</strong></td>
<td></td>
</tr>
<tr>
<td>Feb 25</td>
<td>Organelles I</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>Mar 2</td>
<td>Organelles II</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>Mar 4</td>
<td>Membrane transport and Energy</td>
<td>Chapter 7 and 8</td>
</tr>
<tr>
<td>Mar 9</td>
<td>Glycolysis and the Citric acid cycle</td>
<td>Chapter 9</td>
</tr>
<tr>
<td>Mar 11</td>
<td>Electron transport and fermentation</td>
<td>Chapter 9</td>
</tr>
<tr>
<td>Mar 16</td>
<td>Photosynthesis</td>
<td>Chapter 10</td>
</tr>
<tr>
<td><strong>Mar 18</strong></td>
<td><strong>Midterm #2</strong></td>
<td></td>
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<td>Mar 23</td>
<td>Cytoskeleton</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>Mar 25</td>
<td>Vesicular Transport</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>Mar 30</td>
<td>Signal Transduction</td>
<td>Chapter 11</td>
</tr>
<tr>
<td>April 1</td>
<td>DNA replication</td>
<td>Chapter 15 &amp; 16</td>
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<tr>
<td><strong>April 5</strong></td>
<td><strong>Spring Break</strong></td>
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<tr>
<td>April 8</td>
<td>Spring Break</td>
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<tr>
<td>April 13</td>
<td>Cell Cycle</td>
<td>Chapter 12</td>
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<tr>
<td>April 15</td>
<td>Cancer</td>
<td>Chapter 12</td>
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<td><strong>April 20</strong></td>
<td><strong>Midterm #3</strong></td>
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<tr>
<td>April 22</td>
<td>Transcription</td>
<td>Chapter 17</td>
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<td>April 27</td>
<td>Translation</td>
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<td>April 29</td>
<td>Gene regulation: prokaryotic</td>
<td>Chapter 18</td>
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<tr>
<td>May 4</td>
<td>Gene regulation: eukaryotic</td>
<td>Chapter 18</td>
</tr>
<tr>
<td>May 6</td>
<td>Genomes and genetic diseases</td>
<td>Chapter 18</td>
</tr>
<tr>
<td>May 11</td>
<td>Modern molecular and cell techniques</td>
<td>Chapter 20</td>
</tr>
<tr>
<td><strong>May 13</strong></td>
<td><strong>Midterm #4</strong></td>
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<td>May 18</td>
<td>Applied MCB topics I</td>
<td>Chapter 19</td>
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<tr>
<td>May 20</td>
<td>Applied MCB topics II</td>
<td>Chapter 43</td>
</tr>
<tr>
<td><strong>May 25</strong></td>
<td><strong>Finals (Tuesday, 8am -9:50 am)</strong></td>
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Keep in mind that not everything covered during lecture are in your textbook. Other required reading may be posted.
## BIOL 123 Lab: Lab Schedule
### Spring semester 2010 (subject to modification)

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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</thead>
<tbody>
<tr>
<td>Week of Feb 1</td>
<td><strong>Lab exercise 1</strong> Introduction, Lab Orientation and Chemistry Review: Volume and Concentration</td>
</tr>
<tr>
<td>Week of Feb 8</td>
<td><strong>Lab exercise 2</strong> Aqueous Solutions: pH, Micropipeting, Serial Dilutions, and Sterile Techniques</td>
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<tr>
<td>Week of Feb 15</td>
<td><strong>Lab exercise 3</strong> Molecular Modeling of Carbohydrates and Lipids</td>
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<tr>
<td>Week of Feb 22</td>
<td><strong>Lab exercise 4</strong> Molecular Modeling of Proteins &amp; Nucleotides: Computer Lab</td>
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<tr>
<td>Week of Mar 1</td>
<td><strong>Lab exercise 5</strong> Let’s Get Brown: Catechol Oxidase Enzyme Activity</td>
</tr>
<tr>
<td>Week of Mar 8</td>
<td><strong>Lab exercise 6</strong> Microscopic Techniques: Principles and Applications</td>
</tr>
<tr>
<td>Week of Mar 15</td>
<td><strong>Lab exercise 7a</strong> Membrane Permeability</td>
</tr>
<tr>
<td>Week of Mar 22</td>
<td><strong>Lab exercise 7b</strong> Extraction of Erythrocyte Membrane Proteins</td>
</tr>
<tr>
<td>Week of Mar 29</td>
<td><strong>Lab exercise 8</strong> Protein Electrophoresis: Casting Gels and Preparation of Membrane Proteins for SDS-PAGE Analysis</td>
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<tr>
<td><strong>Week of Apr 5</strong></td>
<td><strong>Spring Break</strong></td>
</tr>
<tr>
<td>Week of Apr 12</td>
<td><strong>Lab exercise 9</strong> Electrophoretic Separation and Analysis of Membrane Proteins</td>
</tr>
<tr>
<td>Week of Apr 19</td>
<td><strong>Lab exercise 10a</strong> Bacterial Transformation</td>
</tr>
<tr>
<td>Week of Apr 26</td>
<td><strong>Lab exercise 10b</strong> Plasmid Isolation</td>
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<tr>
<td>Week of May 3</td>
<td><strong>Lab exercise 11</strong> Restriction Digestion and Polymerase Chain Reaction</td>
</tr>
<tr>
<td>Week of May 10</td>
<td><strong>Lab exercise 12</strong> Agarose Gel Electrophoresis of DNA</td>
</tr>
<tr>
<td>Week of May 17</td>
<td><strong>Lab exam</strong></td>
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</tbody>
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BIOLOGY 224
Human Physiology
Spring, 2010

Lecture (107 Darwin Hall): M, W, F 8-8:50 am
Lab (230 Darwin Hall)
Section #1 - 2 Lab: Mon, 2 - 4:50 pm
Section #3 - 4 Lab: Weds, 2 - 4:50 pm

Instructor: Dr. Fred Griffin
E-mail: frederick.griffin@sonoma.edu
Telephone: 664-2320
SSU Office: 239 Darwin Hall
Office Hours: Mon & Wed 12-1 pm or by appointment

Purpose of Course: Human Physiology is a combined lecture and lab course that will study the physiology of human cells, tissues, organs, and organ systems. We will begin by achieving an understanding of cellular physiology and progress through the organ systems of the human body, emphasizing how they interact to maintain an internal environment that supports life (homeostasis).

Texts:
PhysioEx™8.0 for Human Physiology: Stand Alone CD Version, by T. Stabler, Benjamin Cummings publisher. REQUIRED

Class web site: For the class website go SSU Library page > Services > More … > eReserves. Open Find Electronic Course Reserves. Go to class page by Department → Biology → Human Physiology (Biology 224, Spring 2010) or by Instructor → Griffin → Human Physiology. If you are using a computer that is off campus, eReserve can be accessed with your library card bar code and a PIN (get from library).

Examinations (450 pts): There will be two lecture midterm exams (100 pts each), two lab exams (50 pts each), and a final exam (150 pts). The final exam will be cumulative. Exams will include essay, short essay, multiple choice, and/or true-false questions. Only students with valid excuses will be allowed to take makeup exams.

Laboratory Quizzes (up to 50 pts): Students should be prepared for periodic quizzes at the beginning of laboratory sessions (quizzes will be worth 5-10 pts each). Lab quizzes will focus on background material for the lab that will be undertaken on that day. The quizzes are meant to encourage students to read and understand lab material before coming to each lab.
Laboratory Notebooks (100 pts): Students will maintain an up-to-date laboratory notebook (binder) that will be examined by the instructor each week. Notebooks should contain handouts and PhysioEx exercises, data collected during lab, graphs and analyses of data, and answers to questions posed in handouts and exercises. At the start of each lab period the instructor will expect that PhysioEx exercises listed for that week’s lab will have been competed and that lab handout material (including any assigned graphs and charts) from the previous lab period is also completed.

Physiology Review Paper and Presentation (100 pts): Each student will prepare a 2-3 page research paper that compares: 1) the facts and conclusions from a scientific study that was published in a refereed scientific journal; and 2) a report of the same study from the popular press. Students will also prepare a presentation and give a short (5 min) talk on the subject of their paper.

Extra Credit: Opportunities for extra credit will periodically be offered in class. A portion will be answered during class, while others will involve take-home assignments. The cumulative value of extra credit assignments during the semester will be approximately 30 pts.

Posting of Scores: Scores will be posted on the class web site. Students will have 5 days after posting to submit requests for corrections or changes. After 5 days the posted scores are “etched in stone” and will not be changed.

Grades: Course grades will be based on a class curve; the class average for the semester (out of a total possible 650 pts) will be the midrange for a “C”. Extra Credit points will be added after class curve is developed

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterms (2 @ 100 pts ea)</td>
<td>200</td>
</tr>
<tr>
<td>Physiology Review Paper &amp; Presentation</td>
<td>100</td>
</tr>
<tr>
<td>Lab Exams (2 @ 50 pts ea)</td>
<td>100</td>
</tr>
<tr>
<td>Lab Notebook &amp; Graphs</td>
<td>100</td>
</tr>
<tr>
<td>Final Exam</td>
<td>150</td>
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<tr>
<td><strong>Total Possible (approximately)</strong></td>
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<td>DATE</td>
<td>LECTURE TOPIC</td>
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<tr>
<td>Feb 1</td>
<td>Lecture 1: Introduction to Course Molecular Interactions</td>
</tr>
<tr>
<td>Feb 3</td>
<td>Lecture 2: Compartmentalization: Cells &amp; Tissues</td>
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<tr>
<td>Feb 5</td>
<td>CAMPUS CLOSED: FURLOUGH DAY</td>
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<tr>
<td>Feb 8</td>
<td>Lecture 3: Energy &amp; Cellular Metabolism <em>Physiology Review TOPIC &amp; REFERENCES</em></td>
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<tr>
<td>Feb 10</td>
<td>Lecture 4: Membrane Dynamics</td>
</tr>
<tr>
<td>Feb 12</td>
<td>Lecture 5: Communication, Integration, Homeostasis</td>
</tr>
<tr>
<td>Feb 15</td>
<td>Lecture 6: Intro to the Endocrine System: Pituitary Hormones</td>
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<tr>
<td>Feb 17</td>
<td>Lecture 7: Energy Balance &amp; Metabolism: The Pancreas, Thermal Balance</td>
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<tr>
<td>Feb 19</td>
<td>CAMPUS CLOSED: FURLOUGH DAY</td>
</tr>
<tr>
<td>Feb 22</td>
<td>Lecture 8: Endocrine Control of Growth &amp; Metab Adrenal Function, Growth, Calcium Balance</td>
</tr>
<tr>
<td>Feb 24</td>
<td>Lecture 9: Neurons: Action Potential to Neurotransmitters</td>
</tr>
<tr>
<td>Feb 26</td>
<td>Lecture 10: Neurons: Action Potential to Neurotransmitters (continued)</td>
</tr>
<tr>
<td>Mar 1</td>
<td>Lecture 11: Central Nervous System <em>Physiology Review: OUTLINE DUE</em></td>
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<tr>
<td>Mar 3</td>
<td>Lecture 12: Sensory Physiology: Touch, Taste &amp; Vision</td>
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<tr>
<td>Mar 5</td>
<td>Lecture 13: Sensory Physiology: Touch, Taste &amp; Vision</td>
</tr>
<tr>
<td>Mar 8</td>
<td>Lecture 14: Efferent Division: Autonomic &amp; Somatic Motor Control</td>
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<tr>
<td>Mar 10</td>
<td>MIDTERM EXAM #1 (Lectures 1–13)</td>
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<td>CAMPUS CLOSED: FURLOUGH DAY</td>
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<tr>
<td>Mar 15</td>
<td>Lecture 15: Efferent Division (cont.)</td>
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<tr>
<td>Mar 17</td>
<td>Lecture 16: Integrative Physiology I: Body Movement</td>
</tr>
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<td>Mar 19</td>
<td>Lecture 17: Muscles</td>
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<tr>
<td>DATE</td>
<td>LECTURE TOPIC</td>
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<tr>
<td>Mar 22</td>
<td>Lecture 18: Muscles</td>
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<td>Mar 24</td>
<td>Lecture 19: Muscles</td>
</tr>
<tr>
<td>Mar 26</td>
<td>CAMPUS CLOSED: FURLOUGH DAY</td>
</tr>
<tr>
<td>Mar 29</td>
<td><strong>Lecture 20: Cardiovascular Physiology: Functional Anatomy of the Heart</strong></td>
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<td><strong>Physiology Review: PAPER DUE</strong></td>
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<td>Mar 31</td>
<td>Lecture 21: Cardiovascular Physiology I: Cardiac Electrical Activity</td>
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<td>Apr 2</td>
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<tr>
<td>Apr 5-9</td>
<td><strong>SPRING BREAK</strong></td>
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<tr>
<td>Apr 12</td>
<td>Lecture 22: Blood Flow &amp; Control of Pressure</td>
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<tr>
<td>Apr 14</td>
<td>Lecture 23: Blood Flow &amp; Control of Pressure</td>
</tr>
<tr>
<td>Apr 16</td>
<td>Lecture 24: Blood</td>
</tr>
<tr>
<td>Apr 19</td>
<td>Lecture 25: Mechanics of Breathing</td>
</tr>
<tr>
<td>Apr 21</td>
<td>Lecture 26: Gas Exchange &amp; Transport</td>
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<td>Apr 23</td>
<td>Lecture 27: Gas Exchange &amp; Transport</td>
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<td>Apr 26</td>
<td><strong>MIDTERM # 2 (Lectures 14 – 27)</strong></td>
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<td>Apr 28</td>
<td>Lecture 28: Digestion</td>
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<td>Apr 30</td>
<td>Lecture 29: Digestion</td>
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<tr>
<td>May 3</td>
<td>Lecture 30: The Kidneys: Glomerular Filtration, Fluid &amp; Electrolyte Balance</td>
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<tr>
<td>May 5</td>
<td>Lecture 31: The Kidneys: Glomerular Filtration, Fluid &amp; Electrolyte Balance</td>
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<td>May 7</td>
<td>CAMPUS CLOSED: FURLOUGH DAY</td>
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<tr>
<td>May 10</td>
<td>Lecture 32: Integrative Physiology II: Fluid &amp; Electrolyte Balance</td>
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<td>May 12</td>
<td>Lecture 33: Integrative Physiology III: Exercise</td>
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<td>May 14</td>
<td>Lecture 34: Reproduction: Male &amp;Female</td>
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<td>May 17</td>
<td>Lecture 35: Reproduction &amp; Development: Sex</td>
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<td>May 19</td>
<td>Lecture 36: Immune System</td>
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<td>May 21</td>
<td>CAMPUS CLOSED: FURLOUGH DAY</td>
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<tr>
<td>May 24</td>
<td>FINAL EXAM</td>
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Meeting Time and Location: MW 4:00 – 5:15 pm  Darwin 29


COURSE DESCRIPTION
The Biology of Aging course examines the changes associated with the aging process in each organ system of humans.  Topics include:  longevity, theories of aging, the structure and function of organ systems, common changes, and diseases.  Current research and preventive measures will be discussed.

This is a General Education course that meets the Integrated Person (Group E, upper division) requirement.  The prerequisite is Biology 110 or an equivalent introductory biology course.  Students enrolled for credit must have at least 60 college-level units by the end of the semester in order to receive Upper Division GE credit.  Grading options include letter grades or CR/NC.  Only the student can choose or change the grading option.

CLASS FORMAT
Lecture/Discussion.  Text reading assignments are listed on the schedule. Participation in class discussion is encouraged.  Students will present current articles in class.  Supplemental information and online links to required assignments are posted on WebCT.  All assignments must be completed by December 2nd.

STUDENT RESPONSIBILITIES
Students are expected to read the assigned material in advance of the lecture, participate in discussions, and take all exams.  If class is missed, please get the notes from a classmate and check-in with the instructor to get handouts or additional information.  Check WebCT for class postings (articles, announcements, occasional outlines, relevant website listings).  When emailing, please include the course number in the subject line.  Documentation is required for a makeup exam.
GRADING

There will be four exams, including the final. Each exam is worth 100 points. Required assignments have variable point values. The total is worth 50 points. The semester total is 450 points.

A = 405-450  B = 360-404  C = 315-359  D = 270-314  F = Below 270

Plus and minus grades will be assigned.

TENTATIVE SCHEDULE

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>CHAPTER (C&amp;G)</th>
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</thead>
<tbody>
<tr>
<td>8/26 &amp; 9/2</td>
<td>Introduction. Course Description. The Aging Population / Longevity</td>
<td>1</td>
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<tr>
<td></td>
<td>Our Perception of Aging and Death</td>
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<tr>
<td>9/7 &amp; 9/9</td>
<td>LABOR DAY</td>
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<tr>
<td></td>
<td>Theories of Senescence</td>
<td>2</td>
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<tr>
<td></td>
<td>The Process of Aging: genes, calories, cellular garbage, stress, and more.</td>
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<tr>
<td>9/14 &amp; 9/16</td>
<td>The Integumentary System</td>
<td>3</td>
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<tr>
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<td>Skin Conditions and Diseases</td>
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<tr>
<td>9/21 &amp; 9/23</td>
<td>The Skeletal System</td>
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<td>Bone Structure, Types of Arthritis, and Osteoporosis</td>
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<tr>
<td>9/28 &amp; 9/30</td>
<td>Review</td>
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<tr>
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<td>EXAM 1 Bring Scantron</td>
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<tr>
<td>10/5 &amp; 10/7</td>
<td>The Muscular System</td>
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<td>Tissue Types and Changes</td>
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<td>Polymyositis, Myasthenia Gravis</td>
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<tr>
<td>10/12 &amp; 10/14</td>
<td>The Respiratory System</td>
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<td>Pathway, Lung Capacity</td>
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<td>Pneumonia, COPD</td>
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<td>10/19 &amp; 10/21</td>
<td>The Digestive System</td>
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<td>Pathway, Accessory Organs</td>
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<td>Disorders, Nutrition</td>
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<td>Topic</td>
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</table>
| 10/26 & 10/28 | The Excretory System  
The Amazing Nephrons  
EXAM 2 – Bring Scantron |
| 11/2 & 11/4   | The Cardiovascular System  
The Lymphatics, Blood, and Immunity |
| 11/09 & 11/11 | The Reproductive System  
Structure, Function, Hormones  
VETERAN’S DAY |
| 11/16 & 11/18 | The Endocrine System  
The Nervous System  
Structure and Function |
| 11/23        | EXAM 3                                                               |
| 11/25-27     | Thanksgiving Holiday                                                 |
| 11/30 & 12/2 | The Nervous System (cont’d.)  
Multiple Sclerosis, Parkinson’s, and Alzheimer’s Disease  
LAST DAY TO TURN IN ASSIGNMENTS  
Dec. 2nd |
| 12/7 & 12/9  | The Sense Organs  
The Eye and Ear  
Lifestyles: Environmental Factors and Aging |
| 12/16        | FINAL EXAM  
Wednesday, 5-6:50 pm. |

The subtopics within chapters listed above are a sampling of material but not all inclusive. Many more topics will be presented in class and covered on exams. If you are absent from class, be sure to consult a classmate to acquire the main points for notes. A makeup for an exam is given only for a documented, compelling reason.

If a student has a disability that requires accommodation in the class, the student must register with the campus Disabled Student Services, located in Salazar 1049, extension 42677.

*Action for Repeats in Impacted Courses*  
Due to enrollment pressure and budgetary constraints there are increasing student demands for access to courses in the Department of Biology. Please make a concerted effort this semester to obtain the grade that will meet the requirements of your major
since repeating a course to obtain a better grade requires approval of the Department Chair.

*Process for repeating the course*
You must complete a Repeat of Course form and submit it for the Biology Department chair’s approval before you will be considered for any openings in the course. Students who attempt to repeat a course by enrolling in the course for a second time during Reg I or Reg II without the Department chair's approval will be dis-enrolled. The link for the full SSU course repeat policy is [http://www.sonoma.edu/ar/records/repeat.pdf](http://www.sonoma.edu/ar/records/repeat.pdf)

Review University Policies at [www.sonoma.edu/uaaffairs/policies/studentinfo](http://www.sonoma.edu/uaaffairs/policies/studentinfo)

<table>
<thead>
<tr>
<th>REQUIRED ASSIGNMENTS</th>
<th>Point Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>See WebCT for weblinks</td>
<td></td>
</tr>
<tr>
<td>Longevity Quiz</td>
<td>8</td>
</tr>
<tr>
<td>In-class article</td>
<td>5</td>
</tr>
<tr>
<td>Shin Splints and Fractures Quiz</td>
<td>5</td>
</tr>
<tr>
<td>My Pyramid Plan</td>
<td>5</td>
</tr>
<tr>
<td>In-class article</td>
<td>5</td>
</tr>
<tr>
<td>Cholesterol Quiz</td>
<td>5</td>
</tr>
<tr>
<td>Nervous System Quiz</td>
<td>5</td>
</tr>
<tr>
<td>Excretory System Quiz &amp; Diagrams</td>
<td>10</td>
</tr>
<tr>
<td>Points for turning in assignments during week of corresponding chapter</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>50 points</strong></td>
</tr>
</tbody>
</table>

In-class article
Bring an article (last five years) related to aging and be ready to discuss the contents with a small group and/or the entire class. Submit a copy of the article or a short written summary to the instructor on the designated day. Pertinent information includes: Source of article, date of publication, title of article, name of researchers or organizations conducting studies, introduction to the issue, importance/application of findings and outlook or suggestions for the future.

Additional notes of your own:
Instructor: Richard Whitkus
Office Hours: M 1-2:30, Th 9:30-11
Office: Darwin 219
e-mail: whitkus@sonoma.edu

Lecture: T, Th 8:00 – 9:15 am, Darwin 31
Laboratory: T 9:25-12:15, Darwin 205


Class Materials: On WebCT, BIOL 329 - 001

Grading: 4 exams (15%, 15%, 15%, 15%), presentation (20%), laboratory work (20%)

<table>
<thead>
<tr>
<th>Section</th>
<th>Week</th>
<th>Topic</th>
<th>Text Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Plant Structure &amp; Development</td>
<td>Aug 27</td>
<td>Introduction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sep 1</td>
<td>Macromolecules</td>
<td>2(15-34)</td>
</tr>
<tr>
<td></td>
<td>Sep 3</td>
<td>Plant cell I: General structure/function</td>
<td>3(35-47)</td>
</tr>
<tr>
<td></td>
<td>Sep 8</td>
<td>Plant cell II: Membrane structure and function</td>
<td>4(71-85)</td>
</tr>
<tr>
<td></td>
<td>Sep 10</td>
<td>Plant cell III: Endomembrane system</td>
<td>3(47-50)</td>
</tr>
<tr>
<td></td>
<td>Sep 15</td>
<td>Plant cell IV: Cytoskeleton, cell wall</td>
<td>3(50-58)</td>
</tr>
<tr>
<td></td>
<td>Sep 17</td>
<td>Plant cell reproduction</td>
<td>3(58-60)</td>
</tr>
<tr>
<td></td>
<td>Sep 22</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sep 24</td>
<td>EXAM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sep 29</td>
<td>Cells and tissues of primary plant body</td>
<td>23(512-526)</td>
</tr>
<tr>
<td></td>
<td>Oct 1</td>
<td>Origin of the plant body</td>
<td>23(510-512); 22</td>
</tr>
<tr>
<td></td>
<td>Oct 6</td>
<td>Roots</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Oct 8</td>
<td>Stems</td>
<td>25(547-559, 575-578)</td>
</tr>
<tr>
<td></td>
<td>Oct 13</td>
<td>Leaves</td>
<td>25(559-575)</td>
</tr>
<tr>
<td></td>
<td>Oct 15</td>
<td>Secondary growth</td>
<td>26</td>
</tr>
<tr>
<td>II: Plant Diversity</td>
<td>Oct 20</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oct 22</td>
<td>EXAM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oct 27</td>
<td>Overview of diversity</td>
<td>12(219-226)</td>
</tr>
<tr>
<td></td>
<td>Oct 29</td>
<td>Prokaryote to eukaryote, algae</td>
<td>2(37-38); 12(227-230); 13(244-247)</td>
</tr>
<tr>
<td>Nov 3</td>
<td>Green algae</td>
<td>15(327-340)</td>
<td></td>
</tr>
<tr>
<td>Nov 5</td>
<td>Transition to land, Bryophytes</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Nov 10</td>
<td>Early land plants / Review</td>
<td>17(368-380)</td>
<td></td>
</tr>
<tr>
<td>Nov 12</td>
<td>EXAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov 17</td>
<td>Seedless vascular plants</td>
<td>17(381-405)</td>
<td></td>
</tr>
<tr>
<td>Nov 19</td>
<td>Evolution of the seed: gymnosperms</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Nov 24</td>
<td>Work on student presentations – no class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov 25</td>
<td>THANKSGIVING HOLIDAY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 1</td>
<td>Angiosperm origins and diversity</td>
<td>19(434-438); 20(452-458)</td>
<td></td>
</tr>
<tr>
<td>Dec 3</td>
<td>Angiosperm reproduction / Review</td>
<td>19(442-451)</td>
<td></td>
</tr>
<tr>
<td>Dec 8</td>
<td>Student Presentations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 10</td>
<td>Student Presentations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 15</td>
<td>FINAL EXAM: 8-9:50 am</td>
<td></td>
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</tr>
</tbody>
</table>
“There are important University policies that you should be aware of, such as the add/drop policy; cheating and plagiarism policy, grade appeal procedures; accommodations for students with disabilities and the diversity vision statement. (Go to this URL to find them: http://www.sonoma.edu/uaffairs/policies/studentinfo.shtml)
### LAB SCHEDULE

<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NO LAB</td>
</tr>
<tr>
<td>2</td>
<td>Microscope, cell structure (general cell structure, cell shapes/types)</td>
</tr>
<tr>
<td>3</td>
<td>Cell structure (organelles, other components)</td>
</tr>
<tr>
<td>4</td>
<td>Membranes, movement, and cell division (extra 10 point assignment in lab)</td>
</tr>
<tr>
<td>5</td>
<td>Cells and tissues</td>
</tr>
<tr>
<td>6</td>
<td>Early development</td>
</tr>
<tr>
<td>7</td>
<td>Roots</td>
</tr>
<tr>
<td>8</td>
<td>Shoots and primary growth</td>
</tr>
<tr>
<td>9</td>
<td>Secondary growth</td>
</tr>
<tr>
<td>10</td>
<td>Prokaryotes and green algae I</td>
</tr>
<tr>
<td>11</td>
<td>Green algae II</td>
</tr>
<tr>
<td>12</td>
<td>Land plants intro, Bryophytes</td>
</tr>
<tr>
<td>13</td>
<td>Seedless vascular plants</td>
</tr>
<tr>
<td>14</td>
<td>NO LAB</td>
</tr>
<tr>
<td>15</td>
<td>Seed Plants – Gymnosperms and Angiosperms</td>
</tr>
<tr>
<td>16</td>
<td>Student Presentations</td>
</tr>
</tbody>
</table>

Each lab will be marked on the basis of 10 points. Points will be taken off for not completing answers or diagrams. In making diagrams (drawings), it is important to carefully observe the material and draw the idealized representation of what you observe. This means being careful in your drawing, labeling when necessary, and making drawing large enough to be easily seen and interpreted. Minimize shading (this is not art class), but feel free to use colors if you like. However, black and white is perfectly acceptable. NO DRAWING ARE DONE IN INK CAUSE YOU ARE NOT PERFECT.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 26</td>
<td>Course introduction – lecture &amp; lab</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Aug 31</td>
<td>Approaches to studying ecology</td>
<td>pg 1-18</td>
</tr>
<tr>
<td></td>
<td>Sep 2</td>
<td>Imperiled biodiversity &amp; life history characteristics</td>
<td>pg 30-41, 59-63</td>
</tr>
<tr>
<td>3</td>
<td>Sep 7</td>
<td><strong>Labor Day</strong> [campus closed]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sep 9</td>
<td>Biological invasions</td>
<td>TBA</td>
</tr>
<tr>
<td>4</td>
<td>Sep 14</td>
<td>Global climate change &amp; ecological responses</td>
<td>pg 94-101</td>
</tr>
<tr>
<td></td>
<td>Sep 16</td>
<td>Competition</td>
<td>pg 109-134</td>
</tr>
<tr>
<td>5</td>
<td>Sep 21</td>
<td>Competition (continued)</td>
<td>pg 109-134</td>
</tr>
<tr>
<td></td>
<td>Sep 23</td>
<td>Predation, parasitism &amp; disease</td>
<td>pg 150-169, 189-205</td>
</tr>
<tr>
<td>6</td>
<td>Sep 28</td>
<td>Predation, parasitism &amp; disease (continued)</td>
<td>pg 150-169, 189-205</td>
</tr>
<tr>
<td></td>
<td>Sep 30</td>
<td>Exam 1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Oct 5</td>
<td>Herbivory &amp; granivory</td>
<td>pg 170-188, 370</td>
</tr>
<tr>
<td></td>
<td>Oct 7</td>
<td><strong>Furlough Day</strong> [work on research paper]</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Oct 12</td>
<td><strong>Furlough Day</strong> [work on research paper]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oct 14</td>
<td>Herbivory &amp; granivory (continued)</td>
<td>pg 170-188, 370</td>
</tr>
<tr>
<td>9</td>
<td>Oct 19</td>
<td>Mutualism &amp; symbiosis</td>
<td>pg 135-149</td>
</tr>
<tr>
<td></td>
<td>Oct 21</td>
<td>Mutualism &amp; symbiosis (continued)</td>
<td>pg 135-149</td>
</tr>
<tr>
<td>10</td>
<td>Oct 26</td>
<td>Population regulation &amp; metapopulation dynamics</td>
<td>pg 206-226</td>
</tr>
<tr>
<td></td>
<td>Oct 28</td>
<td>Local &amp; large-scale patterns of diversity</td>
<td>pg 249-267</td>
</tr>
<tr>
<td>11</td>
<td>Nov 2</td>
<td>Community characteristics, structure &amp; stability</td>
<td>pg 273-288, 289-299</td>
</tr>
<tr>
<td></td>
<td>Nov 4</td>
<td>Community characteristics (continued)</td>
<td>pg 273-288, 289-299</td>
</tr>
<tr>
<td>12</td>
<td>Nov 9</td>
<td>Exam 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nov 11</td>
<td><strong>Veteran’s Day</strong> [campus closed]</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Nov 16</td>
<td>System switch points &amp; state transformations</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>Nov 18</td>
<td>Keystone species, biodiversity &amp; ecosystem function</td>
<td>pg 267-272, 344-346</td>
</tr>
<tr>
<td>14</td>
<td>Nov 23</td>
<td><strong>Furlough Day</strong> [review for Lab Exam]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nov 25</td>
<td><strong>Thanksgiving Break</strong></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Nov 30</td>
<td>Community change – succession &amp; disturbance</td>
<td>pg 299-300, 303-317</td>
</tr>
<tr>
<td></td>
<td>Dec 2</td>
<td>Community change (continued)</td>
<td>pg 299-300, 303-317</td>
</tr>
<tr>
<td>16</td>
<td>Dec 7</td>
<td>Island biogeography &amp; applications to reserve design</td>
<td>pg 318-333</td>
</tr>
<tr>
<td></td>
<td>Dec 9</td>
<td>Island biogeography (continued)</td>
<td>pg 318-333</td>
</tr>
<tr>
<td>17</td>
<td>Dec 16</td>
<td>Exam 3 (2:00-3:50 pm)</td>
<td></td>
</tr>
</tbody>
</table>
Sonoma State University
Department of Biology
BIOL 338: Environmental Microbiology and Biotechnology
Syllabus, Spring 2010

Instructor: Michael Cohen, Ph.D.  Office Hours: Wed. 11 a.m. – noon
Office: Darwin 222      Thurs. 11:00 a.m. – 1:00 p.m.
E-mail: cohenm@sonoma.edu  Tel.: 664-3413

Lecture       Monday & Wednesday  4:00- 5:15 PM, 35 Darwin Hall
Laboratory    Monday & Wednesday  5:25- 6:50 PM, 208 Darwin Hall

Course content: An integrated lecture and laboratory course that examines microbial ecology and diversity along with biotechnological applications of microbes in agriculture, wastewater treatment, bioremediation, and biofuel production. In the laboratory you will learn skills for isolating and enumerating environmental microbes and carry out experiments to investigate microbial-related phenomena in the biosphere. This course satisfies a ENSP Hazardous Materials Management and Water Quality Technology core requirement.

Prerequisites: BIOL 121/122 and CHEM 115AB or consent of instructor

Course Goals and Objectives: Students in this course are expected to:

- develop an appreciation for the breadth of genetic and metabolic diversity of microbial life;
- learn the roles of microbes in biogeochemical cycling;
- learn the activities of microbes in soil and their influences on plant health;
- learn uses of environmental microbes in industry and for food production;
- become adept in field sampling procedures and standard microbiological laboratory practices, including microscopy, cell staining, aseptic technique, and serial dilution;
- gain experience in interpreting and presenting scientific data.

Required Textbook: Microbial Ecology of the Soil and Plant Growth by Pierre Davet, Science Publishers, Inc. 2004. Other readings may be provided as handouts or postings on WebCT.

Attendance and serious participation in lecture and lab are strongly encouraged since history has shown a strong correlation with course grade. Points are deducted for unexcused absences. Late arrivals and early departures for no documented reasons will be counted as absence. Late students will not be given extra time to complete tests.

Grading: Your final course grade will be determined based on the total number of points earned on all tests, quizzes, lab exams and lab assignments. It is expected that letter grades will be assigned on the basis of the following scale:

90 % and above: A (A−, A): 80-89.9%: B (B−, B, B+)
70-79.9%: C (C−, C, C+) 60-69.9%: D (D−, D, D+)
Less than 60%: F

DATES AND EVENTS TO REMEMBER
Exams (covering topics from lecture and laboratory): 300 pts
First Exam : Monday, March 1 100 pts
Second Exam : Wednesday, March 31 100 pts
Third Exam : Finals week, date to be announced 100 pts
Exam Total 300 pts

Other: 100 pt
Laboratory project summary report 25 pts
Specialized topic project (written report and oral presentation) 25 pts
Attendance & Participation 25 pts
Laboratory notebook & Quizzes 25 pts
Total 100 pts

Course Total: 400 pts

Regarding Exams: Questions and concerns regarding your answers on exams must be submitted in writing within one week after receiving the graded exam. Upon your request, the entire exam may be regraded. No make-ups will be given for any tests except in genuine documented emergencies in which case the make-up must be completed before the next class section.

Learning Disabilities: If you have a learning disability and may have need for some type of accommodation(s) in order to participate fully in this class, please feel free to discuss your concerns in private with me AND BE SURE TO CONTACT the SSU Disability Student Services office.

As a student at Sonoma State University, it is important that you know the policies and procedures that affect you. These policies and procedures, approved by the SSU Academic Senate, may be found on the following web sites:
Add/Drop Policy: http://www.sonoma.edu/catalog/regulations.html#adrop
Cheating and Plagiarism Policy, Student Grievance Policy, and Grade Appeal Policy:
http://www.sonoma.edu/Senate/FairnessBoard/FairnessBoard.html
Diversity Statement: http://www.sonoma.edu/diversity/

Laboratory notebook format
You will be required to maintain a laboratory notebook containing the following elements:
• each page numbered at top or bottom right;
• dated left margin;
• underlined project heading followed by a description of that day’s experimental procedures;
• experimental results (in tabular format where appropriate), and a tentative interpretation of the results.
For multi-session projects each day’s entry should be flanked by “From p._____” at the top left and “Go to p. _____” on the bottom right. A table of contents at the front of the notebook should list the first page and title of each lab project.
## BIOL 338 Spring 2010 Lecture Schedule†

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/1</td>
<td>Course introduction; Themes in environmental microbiology;</td>
<td>22-55, 62-70</td>
</tr>
<tr>
<td></td>
<td>Classification systems</td>
<td></td>
</tr>
<tr>
<td>2/3</td>
<td>Eukaryotes; Nematodes</td>
<td></td>
</tr>
<tr>
<td>2/8</td>
<td>Stramenopila; Alveolata; Amoebozoa</td>
<td></td>
</tr>
<tr>
<td>2/10</td>
<td>Green Algae, Primary and secondary symbioses</td>
<td></td>
</tr>
<tr>
<td>2/15</td>
<td>Fungi</td>
<td></td>
</tr>
<tr>
<td>2/17</td>
<td>Bacteria; Wine-making</td>
<td></td>
</tr>
<tr>
<td>2/22</td>
<td>Microbial production of liquid biofuels</td>
<td></td>
</tr>
<tr>
<td>2/24</td>
<td>Methods for monitoring environmental microbes</td>
<td></td>
</tr>
<tr>
<td>3/1</td>
<td>EXAM I</td>
<td></td>
</tr>
<tr>
<td>3/3</td>
<td><strong>No class (Instructor at WRPI meeting); read carbon cycle overview</strong></td>
<td>120-130</td>
</tr>
<tr>
<td>3/8</td>
<td>Biodegradation: Mineralization of large molecules</td>
<td>189-194; 284-285</td>
</tr>
<tr>
<td>3/10</td>
<td>Biodegradation of organic contaminants: Bioremediation</td>
<td>151-156</td>
</tr>
<tr>
<td>3/15</td>
<td>Phytoremediation</td>
<td></td>
</tr>
<tr>
<td>3/17</td>
<td>Carbon flow in the rhizosphere</td>
<td>195-206</td>
</tr>
<tr>
<td>3/22</td>
<td>Roles for metals and biotransformations by microbes</td>
<td></td>
</tr>
<tr>
<td>3/29</td>
<td>The nitrogen cycle, applications in waste treatment</td>
<td>130-135</td>
</tr>
<tr>
<td>3/31</td>
<td>EXAM II</td>
<td></td>
</tr>
<tr>
<td>4/5</td>
<td><strong>Spring break</strong></td>
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</tr>
<tr>
<td>4/7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/12</td>
<td><strong>Furlough; no class</strong></td>
<td></td>
</tr>
<tr>
<td>4/14</td>
<td>Predation &amp; Parasitism; Viruses; Vectors</td>
<td>64; 97-99; 164-170; 246-249</td>
</tr>
<tr>
<td>4/19</td>
<td>Plant-associated microbial activities</td>
<td>210-213</td>
</tr>
<tr>
<td>4/21</td>
<td>The root colonization process</td>
<td>220-230, 246</td>
</tr>
<tr>
<td>4/26</td>
<td>Symbiotic N₂-fixation: <em>Frankia</em>; Cyanobacteria</td>
<td>140-142</td>
</tr>
<tr>
<td>5/3</td>
<td>Field trip</td>
<td></td>
</tr>
<tr>
<td>5/5</td>
<td>Colonization by eukaryotes; Oomycetes; Mycorrhizae; <em>Macrophomina</em></td>
<td>224; 117-118, 230-238; 278-280</td>
</tr>
<tr>
<td>5/10</td>
<td>Organic soil amendments; Disease suppression</td>
<td>98-101; 341-343, 161-164</td>
</tr>
<tr>
<td>5/12</td>
<td>Production and use of auxillary microorganisms</td>
<td>332-339</td>
</tr>
<tr>
<td>5/17</td>
<td>Oral reports (report outlines due)</td>
<td></td>
</tr>
<tr>
<td>5/19</td>
<td>Oral reports</td>
<td></td>
</tr>
<tr>
<td><strong>TBA</strong></td>
<td>EXAM III</td>
<td></td>
</tr>
</tbody>
</table>

†Subject to change.
*Reading assignments are from “Microbial Ecology of the Soil and Plant Growth”, Pierre Davet (2004).
BIOL 340  Fall ’09 SYLLABUS

Instructor: Michael Cohen, Ph.D.  Office Hours:  Wed 11:00 AM – Noon
Office: Darwin 222      Thurs 11:00 AM– 1:00 PM
E-mail: cohenm@sonoma.edu  Tel.: 664-3413

Text: Madigan & Martinko, Brock Biology of Microorganisms, 11th edition
Lab manual: “Symbiosis”, a condensed version of Johnson & Case, Laboratory Experiments in Microbiology with supplemental material; available at the SSU bookstore

Other required material: Fine point black Sharpie
Three-ring binder for handouts and notepaper
Calculator

Course Objectives. This course will introduce you to a range of bacteria, demonstrating some of their tremendous metabolic diversity, adaptability, interactions with other organisms and roles in human affairs. In the laboratory you will learn basic skills needed to work with microbes and will gain experience in collecting, interpreting and presenting scientific data. The laboratory and lecture coursework are highly integrated.

Attendance & Work Load. Attendance at all laboratory meetings is required. No make-ups will be given for any tests except in genuine documented emergencies in which case the make-up must be completed before the next class section. This four unit course requires a large amount of study time. About 8 hours per week will be spent in the classroom and you should anticipate having to spend about twice that amount of time for self-study. It is essential that you come to class prepared.

Course Point Allocations:

<table>
<thead>
<tr>
<th>Content</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes, Three exams</td>
<td>300</td>
</tr>
<tr>
<td>Skills &amp; homework, projects</td>
<td>50</td>
</tr>
<tr>
<td>Lab notebook &amp; report</td>
<td>50</td>
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Percentage cutoffs for grading:

<table>
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<tr>
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<th>Grade</th>
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<tbody>
<tr>
<td>90-100</td>
<td>A-, A</td>
</tr>
<tr>
<td>80-89</td>
<td>B-, B, B+</td>
</tr>
<tr>
<td>70-79</td>
<td>C-, C, C+</td>
</tr>
<tr>
<td>60-69%</td>
<td>D-, D, D+</td>
</tr>
<tr>
<td>≤59%</td>
<td>F</td>
</tr>
</tbody>
</table>

Regarding Exams: Questions and concerns regarding your answers on exam must be submitted in writing within one week after receiving the graded exam. Upon your request, the entire exam may be regraded.

Learning Disabilities: If you have a learning disability and may have need for some accommodation(s) in order to participate fully in this class, please feel free to discuss your concerns in private with me AND BE SURE TO CONTACT the SSU Disability Student Services office.

As a student at Sonoma State University, it is important that you know the policies and procedures that affect you. These policies and procedures, approved by the SSU Academic Senate, may be found on the following web sites:

Add/Drop Policy  http://www.sonoma.edu/catalog/regulations.html#adddrop
Cheating and Plagiarism Policy  http://www.sonoma.edu/uaffairs/policies/cheatingpolicy.htm
Grade Appeal Policy  http://www.sonoma.edu/uaffairs/policies/gradepolicy.htm
Access to Programs for Students with Disabilities Policy  http://www.sonoma.edu/uaffairs/policies/disabilitypolicy.htm
Diversity Statement  http://www.sonoma.edu/diversity/
# BIOL 340 LECTURE SCHEDULE

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Th</td>
<td>Aug 27 Introduction; bacteria in human affairs</td>
<td>Ch. 1; Review Ch. 2 &amp; 3</td>
</tr>
<tr>
<td>T</td>
<td>Sep 1 Koch’s postulates Axenic cultures; Odds ratios; NGU</td>
<td>6.7</td>
</tr>
<tr>
<td>Th</td>
<td>Sep 3 Origin of microbial life</td>
<td>Ch. 11 part I</td>
</tr>
<tr>
<td>T</td>
<td>Sep 8 Evolution and taxonomy</td>
<td>Ch. 11 parts II &amp; III (p. 323 FAME)</td>
</tr>
<tr>
<td>Th</td>
<td>Sep 10 The oxic atmosphere; Nutrition and culture of bacteria</td>
<td>Ch. 5 part I; 6.15, 6.16</td>
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<tr>
<td>T</td>
<td>Sep 15 Bioenergetics; Oxidation-reduction; Nitrate reduction</td>
<td>Ch. 5 part II &amp; III; 17.13-17.14</td>
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<tr>
<td>Th</td>
<td>Sep 17 Catabolism and fermentation pathways</td>
<td>Ch. 5 part IV &amp; V, 17.19</td>
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<tr>
<td>T</td>
<td>Sep 22 Fermentation (cont.); <em>Oxalobacter</em></td>
<td>17.20</td>
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<tr>
<td>Th</td>
<td>Sep 24 Biosynthesis; Photosynthesis; Bacteria as food <em>(Spirulina)</em></td>
<td>Ch. 5 part VI; 17.1-2, 17.5-7, 17.26; 30.7</td>
</tr>
<tr>
<td>T</td>
<td>Sep 29 EXAM I</td>
<td></td>
</tr>
<tr>
<td>Th</td>
<td>Oct 1 The cell envelope: cell membrane and peptidoglycan</td>
<td>4.5, 4.6, 4.8 - 4.10</td>
</tr>
<tr>
<td>T</td>
<td>Oct 6 Bacterial cell division and population growth</td>
<td>Ch. 6 parts I, II &amp; III</td>
</tr>
<tr>
<td>Th</td>
<td>Oct 8 The cell envelope: outer membrane and capsule</td>
<td>4.9, 4.10 p. 269-70 (fig. 10.13); Sec. 21.6; p. 851 rheumatic fever</td>
</tr>
<tr>
<td>T</td>
<td>Oct 13 Cell Motility</td>
<td>Ch. 4 part IV</td>
</tr>
<tr>
<td>Th</td>
<td>Oct 15 Temperature effects on bacteria</td>
<td>Ch. 6 part IV; 20.1</td>
</tr>
<tr>
<td>T</td>
<td>Oct 20 Endospores, <em>Bacillus anthracis</em></td>
<td>4.13; 12.20; 25.13</td>
</tr>
<tr>
<td>Th</td>
<td>Oct 22 Genetic response to environmental change (e.g. the lac operon)</td>
<td>Ch. 7 p. 188-191 (review); 8.5-8.7, p. 220 (Alternative sigma factors) &amp; Fig. 4.25</td>
</tr>
<tr>
<td>T</td>
<td>Oct 27 Bacterial toxins &amp; secretion systems; <em>Vibrio cholerae, Corynebacterium diphtheriae, Helicobacter pylori</em></td>
<td>Ch. 21 part III; 26.3; 26.10; 28.5</td>
</tr>
<tr>
<td>Th</td>
<td>Oct 29 <em>Agrobacterium</em>; Genetic modification of plants</td>
<td>19.21, 31.10</td>
</tr>
<tr>
<td>T</td>
<td>Nov 3 EXAM II</td>
<td></td>
</tr>
<tr>
<td>Th</td>
<td>Nov 5 The carbon cycle; Syntropy; Methanogenesis</td>
<td>17.21; Ch. 19 part IV; 19.5, 28.2</td>
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<tr>
<td>T</td>
<td>Nov 10 Decomposition &amp; Waste treatment</td>
<td>17.17, Fig. 13.5, Fig. 17.58</td>
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<tr>
<td>Th</td>
<td>Nov 12 The N cycle: Ammonification, Nitrification</td>
<td>12.3! 19.12; 17.12</td>
</tr>
<tr>
<td>T</td>
<td>Nov 17 N cycle: N₂ fixation, Nitrogenous products; Predation</td>
<td>p. 355 (<em>Serratia</em>)</td>
</tr>
<tr>
<td>Th</td>
<td>Nov 19 Bacteriophage infection</td>
<td>9.4-9.6, p.242 Viral Proteins, p.244-5 T4 Infection Events</td>
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<td>T</td>
<td>Nov 24 Furloughed; complete webpage assignment</td>
<td></td>
</tr>
<tr>
<td>Th</td>
<td>Nov 26 <em>Thanksgiving Break</em></td>
<td>20.1-20.5, 20.6 (quinolones), 20.12-20.13; 12.25</td>
</tr>
<tr>
<td>T</td>
<td>Dec 1 Killing bacteria: Physical methods; Antibiotics; <em>Streptomyces</em></td>
<td></td>
</tr>
<tr>
<td>Th</td>
<td>Dec 3 Quorum sensing; Biofilms; Dental bacteria; Microbial ecosystems</td>
<td>8.10, 19.3; Ch. 21 part I</td>
</tr>
<tr>
<td>T</td>
<td>Dec 8 Nitric oxide</td>
<td>12.9; Ch. 17 part VI</td>
</tr>
<tr>
<td>Th</td>
<td>Dec 10 Symbiotic associations; Sulfur &amp; Phosphorous cycles; Hydrothermal vents</td>
<td>12.25, 19.22; 17.10, 19.13; 19.8</td>
</tr>
<tr>
<td>?</td>
<td>Dec ? FINAL EXAM</td>
<td></td>
</tr>
</tbody>
</table>

* Schedule subject to revision

Biol 340
Sonoma State University
Virology (BIOL 383)
Spring 2010

Instructor: Joseph Lin, Ph.D.
Office location: 211 Darwin Hall
Office phone: (707) 664-2931
E-mail: joseph.lin@sonoma.edu
Office hours: Tues. 2:15 pm-3:15 pm, Wed. 3:30 pm-4:30 pm, Fri 1:00 pm-2:00 pm

Lecture: Mon. & Wed., 1:00 pm - 2:15 pm, Darwin Hall 030
Discussion: Section 1: Mon., 2:25 pm - 3:15 pm, Darwin Hall 231
Section 2: Mon., 3:30 pm - 4:25 pm, Darwin Hall 231
Section 3: Wed., 2:25 pm - 3:15 pm, Darwin Hall 231

Course description: Lecture, 3 hours; discussion, 1 hour. Viruses: their characteristics, classification, genetics, and host-parasite interactions, including methods of disease prevention, control, and applications in biotechnology.

Prerequisites: BIOL 123 and CHEM 335A.

Course objective: The objective of this course is to provide a survey of the various types of viruses, how they propagate, the problems they cause, and how they can be utilized for beneficial purposes. Emphasis will be placed on the molecular mechanisms viruses use to replicate and how this can affect the host.

The discussion sections will focus on engaging students to discuss important issues regarding virology, teach students to analyze and interpret data generated to study viruses, and allow students to formally lead discussions and give presentations to their peers.


Grading:

Lecture 80%
Midterm #1 (March 1) 20%
Midterm #2 (March 31) 20%
Midterm #3 (May 5) 20%
Final (May 26) 20%

Discussion 20%

Letter grades will be determined relative to the class average and incremental (plus/minus) grades will be given.
Lecture Exams: There will be 3 midterm exams (emphasizing material covered between exams) and one final (cumulative).

Expectations: Attendance and participation in lecture is essential for success in the course since some material covered in class will not necessarily be in the required reading. Please be on time. This course has a substantial amount of reading that I expect you to do, but you should approach the reading as a supplement to lectures. As a general rule, if it’s not mentioned during lecture, you don’t need to spend too much time on it.

Attendance and participation in discussion is required. If there is a known conflict, please contact me as soon as possible.

Missed exams: If a known reasonable conflict exists with an exam, exams can be taken early at my discretion. Exams missed for reasons beyond the student’s control can be discussed on a case-by-case basis, otherwise no make up exams will be given.

Civility: Please turn off cell phones and pagers during class. Show respect for your fellow students and keep in mind that this is a learning environment. If for some reason issues arise during the semester, please inform me of the situation so that attempts can be made to resolve them.

Academic Dishonesty: In all cases of academic dishonesty, for example cheating, plagiarism, or sabotage, the instructor will issue a grade for the work involved. Since the grade is often a “zero”, its assignment can result in a failing grade for the course. The complete campus policy on academic dishonesty may be found at http://www.sonoma.edu/uaffairs/policies/cheating_plagiarism.htm

Learning Disabilities: Students requiring special accommodations should meet with me during office hours so that we can discuss how to meet your needs this semester. Prior to our meeting, be sure you have met with the SSU Disability Student Services office and are familiar with their policies. http://www.sonoma.edu/uaffairs/policies/disabilitypolicy.htm

Other SSU policies: Be sure you understand the other policies that affect you as a student at SSU for this course.

Add/Drop Policy: http://www.sonoma.edu/catalog/08-10/17regulations.pdf#adddrop

Grade Appeal Policy: http://www.sonoma.edu/uaffairs/policies/gradepolicy.htm

Diversity Vision Statement: http://www.sonoma.edu/diversity
## Virology: Lecture Topics and Required Reading

Spring semester 2010 (subject to modification)

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Textbook Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 1</td>
<td>Course Overview and Introduction</td>
<td>Ch 1</td>
</tr>
<tr>
<td>Feb 3</td>
<td>Virus/host interactions</td>
<td>Ch 2, Ch 3 (p.27-33), Ch 4 (p. 41-48)</td>
</tr>
<tr>
<td>Feb 8</td>
<td>Cellular processes</td>
<td>Ch 13</td>
</tr>
<tr>
<td>Feb 10</td>
<td>Viral structure</td>
<td>Ch 5 (p.65-72), Ch 9</td>
</tr>
<tr>
<td>Feb 15</td>
<td>Classification and taxonomy</td>
<td>Ch 5 (p.72-78)</td>
</tr>
<tr>
<td>Feb 17</td>
<td>Basic viral life cycle</td>
<td>Ch 6</td>
</tr>
<tr>
<td>Feb 22</td>
<td>Techniques to study viruses</td>
<td>Ch 10</td>
</tr>
<tr>
<td>Feb 24</td>
<td>Techniques to study viruses</td>
<td>Ch 11 &amp; 12</td>
</tr>
<tr>
<td>Mar 1</td>
<td><strong>Midterm Exam 1</strong></td>
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<tr>
<td>Mar 3</td>
<td>Immune response to viruses</td>
<td>Ch 7 (p.97-108)</td>
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<td>Mar 8</td>
<td>Vaccines and drugs</td>
<td>Ch 8</td>
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<tr>
<td>Mar 10</td>
<td>Immune Evasion</td>
<td>Ch 7 (p.108-112)</td>
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<tr>
<td>Mar 15</td>
<td>Positive sense ssRNA viruses</td>
<td>Ch 14</td>
</tr>
<tr>
<td>Mar 17</td>
<td>Negative sense ssRNA viruses</td>
<td>Ch 15 (273-292)</td>
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<tr>
<td>Mar 22</td>
<td>Double stranded RNA and ssDNA viruses</td>
<td>Ch 15 (p.292-295), Ch 16 (p.323-328)</td>
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<td>Mar 24</td>
<td>Double stranded DNA viruses</td>
<td>Ch 16 (p.303-323), Ch 18 (p.359-364)</td>
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<td>Mar 29</td>
<td>Retroviruses (RNA to DNA)</td>
<td>Ch 19 (p.381-392)</td>
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<td>Mar 31</td>
<td><strong>Midterm Exam 2</strong></td>
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<tr>
<td>April 5</td>
<td>Spring Break</td>
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<td>April 7</td>
<td>Spring Break</td>
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<tr>
<td>April 12</td>
<td>Phage</td>
<td>Ch 18 (p.365-376)</td>
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<td>April 14</td>
<td>Plant Viruses</td>
<td>Ch14 (p.267-269)</td>
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<td>April 19</td>
<td><strong>Furlough</strong></td>
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<tr>
<td>April 21</td>
<td>Flu</td>
<td>Ch 15 (p.283-285)</td>
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<tr>
<td>April 26</td>
<td>HIV</td>
<td>Ch 20</td>
</tr>
<tr>
<td>April 28</td>
<td>Viroids and Prions</td>
<td>Ch 15 (p.295-300)</td>
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<tr>
<td>May 3</td>
<td>Viral oncogenes; Tumors</td>
<td>Ch 19 (p.392-395)</td>
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<tr>
<td>May 5</td>
<td><strong>Midterm Exam 3</strong></td>
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<tr>
<td>May 10</td>
<td>New techniques to study viruses</td>
<td>Ch 22 (p.441-461), Ch 23 (p.463-470)</td>
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<tr>
<td>May 12</td>
<td>Viral bioinformatics</td>
<td>Ch 24</td>
</tr>
<tr>
<td>May 17</td>
<td>Using viruses in medicine</td>
<td>Ch 25</td>
</tr>
<tr>
<td>May 19</td>
<td>Wrap up and review</td>
<td></td>
</tr>
<tr>
<td>May 26</td>
<td><strong>FINAL (Wednesday, 2:00 pm – 3:50pm)</strong></td>
<td></td>
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</tbody>
</table>

Other required reading will be posted
SONOMA STATE UNIVERSITY
DEPARTMENT OF BIOLOGY
BIOLOGY 472: DEVELOPMENTAL BIOLOGY
SPRING 2010

Instructor: Murali Pillai, Ph.D
Office: Darwin Hall Room 214
Telephone: 707-664-2981
Email: pillai@sonoma.edu
Webpage: www.sonoma.edu/biology/pillai
Office Hours: Wed. & Thurs. 10:00 AM - 11:30 AM
[OR by appointment]

HPAC Office Hours: Wed. & Thurs. 9:30 AM - 10:00 AM

Lecture: Tues. & Thurs. 1:00 PM - 2:15 PM, DARWIN HALL - ROOM 38
Laboratory: Tues. 9:25 AM - 12:15 PM, DARWIN 204 (Sec. 1)
Tues. 2:25 PM - 5:10 PM, DARWIN 204 (Sec. 2)

Course goals and objectives: This course is designed to provide students with a comprehensive appreciation of the developmental process, presenting detailed descriptions of developmental mechanisms along with a conceptual framework for understanding how development occurs. Discussions will focus on developmental processes in a variety of invertebrate and vertebrate embryos at the anatomical, cellular, biochemical and molecular levels. Laboratory experiences are mostly experimental in nature and are designed to demonstrate concepts covered in lecture.

Pre-requisites/ Requirements: BIOL 123 is required. Completion of BIOL 344 and 342, as well as CHEM 335AB, is highly recommended. Students with a strong background in genetics and molecular cell biology generally do better in this course. Therefore, introductory level genetics, cell biology and molecular biology materials should be consulted appropriately. Note: From time to time you will be required to monitor the progress of your laboratory experiments (embryo cultures, for example) and gather the data. This will require periodic visits to lab (Darwin 204) outside of regular lab hours. You may take turns with your lab partner so that one person alone won’t end up doing all the visits.

Assignments and Assessment Methods: in this course include reading of assigned textbook chapters and other suggested materials, course lectures, laboratory experiences, participation in both lecture and lab discussions, lecture and laboratory exams and a library research project.

Textbook: Developmental Biology by Scott Gilbert (8th Edition, 2006), Sinauer Associates, Inc., Sunderland, Massachusetts. This textbook is linked to a web site (www.devbio.com). Much of the more advanced material in Developmental Biology, as well as nearly all the material now covered in introductory biology textbooks can be found on this web site. You might want to visit this site as needed. Other required readings will be announced in classrooms and/or specified in the lecture and laboratory handouts.

Laboratory Manual: For the laboratory portion of the course, we will be using a Laboratory Manual that will be available at the KODA Copy Center (Stevenson Hall 2011) for you to purchase during the first week of classes.

Examinations and Assignments: There will be TWO (2) lecture midterm examinations, TWO (2) laboratory examinations and a cumulative lecture final examination. In addition, for the lecture part of the course, you are required to prepare and submit a 5 pages long (double spaced) literature review paper on a topic of your interest in contemporary developmental biology [Library Research Project].
This research should focus on recent advances and issues in the chosen field (detailed guidelines on this later). For the laboratory portion of the course, in addition to lab practical exams, you will keep a laboratory notebook which will be graded. See the box below for more information on examinations and assignments. **No make up exams will be given!**

**DATES AND EVENTS TO REMEMBER**

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>First Midterm Exam</td>
<td>Thursday, March 09</td>
<td>100 pts</td>
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<tr>
<td>Second Midterm Exam</td>
<td>Tuesday, April 20</td>
<td>100 pts</td>
</tr>
<tr>
<td>Review Paper- Outline</td>
<td>Tuesday, May 04</td>
<td>10 pts</td>
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<tr>
<td>Review Paper- Final</td>
<td>Tuesday, May 18</td>
<td>40 pts</td>
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<tr>
<td>Final Exam (Cumulative)</td>
<td>Thursday, May 27</td>
<td>100 pts</td>
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**Laboratory:** .................................................................150 pts

<table>
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<tr>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>First Lab Exam</td>
<td>Tuesday, March 30</td>
<td>50 pts</td>
</tr>
<tr>
<td>Laboratory Notebook</td>
<td>Tuesday, March 30</td>
<td>25 pts</td>
</tr>
<tr>
<td>Second Lab Exam</td>
<td>Tuesday, May 18</td>
<td>50 pts</td>
</tr>
<tr>
<td>Laboratory Notebook</td>
<td>Tuesday, May 18</td>
<td>25 pts</td>
</tr>
</tbody>
</table>

**TOTAL FOR THE COURSE** ........................................500 pts

**Course Grade:** Your course grade will be determined based on the total number of points earned. It is expected that letter grades will be assigned on the basis of the following scale:

- 90 % and above:    **A (A-, A):**
- 80-89.9%:          **B (B-, B, B+)**
- 70-79.9%:          **C (C-, C, C+)**
- 60-69.9%:          **D (D-, D, D+)**
- Less than 60%:     **F**

**Attendance and Participation:** Attendance and "serious participation" in lecture and lab are strongly encouraged since history has shown a strong correlation with course grade. Absence from the lab will cost you 5 points per unexcused absence. Poor attendance at lecture can result in deduction of points from your test scores. Late arrivals and early departures for no documented reasons will be counted as absence. Late arriving students disrupt the class, so do those who leave early!! Late students will not be given extra time to complete tests.

**Regarding Exams:** Questions and concerns regarding your answers on exams must be submitted in writing within one week after receiving the graded exam. Upon your written request, the entire exam may be re-graded. Please check the answer key before requesting a re-grade.

**Action for Repeats in Impacted Courses***: Due to enrollment pressure and budgetary constraints there are increasing student demands for access to courses in the Department of Biology. Please make a concerted effort this semester to obtain the grade that will meet the requirements of your major since repeating a course to obtain a better grade requires approval of the Department Chair.
*Process for repeating the course*
You must complete a Repeat of Course form and submit it for the Biology Department chair’s approval before you will be considered for any openings in the course. Students who attempt to repeat a course by enrolling in the course for a second time during Reg I or Reg II without the Department chair's approval will be dis-enrolled. The link for the full SSU course repeat policy is http://www.sonoma.edu/ar/records/repeat.pdf

Learning Disabilities: If you have a learning disability and may have need for some type of accommodation(s) in order to participate fully in this class, please feel free to discuss your concerns in private with me AND BE SURE TO CONTACT the SSU Disability Student Services office.

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   http://www.sonoma.edu/uaaffairs/policies/cheatingpolicy.htm
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   http://www.sonoma.edu/uaaffairs/policies/gradepolicy.htm
   Access to Programs for Students with Disabilities Policy
   http://www.sonoma.edu/uaaffairs/policies/disabilitypolicy.htm
   Diversity Statement
   http://www.sonoma.edu/diversity/

CELL PHONES MUST BE TURNED OFF AT ALL TIMES DURING THE LECTURE AND LAB HOURS

COURSE SYLLABUS

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEB. 02</td>
<td>Introduction to Course</td>
<td>Chapter 1</td>
</tr>
<tr>
<td></td>
<td>The Questions of and Approaches to Developmental Biology</td>
<td>pp. 1-24</td>
</tr>
<tr>
<td></td>
<td><strong>Principles of Experimental Embryology</strong></td>
<td>Chapter 3</td>
</tr>
<tr>
<td>04</td>
<td>Developmental Dynamics of Cell Specification</td>
<td>pp. 49-62</td>
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<td>Development of Kidney: An Evolutionary Perspective</td>
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<td>Development of Digestive and Respiratory Systems</td>
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TENTATIVE LABORATORY SCHEDULE

WEEK (DATE) LAB EXPERIENCE

WEEK 1 (FEB. 02) No Scheduled Lab Experience: I prefer to start lab experiences after both sections meet together as a group at least once [for lecture]. Purchase your lab manual from the Student Copy Center and review the material on Gametogenesis in preparation for Week 3 Lab.

WEEK 2 (FEB. 09): Getting Started: Laboratory and technique orientation. Discussions of “do”s and “don’t”s; different systems for the study of development; how to prepare lab notebooks? Video Presentation: Miracle of Life

WEEK 3 (FEB. 16): Gametogenesis: Discussion of oogenesis and spermatogenesis. Observation and analysis of histological slides of rat ovary and testis.


WEEK 5 (MAR. 02) Regulative Development: Isolation and culturing of sea urchin blastomeres: demonstration of “regulative development.”

WEEK 6 (MAR. 09) Cell-cell Adhesion During Development: Role of cell surface carbohydrates in embryonic cell-cell recognition and adhesion: Effect of Tunicamycin.

WEEK 7 (MAR. 16): Fertilization and Activation of Development: In vitro fertilization in sea urchins. Observation of live gametes (sperm and eggs); fertilization and egg activation; determination of sperm-egg ratio for optimal fertilization rate under in vitro conditions.

WEEK 9 (MAR. 30): FIRST LABORATORY EXAMINATION (50 points);
Submit Lab Notebook for Grading (25 points)

WEEK 10 (APR. 06): Spring Break: No Lab

WEEK 11 (APR. 13): Cleavage: Cleavage pattern in echinoderms; effects of cytochalasins on embryonic cleavage.

WEEK 12 (APR. 20): Invertebrate Embryogenesis: Embryonic development in the sea urchin, Strongylocentrotus purpuratus. Analysis of cleavage, gastrulation, primary mesenchyme cell migration, spicule formation, and development of the digestive system. [This will require periodic visits to lab outside of regular lab hours]

WEEK 13 (APR. 27): Artificial Induction of Vegetalization and Exogastrulation: Teratogenic properties of environmental polycyclic aromatic hydrocarbons (PAH) [[This will require periodic visits to lab outside of regular lab hours]

WEEK 14 (MAY 04): Zebrafish Development: Dechorionation of early embryos, observation of early cleavage divisions and gastrulation. Somitogenesis and development of circulatory system. [This will require periodic visits to lab outside of regular lab hours]

WEEK 15 (MAY 11): Vertebrate Development: Neurulation, development of eyes and heart in vertebrates. Some Endodermal and mesodermal derivatives

WEEK 16 (MAY 18): SECOND LABORATORY EXAMINATION (50 points)
Submit Lab Notebook for Grading (25 points)
### APPENDIX 4

**Examples of Meeting and Assessing Learning Objectives**

<table>
<thead>
<tr>
<th>Meet learning objectives</th>
<th>BIOL 110</th>
<th>BIOL 115</th>
<th>BIOL 121</th>
<th>BIOL 122</th>
<th>BIOL 123</th>
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<td>a. Conceptual, factual, and visual lecture content that integrates information from laboratories and other methodologies.</td>
<td>Y</td>
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<td>b. Hands-on laboratory experience that feature methodologies and conceptual content that integrates with lecture content.</td>
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<td>c. Electronic resources such as course web pages, eReserve or Web CT</td>
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<td>d. Computer simulation and modeling</td>
<td>N</td>
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<td>e. Data management, statistical analysis, and results presentation using computer software</td>
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<td>f. Experiences at field sites, research facilities or museums.</td>
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<td>g. Incorporate, train and mentor paid laboratory instructors.</td>
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<td>h. Involvement of undergraduate or graduate student assistants in laboratory or field instruction.</td>
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<td>i. Assignments requiring students to draw on external resources (e.g. research literature or community engagement) to satisfy course requirements.</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
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**Meet learning objectives**

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<tr>
<td>a. Conceptual, factual, and visual lecture content that integrates information from laboratories and other methodologies.</td>
<td>Y</td>
<td>Y</td>
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<td>b. Hands-on laboratory experience that feature methodologies and conceptual content that integrates with lecture content.</td>
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<td>c. Electronic resources such as course web pages, eReserve or Web CT</td>
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<td>d. Computer simulation and modeling</td>
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<td>e. Data management, statistical analysis, and results presentation using computer software</td>
<td>N</td>
<td>Y</td>
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<td>f. Experiences at field sites, research facilities or museums.</td>
<td>Y</td>
<td>Y</td>
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<td>g. Incorporate, train and mentor paid laboratory instructors.</td>
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<tr>
<td>i. Assignments requiring students to draw on external resources (e.g. research literature or community engagement) to satisfy course requirements.</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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**Assessing learning objectives**

<table>
<thead>
<tr>
<th>BIOL 330</th>
<th>BIOL 335</th>
<th>BIOL 340</th>
<th>BIOL 341</th>
<th>BIOL 344</th>
<th>BIOL 347</th>
<th>BIOL 348</th>
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<tbody>
<tr>
<td>a. Multiple choice examinations.</td>
<td>N</td>
<td>N</td>
<td>Y</td>
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<tr>
<td>b. Short-answer, fill-in examinations</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>c. Lecture or laboratory quizzes</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
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<td>d. Laboratory practical</td>
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<td>Y</td>
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<td>N</td>
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<td>n. Paper summarizing results of original research</td>
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<tr>
<td>o. Oral presentation of research findings (original or based on literature)</td>
<td>N</td>
<td>Y</td>
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<td>p. Community-based learning experience</td>
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<td>N</td>
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<td>q. Specimen collection, preparation, and curatorial skills</td>
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<td>N</td>
<td>Y</td>
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**Meet learning objectives**

<table>
<thead>
<tr>
<th>Objective</th>
<th>BIOL 349</th>
<th>BIOL 383</th>
<th>BIOL 385</th>
<th>BIOL 472</th>
<th>BIOL 480</th>
<th>BIOL 485</th>
</tr>
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<tbody>
<tr>
<td>a. Conceptual, factual, and visual lecture content that integrates information from laboratories and other methodologies.</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
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<td>b. Hands-on laboratory experience that feature methodologies and conceptual content that integrates with lecture content.</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
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<tr>
<td>c. Electronic resources such as course web pages, eReserve or Web CT</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>d. Computer simulation and modeling</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
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<tr>
<td>e. Data management, statistical analysis, and results presentation using computer software</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
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<tr>
<td>f. Experiences at field sites, research facilities or museums.</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<tr>
<td>g. Incorporate, train and mentor paid laboratory instructors.</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<tr>
<td>h. Involvement of undergraduate or graduate student assistants in laboratory or field instruction.</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
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<tr>
<td>i. Assignments requiring students to draw on external resources (e.g. research literature or community engagement) to satisfy course requirements.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>a. Multiple choice examinations.</td>
<td>Y</td>
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<td>N</td>
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</table>
APPENDIX 5

Faculty Expertise and Concentration Advising Information
PERMANENT FACULTY – AREAS OF EXPERTISE
Department of Biology
2009-2010

Thomas Buckley
664-3286
tom.buckley@sonoma.edu
Plant Physiology, Ecophysiology, Ecological Plant Morphology & Anatomy, Theoretical and Mathematical Biology

Michael Cohen
664-3413
cohenm@sonoma.edu
General Microbiology, Environmental Microbiology, Bacteriology

Daniel Crocker
664-2995
crocker@sonoma.edu
Environmental Physiology, Biometry, Human and Animal Physiology, Bioenergetics

Hall Cushman
664-2142
cushman@sonoma.edu
Population and Community Ecology, Conservation Biology, Ecology and Impacts of Invasive Species Galbreath Wildlands Preserve Director

Nicholas Geist
664-3056
geist@sonoma.edu
Human Physiology, Vertebrate Evolutionary Morphology, Macroevolution, Health Professions Advising

Derek Girman
664-3055
girman@sonoma.edu
Vertebrate Biology, Conservation Genetics, Evolution

Joseph Lin
664-2931
Immunology, Cell biology.

Karina Nielsen
664-2962
karina.nielsen@sonoma.edu
Invertebrate Biology, Marine Ecology, Biodiversity and Conservation, Coastal Oceanography, Climatic Change and Ecosystem functioning

Murali Pillai
664-2981
murali.pillai@sonoma.edu
Molecular and Cell Biology, Developmental Biology, Cell Biology, Pre-Health Professions Coordinator

Nathan Rank
664-3053
rank@sonoma.edu
Introduction to Genetics, Evolution, Entomology, Biometry Fairfield Osborn Preserve Director

Richard Whitkus
664-2303
whitkus@sonoma.edu
Plant Biology, Plant Taxonomy, Speciation

rev 06/09
Concentration/Program Area List (with recommended faculty advisors)

Pre-Health Professions (regardless of concentration)
  Pillai, Crocker, Geist

BA Degree Concentrations (optional):
  Biology (no concentration): any Biology Faculty
  Teacher Preparation (in development): Girman
  Botany: Buckley, Cushman, Nielsen, Rank, Whitkus
  Zoology:
    Vertebrates: Crocker, Geist, Girman
    Invertebrates: Nielsen, Rank

BS Degree Concentrations (must choose one):
  Ecology, Evolution and Conservation:
    Ecology: Crocker, Cushman, Nielsen
    Evolution: Geist, Girman, Rank, Whitkus
  Marine Biology (new revisions pending approval):
    Vertebrates: Crocker
    Invertebrates: Nielsen
    Algae: Cohen, Nielsen
  Microbiology:
    Cohen, Pillai
  Molecular and Cell Biology:
    Cohen, Lin, Pillai
  Physiology:
    Animal: Crocker, Geist, Lin, Pillai
    Plant: Buckley

Faculty list showing Concentration/Program Advising areas

Buckley, Thomas: Plant Physiology
  Botany
  Physiology (Plant)
Crocker, Dan: Environmental Physiology of Marine Vertebrates
  Marine Biology
  Physiology (Animal)
  Pre-Health Professions
Cohen, Michael: Environmental Microbiology
  Microbiology
Cushman, Hall: Terrestrial Ecology
  Ecology (Conservation Biology)
Geist, Nick: Evolution of Dinosaurs/Birds
  Zoology (vertebrate)
  Physiology (vertebrate)
  Evolution (Macroevolution)
Girman, Derek: DNA sequence comparison of populations
  Zoology
  Evolution (Microevolution)
  Teacher Credential Liaison
Lin, Joseph: Immunology, cell biology
  Molecular Biology
  Physiology (vertebrate)
Nielsen, Karina: Intertidal Ecology and Marine Invertebrates
  Marine Biology (Population Ecology)
Pillai, Murali: Developmental Toxicology in animals
  Pre-Health Professions Coordinator
  Cell Biology (microscopy and imaging)
Rank, Nathan: Environmental Effects on Population Genetics
  Zoology (Entomology)
  Ecology (Population Genetics)
Whitkus, Richard: Plant biology, Evolutionary Genetics
  Botany
  Undergraduate Coordinator (assigns initial advisor)

Rev 06/09
APPENDIX 6

Major Advising Check Sheet
### BIOLOGY MAJOR CHECKSHEET
(To be used in consultation with advisor)

<table>
<thead>
<tr>
<th>LD Biology</th>
<th>UD Core Biology</th>
<th>UD Biology Electives* (includes concentration specific courses)</th>
<th>Physical Sciences</th>
<th>Math</th>
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<td>B.A. and B.S.</td>
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<td>BIOL 121 (4)</td>
<td>Organismal Biology (4)</td>
<td>CHEM 115A (5)</td>
<td>CHEM 115A (5)</td>
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<tr>
<td>BIOL 122 (4)</td>
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<tr>
<td>Mol/Cell Biology (4)</td>
<td>CHEM 335A (5)</td>
<td>PHYS 210A/209A (4)</td>
<td>GEOL 102 (3)</td>
<td>PHYS 114/116 (5)</td>
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<td>PHYS 209A (1)</td>
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<tr>
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<td>Evo/Eco Biology (4)</td>
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<td>PHYS 210B (3)</td>
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<td>BIOL 496 (2)</td>
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**TOTAL:** 12 units
Satisfies Area B2 GE, Biological Science

**TOTAL:** 16 units

**TOTAL:** 15-16 units

**TOTAL:** 23 units

**TOTAL:** 18-19 units
1 course (except CHEM 335A) satisfies Area B GE, Phys. Sci.

**TOTAL:** 25-27 units
1 course (except CHEM 335A) satisfies Area B GE, Phys. Sci.

**TOTAL:** 4 units
Satisfies Area B GE, Math

**TOTAL:** 8 units
Area B GE, Math as B.A.

---

**Student:** _____________________________

**Advisor:** _____________________________

**Date of Draft:** ________________________

**UNIT REQUIREMENTS**
- Graduation: 120 B.A., 126 B.S. (includes 39 units of GE not on this form)
- Upper Division Biology: 31 B.A., 36 B.S.
- Residence: 30 (24 UD, 12 UD in major, 9 UD in GE).
- Credit/no credit: 24 maximum

*Non-major’s courses applicable to major electives, with written permission of advisor: ANTH 301, 302, 318, 345, 414; BIOL 220, 224, 243, 307; CHEM 441, 445, 446; ENSP 315, 321, 322, 323; GEOG 416; GEOL 413; KIN 360; PSY 451
APPENDIX 7

Concentration Advising Sheets
 BOTANY CONCENTRATION  
Bachelor of Arts in Biology – Sonoma State University

Lower-Division Core in Biology (12)  
BIOL 121, 122, and 123 (4 units each)

Physical Sciences & Mathematics (22-23)  
CHEM 115A & 115B (General Chemistry, 5 units each)  
CHEM 335A (Organic Chemistry, 5 units)  
MATH 165 (Elementary Statistics, 4 units)  
PHYS 210A & 209A (4 units) or GEOL 102 (3 units)

Upper-Division Core in Biology (20)  
a. Organismal Biology (complete the following, 4 units)  
BIOL 329 Plant Biology  
b. Physiology (complete the following, 4 units)  
BIOL 348 Plant Physiology  
c. Molecular & Cell Biology (complete 1 of the following, 4 units)  
BIOL 342 Molecular Genetics  
BIOL 344 Cell Biology  
d. Ecology & Evolutionary Biology (complete both of the following, 8 units)  
BIOL 333 Ecology  
BIOL 341 Evolution

Additional Upper-Division Requirements (11)  
a. Take both of the following (8 units)  
BIOL 330 Plant Taxonomy  
BIOL 331 Aquatic Botany  
b. Additional upper-division electives (3 units)  
Complete biology major units of your choice

Total Units 65-66

Recommended Upper-Division Courses (but not required)  
BIOL 323 Entomology 4  
BIOL 335 Marine Ecology 4  
ENSP 322 Conservation Biology 4  
ENSP 423 Restoration Ecology 4

Recommended Advisors (in alphabetical order): Tom Buckley, Hall Cushman, Karina Nielsen, Nathan Rank, and Richard Whitkus.
**ZOOLOGY CONCENTRATION**

*Bachelor of Arts in Biology – Sonoma State University*

**Lower-Division Core in Biology** (12)

- BIOL 121, 122, and 123 (4 units each)

**Physical Sciences & Mathematics** (22-23)

- CHEM 115A & 115B (General Chemistry, 5 units each)
- CHEM 335A (Organic Chemistry, 5 units)
- MATH 165 (Elementary Statistics, 4 units)
- PHYS 210A & 209A (4 units) or GEOL 102 (3 units)

**Upper-Division Core in Biology** (24)

a. **Organismal Biology** (complete both of the following, 8 units)
   - BIOL 322 Invertebrate Biology
   - BIOL 327 Vertebrate Biology

b. **Physiology** (complete 1 of the following, 4 units)
   - BIOL 347 Environmental Physiology
   - BIOL 349 Animal Physiology

c. **Molecular & Cell Biology** (complete 1 of your choice, 4 units)

d. **Ecology & Evolutionary Biology** (complete 1 of the your choice, 4 units)

**Additional Upper-Division Requirements** (8)

a. Take 1 of the following (4 units)
   - BIOL 323 Entomology
   - BIOL 328 Vertebrate Evolutionary Morphology

b. Take 1 of the following (4 units)
   - Any core courses listed above not already included
   - BIOL 463 Herpetology
   - BIOL 468 Mammalogy
   - BIOL 472 Developmental Biology

**Total Units** 66-67

**Recommended Advisors** (in alphabetical order): Dan Crocker, Nick Geist, Derek Girman, Karina Nielsen and Nathan Rank.
ECOLOGY, EVOLUTION & CONSERVATION CONCENTRATION
Bachelor of Science in Biology – Sonoma State University

Lower-Division Core in Biology (12)
BIOL 121, 122, and 123 (4 units each)

Physical Sciences & Mathematics (33)
CHEM 115A & 115B (General Chemistry, 5 units each)
CHEM 335A & 335B (Organic Chemistry, 8 units)
MATH 165 (Elementary Statistics, 4 units)
MATH 161 (Calculus I, 4 units)
PHYS 210A & 210B (General Physics Lecture, 6 units)
PHYS 209A (General Physics Lab, 1 unit)

Upper-Division Core in Biology (20)
a. Organismal Biology (complete 1 of your choice, 4 units)
b. Physiology (complete 1 of your choice, 4 units)
c. Molecular & Cell Biology (complete the following, 4 units)
   BIOL 342 Molecular Genetics
d. Ecology & Evolutionary Biology (complete both of the following, 8 units)
   BIOL 333 Ecology
   BIOL 341 Evolution

Additional Upper-Division Requirements (19)
a. Take all of the following (8 units)
   ENSP 322 Conservation Biology
   BIOL 485 Biometry
b. Take 1 of the following (4 units)
   BIOL 338 Environmental Microbiology and Biotechnology
   BIOL 335 Marine Ecology
   BIOL 337 Behavioral Ecology
   GEOG 365 Biogeography & Landscape Ecology
   GEOL 413 Paleontology
c. Take all of the following (3 units)
   BIOL 494 Independent Research Design
   BIOL 496 Senior Thesis Research
d. Additional upper-division electives (4 units)
   Complete biology major units of your choice

Total Units 84

Recommended Upper-Division Courses (but not required)
BIOL 323 Entomology 4
BIOL 328 Vertebrate Evolutionary Morphology 4
BIOL 330 Plant Taxonomy 4
BIOL 347 Environmental Physiology 4
BIOL 463 Herpetology 3-4
BIOL 468 Mammalogy 4
ENSP 423 Restoration Ecology 4

Recommended Advisors (in alphabetical order): Tom Buckley, Dan Crocker, Hall Cushman, Nick Geist, Derek Girman, Karina Nielsen, Nathan Rank and Richard Whitkus.
MARINE BIOLOGY CONCENTRATION
Bachelor of Science in Biology – Sonoma State University

Lower-Division Core in Biology (12)
BIOL 121, 122, and 123  (4 units each)

Physical Sciences & Mathematics (33)
 CHEM 115A & 115B (General Chemistry, 5 units each)
 CHEM 335A & 335B (Organic Chemistry, 8 units)
 MATH 165 (Elementary Statistics, 4 units)
 MATH 161 (Calculus I, 4 units)
 PHYS 210A & 210B (General Physics Lecture, 6 units)
 PHYS 209A (General Physics Lab, 1 unit)

Upper-Division Core in Biology (20)
a.  Organismal Biology (complete the following, 4 units)
   BIOL 322  Invertebrate Biology
b.  Physiology (complete the following, 4 units)
   BIOL 347  Environmental Physiology
c.  Molecular & Cell Biology (complete 1 of your choice, 4 units)
d.  Ecology & Evolutionary Biology (complete both of the following, 8 units)
   BIOL 335  Marine Ecology
   BIOL 341  Evolution

Additional Upper-Division Requirements (19)
a.  Take all of the following (8 units)
   BIOL 485  Biometry
   BIOL 331  Aquatic Botany
b.  Take all of the following (3 units)
   BIOL 494  Independent Research Design
   BIOL 496  Senior Thesis Research
c.  Additional upper-division electives (8 units)
   Complete biology major units of your choice

Total Units  84

Recommended Upper-Division Courses (but not required)
 BIOL 312  Biological Oceanography  3
 BIOL 333  Ecology  4
 BIOL 472  Developmental Biology  4
 BIOL 400  Ocean Science Literacy  4

Recommended Advisors (in alphabetical order): Dan Crocker and Karina Nielsen.
MICROBIOLOGY CONCENTRATION
Bachelor of Science in Biology – Sonoma State University

Lower-Division Core in Biology (12)
BIOL 121, 122, and 123 (4 units each)

Physical Sciences & Mathematics (33)
CHEM 115A & 115B (General Chemistry, 5 units each)
CHEM 335A* & 335B (Organic Chemistry, 8 units)
MATH 165* (Elementary Statistics, 4 units)
MATH 161 (Calculus I, 4 units)
PHYS 210A & 210B* (General Physics Lecture, 6 units)
PHYS 209A (General Physics Lab, 1 unit)

Upper-Division Core in Biology (16)

a. Organismal Biology (complete the following, 4 units)
   BIOL 340 General Bacteriology

b. Physiology (complete 1 of the following, 4 units)
   BIOL 347 Environmental Physiology
   BIOL 348 Plant Physiology
   BIOL 349^ Animal Physiology

c. Molecular & Cell Biology (complete 1 of the following, 4 units)
   BIOL 342^ Molecular Genetics
   BIOL 343 Molecular Microbiology
   BIOL 344 Cell Biology

d. Ecology & Evolutionary Biology (complete 1 of the following, 4 units)
   BIOL 333 Ecology
   BIOL 341 Evolution

Additional Upper-Division Requirements (23)

a. Take 2 of the following (8 units)
   BIOL 382^ Parasitology
   BIOL 480* Immunology
   BIOL 481* Medical Microbiology

b. Take 1 of the following (4 units)
   CHEM 255* Quantitative Analysis
   BIOL 338 Environmental Microbiology and Biotechnology

c. Take all of the following (3 units)
   BIOL 494 Independent Research Design
   BIOL 496 Senior Thesis Research

d. Additional upper-division electives (7-8 units)
   Complete biology major units of your choice

Total Units 84

Recommended Upper-Division Courses (but not required)

BIOL 383^ Virology 4
BIOL 472 Developmental Biology 4
BIOL 484* Hematology 4
BIOL 485 Biometry 4

Recommended Advisors (in alphabetical order): Mike Cohen, Murali Pillai, and Eileen Thatcher
* Required or ^recommended for application to Clinical Laboratory Science Internships.
MOLECULAR & CELL BIOLOGY CONCENTRATION
Bachelor of Science in Biology – Sonoma State University

Lower-Division Core in Biology (12)
BIOL 121, 122, and 123 (4 units each)

Physical Sciences & Mathematics (33)
CHEM 115A & 115B (General Chemistry, 5 units each)
CHEM 335A & 335B (Organic Chemistry, 8 units)
MATH 165 (Elementary Statistics, 4 units)
MATH 161 (Calculus I, 4 units)
PHYS 210A & 210B (General Physics Lecture, 6 units)
PHYS 209A (General Physics Lab, 1 unit)

Upper-Division Core in Biology (20)
a. Organismal Biology (complete the following, 4 units)
   BIOL 340 General Bacteriology
b. Physiology (complete 1 of the following, 4 units)
   BIOL 348 Plant Physiology
   BIOL 349 Animal Physiology
c. Molecular & Cell Biology (complete both of the following, 8 units)
   BIOL 342 Molecular Genetics
   BIOL 344 Cell Biology
d. Ecology & Evolutionary Biology (complete the following, 4 units)
   BIOL 341 Evolution

Additional Upper-Division Requirements (19)
a. Take 2 of the following (8 units)
   BIOL 343 Molecular Microbiology
   BIOL 383 Virology
   BIOL 472 Developmental Biology
   BIOL 480 Immunology
b. Take 1 of the following (3-4 units)
   BIOL 544 Advanced Cell Biology
   BIOL 545 Recombinant DNA Laboratory
   CHEM 441 Biochemical Methods
c. Take 1 of the following (3 units)
   CHEM 446 Metabolic Biochemistry
   CHEM 445 Structural Biochemistry
d. Take all of the following (3 units)
   BIOL 494 Independent Research Design
   BIOL 496 Senior Thesis Research
e. Additional upper-division electives (1-2 units)
   Complete biology major units of your choice

Total Units 84

Recommended Upper-Division Courses (but not required)
BIOL 346 Introduction to Bioinformatics 4
BIOL 485 Biometry 4

Recommended Advisors (in alphabetical order): Jim Christmann, Mike Cohen, Joe Lin, Murali Pillai, and Eileen Thatcher
PHYSIOLOGY CONCENTRATION
Bachelor of Science in Biology – Sonoma State University

Lower-Division Core in Biology (12)
BIOL 121, 122, and 123 (4 units each)

Physical Sciences & Mathematics (33)
CHEM 115A & 115B (General Chemistry, 5 units each)
CHEM 335A & 335B (Organic Chemistry, 8 units)
MATH 165 (Elementary Statistics, 4 units)
MATH 161 (Calculus I, 4 units)
PHYS 210A & 210B (General Physics Lecture, 6 units)
PHYS 209A (General Physics Lab, 1 unit)

Upper-Division Core in Biology (24)
a. Organismal Biology (complete 1 of the following, 4 units)
   BIOL 322 Invertebrate Biology
   BIOL 327 Vertebrate Biology
   BIOL 329 Plant Biology
b. Physiology (complete 3 of the following, 12 units)
   BIOL 328 Vertebrate Evolutionary Morphology
   BIOL 347 Environmental Physiology
   BIOL 348 Plant Physiology
   BIOL 349 Animal Physiology
c. Molecular & Cell Biology (complete the following, 4 units)
   BIOL 344 Cell Biology
d. Ecology & Evolutionary Biology (complete 1 of your choice, 4 units)

Additional Upper-Division Requirements (15)
a. Take all of the following (7 units)
   BIOL 472 Developmental Biology
   CHEM 446 Metabolic Chemistry
b. Take all of the following (3 units)
   BIOL 494 Independent Research Design
   BIOL 496 Senior Thesis Research
c. Additional upper-division electives (5 units)
   Complete biology major units of your choice

Total Units 84

Recommended Upper-Division Courses (but not required)
BIOL 341 Evolution 4
BIOL 342 Molecular Genetics 4
BIOL 340 Bacteriology 4
BIOL 485 Biometry 4

Recommended Advisors (in alphabetical order): Tom Buckley, Dan Crocker, Nick Geist and Murali Pillai.
APPENDIX 8
BIOLOGY DEPARTMENT COMMITTEES
2009-10

I. COORDINATORS
Undergraduate Advising Coordinator Richard Whitkus (2011)
Graduate Program Dan Crocker (2012)
Web Coordinator Hall Cushman (2010)
Library Michael Cohen (2012)

II. PROGRAM ADVISORS OR FACULTY ADVISORS
Biology Club Nick Geist
Clinical Lab Science (Med Tech) Michael Cohen
Pre-Health Club Murali Pillai
Teaching Credentials Derek Girman
Tri Beta Nick Geist

III. STANDING COMMITTEES – Department Chair (Richard Whitkus) ex officio on all, except the RTP Committee. (RTP is evaluative, therefore chair should be elected to the RTP committee.)

Budget/Space/Equipment Committee (2 faculty members)
The BSE committee shall make recommendations to the chair and the department regarding 1) expenditures and allocations of departmental accounts and funds, 2) shall review department expenditures from these funds at least twice annually for appropriateness of expenditures, 3) shall make recommendations regarding the allocation and appropriate use of department space beyond nominal class and faculty use, and 4) shall make recommendations regarding purchase, repair, and replacement of equipment that requires department funding.

Tom Buckley (2010)
Nick Geist (2011)
Stephanie Thibualt ex officio
Natalie Graham ex-officio
Office staff (as available) ex-officio

Research and Scholarship Committee (2 faculty members)
The Research and Scholarship committee has the general charge of facilitating research and scholarship activities in the Department of Biology. This includes identifying funding opportunities to support research and equipment needs of department; developing materials that assist faculty with pre- and post-award administration; and developing policies on the use of shared facilities, such as greenhouse, animal rooms, culture rooms, circulating seawater system, etc.

Hall Cushman (2010)
Dan Crocker (2011)

Curriculum Committee (3 faculty members)
The Curriculum Committee is charged to make recommendations to the Department on issues related to the development, implementation, and assessment of all aspects of the undergraduate curriculum, including Biology majors and minors, non-majors GE, and service courses for majors in other departments and programs. This charge also includes aspects of the graduate curriculum that may impact the undergraduate curriculum.

Nick Geist; Fall sabbatical replacement for (2010)
Nathan Rank (2010)
Derek Girman (2012)
Karina Nielsen; Fall sabbatical replacement for (2011)
Murali Pillai
Education/Outreach/Development Committee (2 faculty members)
This committee communicates with campus entities and external programs dealing with educational matters. In addition, it oversees department activities in the areas of community and alumni relations, development, and external funding. The committee serves as liaison to campus-based internship and service learning programs and media relations entities. The committee oversees department-sanctioned programs in the area of outreach, community-based education, and fund-raising, and maintains a record of activities and organizations to which department members belong.

Michael Cohen (2010)
Derek Girman (2011)

Graduate Committee (3 faculty members)
The Biology Graduate Committee oversees development and content of department graduate policies, including requirements for completion of the degree and advancement to candidacy. The committee oversees development and content of the Biology MS graduate curriculum, including approval of courses offered and their scheduling. The committee oversees decisions on student admissions to the program and approves composition of student thesis committees.

Dan Crocker (coordinator) (2012)
Karina Nielsen (2010)
Michael Cohen (2011)

RTP Committee (3 faculty members)
Jim Christmann (2010)
Dan Crocker (2011)
Hall Cushman (2012)
DEPARTMENT REPRESENTATION ON SCHOOL COMMITTEES

- Election Panel Committee
- Health Professions Advisory Committee
- SST RTP Committee
- School Travel Committee

- Derek Girman, Tom Buckley
- Murali Pillai (chair), Nick Geist, Dan Crocker
- Derek Girman
- Murali Pillai

DEPARTMENT REPRESENTATION ON CAMPUS AND CSU ACTIVITIES

Tom Buckley

Jim Christmann
   Campus Classroom Renovation Committee

Michael Cohen
   Alternative Transportation Committee
   Sustainability and Civic Engagement Subcommittee (of USPC)
   SST representative to Academic Senate

Dan Crocker
   Radiation Safety Committee (RSO)
   Graduate Studies Subcommittee (of EPC)
   Chemical Hygiene Committee
   Animal Care Committee (Chair)

Hall Cushman
   GWP Academic Advisory Committee
   Professional Development Subcommittee
   Faculty Hearing Panel for CBA

Nick Geist
   Athletic Advisory Committee
   SST representative to Academic Senate

Derek Girman
   Athletic Advisory Council
   Faculty Hearing Panel for CBA
   Student Advisory Committee (SAC, Chair)
   SAC representative to Academic Senate
   SAC representative to Senate Executive Committee

Kathleen Hardy
   Employee Wellness Committee
   Provost’s Strategic Planning Committee

Karina Nielsen
   ORSP – Faculty Research Associate
   IT Strategic Planning

Murali Pillai
   Co-Director, Keck Microanalysis Lab
   Structure & Functions Committee
   CSUPERB Faculty Consensus Group

Nathan Rank
   Faculty/Staff Housing Committee
   GE Subcommittee
   URTP

Stephanie Thibault
   Animal Care Committee

Richard Whitkus
   Campus Reengineering Committee
   Faculty Standards and Affairs Committee
   University Space Committee
This policy focuses on the distribution of weighted teaching units (WTU) among the tenure/tenure-track faculty in the Department of Biology, with respect to the California State University standards as outlined in EP&R 76-36, Faculty Workload: Policies and Procedures. The three major components of workload are: instruction, assigned/release time (from University sources), and buyout from external funding. The Department makes a commitment to ensuring the normal instructional workload includes teaching in the major core curriculum on a yearly basis and sufficient supervisory workload to support approved curricular needs and requirements. This policy allows for flexibility with workload such that faculty can engage in required professional and scholarly activities and administrative commitments. Exceptions to the guidelines described below may be granted by the Chair and Curriculum Committee upon written request by a faculty member before the upcoming schedule of classes is finalized.

1) Each faculty member is expected to offer a minimum of 18 WTUs in scheduled classes per academic year. This instructional workload does not need to be equally distributed between the Fall and Spring semesters. Each faculty member is responsible for generating 3 WTU of supervisory course workload per semester to bring the total instructional workload to the CSU standard of 24 WTUs per academic year.

2) Upon approval of the Curriculum Committee and the Department Chair, assigned, release or buyout time may be used to reduce the 24 WTU of instructional workload obligation, with limits set below.

3) A maximum of 12 WTU from a combination of assigned or release time (acquired for university governance, oversight of programs, etc.) or buyout time (acquired from grants and contracts) will be allowed to reduce the 24 WTU of instructional workload per academic year.

4) The Curriculum Committee and the Department Chair will assign additional instructional workload to those faculty members who do not meet 24 WTU of instructional workload as specified above.

5) The 6 WTU per year of indirect instructional activity provided by the University for professional responsibility such as student advising, active participation in Department, School, and University-wide governance, and community involvement, must be met by individual faculty.
In order to learn from you as you have from us, and to assist us in developing short- and long-range goals for our department, please consider carefully each of the questions below. These evaluations will allow the department to respond better to changing student needs. Your responses will be anonymous, so this is your chance to tell it like it is!

PLEASE DO NOT SIGN YOUR NAME OR IN ANY WAY REVEAL YOUR IDENTITY ON EITHER THE QUESTIONNAIRE OR ANSWER SHEET. IGNORE INSTRUCTIONS ON THE ANSWER SHEET ASKING YOUR NAME, SEX, CLASS LEVEL, AND SOCIAL SECURITY NUMBER!

Please indicate your answers on the separate answer sheet. If the question does not apply to you, leave it blank. Use a #2 pencil and erase all stray marks and unintended responses.

1. Of the factors listed below, which one was most influential in your decision to come to Sonoma State University?
   a. Its small size
   b. Rural setting
   c. Convenience (close to home)
   d. Low cost
   e. Good faculty

2. Which of the factors listed below was most influential in your decision to major in biology at Sonoma State University?
   a. Biology Department's reputation
   b. Biology Department's curriculum
   c. Good faculty
   d. Desirable intellectual atmosphere
   e. Location for study of Biology

   If you marked "e" above, what did influence your decision?

3. Please indicate how many years you have attended Sonoma State:
   a. One
   b. Two
   c. Three
   d. Four
   e. Five
USE THE FOLLOWING SCALE FOR ITEMS 4-25.

A) Strongly agree  B) Agree  C) Disagree  D) Strongly Disagree  E) Undecided

4. I feel very good about my association with the Biology Department.
5. When I had a question or comment, I knew it would be respected.
6. The faculty were enthusiastic and encouraging.
7. The faculty were readily available for consultation.
8. The biology instructors were interested in the subjects they taught.
9. The instructors displayed a clear understanding of course topics.
10. The subjects taught were well covered.
11. The faculty related to me with understanding and respect. (They treated me "like a human being.")
12. My advisors were reasonably available for academic advice and consultation.
13. My advisors helped provide me with information on graduation requirements.
14. The stockroom personnel were competent and helpful.
15. The secretaries were competent and helpful.
16. The four-year biology program offers the student a varied choice of curricula.
17. The curricula provided ample opportunity for career preparation.
18. The weekly scheduling of course offerings was convenient to students.
19. On the average, fro semester to semester, the balance between single semester course offerings was as good as could be expected.
20. Lower division requirements for the biology major were adequate.
21. Upper division requirements for the biology major were adequate.
22. The department's physical facilities were adequate and available for my use.
23. I would rate my overall experience with the department as satisfactory.
24. Overall, I would rate SSU's Biology Department superior to biology departments on other campuses.
25. All things considered, I have been happy with my decision to obtain a degree in biology.
The following questions require a short written response in the space provided.

1. Can you suggest any changes in lower or upper division course requirements?
   Lower Division __________________________________________
   __________________________________________________________
   Upper Division: Field Courses _____________________________
   __________________________________________________________
   Upper Division: Genetics Courses __________________________
   __________________________________________________________
   Upper Division: Physiology Courses _________________________
   __________________________________________________________
   Upper Division: Developmental and Laboratory Courses _________
   __________________________________________________________

2. What did you like most about the Biology Department? ________________
   __________________________________________________________________
   __________________________________________________________________

3. What did you like least about the department? _______________________
   __________________________________________________________________
   __________________________________________________________________

4. If you were Biology Department Chair, what aspect of the department would you encourage, based on your experiences as a student?
   __________________________________________________________________
   __________________________________________________________________
   __________________________________________________________________
   What would you change to benefit all biology majors? ________________
   __________________________________________________________________
   __________________________________________________________________

5. Do you gave any general suggestions for the department in terms of organization, communication, orientation, etc., that might improve our overall image?
   __________________________________________________________________
   __________________________________________________________________
   __________________________________________________________________
   Thank you for your time and effort in completing this form, and best wishes for your future success!
THOMAS N. BUCKLEY

Personal Information:
Department of Biology
Sonoma State University
1801 E Cotati Ave
Rohnert Park, CA 94928
Tel: (707) 664 3286
Email: buckley@sonoma.edu

Education:
1999: PhD, Biology, Utah State University
1994: B.S., Biology, James Madison University

Employment History:
2008-present: Assistant Professor, Biology Dept, Sonoma State University
2006-2008: Senior Research Fellow, University of New South Wales
2005-2006: Research Assistant Professor, Biology Dept, Utah State University
2004-2005: Research Fellow, Research School of Biological Sciences, The Australian National University
2002-2003: Postdoctoral Fellow, Research School of Biological Sciences, The Australian National University
2000-2002: Postdoctoral Fellow, Forest Resources Dept, Utah State University
2000: Lecturer, Biology Dept, Utah State University
1999-2000: Postdoctoral Fellow, Research School of Biological Sciences, The Australian National University

Honors/Awards:
1999: Graduate Research Assistant of the Year, Utah State University (Robins Award)
1999: Graduate Student Researcher of the Year, College of Science, Utah State University
1994-1997: Willard C. Eccles Foundation Fellowship, College of Science, Utah State University
1994: Vice-presidential scholarship, Utah State University (declined)
1994: Summa cum laude, Bachelor of Science degree, James Madison University
1994: Award for Excellence in Botany, Biology Department, James Madison University
1990: Full scholarship to Old Dominion University, Norfolk, VA (declined)

Grants – Title/Total Award/Dates in Effect (last 5 years):
"Consequences of the stomatal control of transpiration in fruit trees under deficit irrigation due to limitations imposed by hydraulic conductivity of the system soil-plant and the hormonal signals from roots. Development of an integrative and mechanistic model." EU 220,000 (no funds directly to SSU). 2010–2012. Spanish Ministry of Science and Innovation (MICINN). PI: Dr Antonio Diaz Espejo (Instituto de Recursos Naturales y Agrobiología de Sevilla, Spain).

"Testing climatic, physiological and hydrological assumptions underpinning water yield from montane forests." AUD$3,500,000 (no funds directly to SSU). 2009–2012. Australian Research Council. PI: Mark Adams (University of Sydney). Co-PIs: Tom Buckley (SSU), Tarryn Turnbull
(University of Sydney), Nathan Phillips (Boston University), David Dissue (University of Western Sydney), RW Vervoort (University of Sydney), Chris Hepplewhite (ACTEW Corporation).

Publications:


Invited Seminars – Title/Institution/City/State or Country (last five years)
Dec 09: "New scaling rules emerge from linked optimisation of crown nitrogen and water use." American Geophysical Union, San Francisco, CA.

Jun 08: "Regulation of nocturnal sapflow in Australian subalpine forests." Research School of Biological Sciences, Australian National University, Canberra, Australia.

Dec 07: "The coordination of water loss and carbon gain by stomata." Department of Biology, Sonoma State University, Rohnert Park, CA.

Jul 07: "Tree carbon-water balance at high CO2: are stomata up to the task?" 14th International Congress on Photosynthesis, Glasgow, Scotland.
Contributed Seminars – Title/Meeting Title/City/State or Country (last five years)
Aug 09: "An analytical model of non-photorespiratory CO₂ release in the light and dark in leaves of C₃ species." Ecological Society of America, Albuquerque, NM.


Apr 05: "In defense of feedback: the control of stomata by water balance." Research School of Biological Sciences, Australian National University, Canberra, Australia.

Courses Taught – Number/Title/Institution (if different from SSU) (last five years)
Biol 347, Environmental Physiology.
Biol 348, Plant Physiology.
Biol 121, Diversity, Structure and Function.
Biol 122, Genetics, Evolution and Ecology.
Biol 497, Global Change Biology.
Biol 115, Introduction to Biology.

Professional Reviews (last five years)
Agricultural and Forest Meteorology
Annals of Botany
Australian Research Council
Canadian Journal of Botany
Ecology Letters
Ecological Research
Field Crops Research
Functional Plant Biology
Global Change Biology
Land and Water Australia
New Phytologist
Oecologia
Silva Fennica
Sinauer Academic Publishing
Plant, Cell & Environment
Tree Physiology
Trees: Structure and Function

Professional Associations/Societies Membership
American Society of Plant Biologists
Ecological Society of America
American Geophysical Union
MICHAEL F. COHEN

Assistant Professor
Sonoma State University
Department of Biology, Darwin 222
1801 East Cotati Ave.
Rohnert Park, CA 94928

Tel. 707-664-3413
Email: cohenm@sonoma.edu

EDUCATION

September 1990 to June 1996
Ph.D. Microbiology
University of California at Davis

August 1986 to May 1990
B.A. Biology, Microbiology option, Magna cum laude
California State University at Northridge

PROFESSIONAL EXPERIENCE

Aug. 2005 to present
Assistant Professor of Biology, Sonoma State University

Sept. 2004 to present
Affiliate Assistant Professor University of Washington, College of Forest Resources, Box 352100, Seattle, WA 98195-2100

Aug. 2002 to Jul. 2005
Research Plant Pathologist (postdoctoral research); USDA-Agricultural Research Service, Tree Fruit Research Laboratory; Supervisor, Mark Mazzola
Research on biologically-based integrated management systems for control of soilborne diseases of deciduous fruit trees.

Apr. 1999 to Jul. 2002
Post-doctoral Researcher; University of the Ryukyus; Supervisor, Dr. Hideo Yamasaki
Research on applied and basic aspects of Azolla water fern interactions with bacteria.

Lecturer in Biology; University of Maryland, Asian Division, Supervisor: Dr. Allan Berg

Nov. 1997 to Aug. 1998
Health Science Specialist (Postdoctoral Researcher); VA Medical Center; Laboratory of Cardiovascular Molecular Biology; 16111 Plummer St., Sepulveda, CA 91343
Characterization and cloning of mammalian folate and pantothenic acid transporters.

General Science & Medical Microbiology Instructor; United States Peace Corps; United States Peace Corps/Nepal
Aug. 1995 to May 1996
**Full-time Instructor;** (one-year replacement); Department of Biology, California State University, Fresno

Sept. 1990 to Jun. 1995
**Graduate Researcher and Part-time Instructor;** University of California, Davis; Section of Microbiology, Supervisor, Dr. Jack Meeks
Characterized a symbiotic interaction between the N₂-fixing cyanobacterium *Nostoc punctiforme* and a bryophyte plant host.

**Fellowships and Awards**

- Association of California Water Agencies Theodore Roosevelt Environmental Award, “Wastewater to Fuel” project (Dec. 1, 2009)
- Pearson Sustainable Solutions Award, “Wastewater to Fuel” project, $1,000 (Dec. 22, 2008)
- International Council for Local Environmental Initiatives (ICLEI) 2008 Climate Innovation Invitational Award, “Aquatic Biomass to Fuel” project, $1,000 (May 15, 2008)
- USDA Performance Bonus Award, $1,500 (2003)
- Japan Society for the Promotion of Science Fellowship, $100,000 (Nov. 2000 to July 2002)
- Schwall Medical Research Fellowship, $50,000 (Sept. 1990 to July 1995)

**Grants at SSU**

Mazzola M, **Cohen MF**, “Active management of soil microbial communities to limit soilborne disease development in strawberry production systems” California Strawberry Commission. $46,090 (Mar. 2010 – Feb. 2011)

**Cohen MF**, Care C, Kozlowski J “Wastewater to fuel project” internship fund, City of Santa Rosa, $25,000 (July 2009 – June 2010).

Mazzola M, **Cohen MF**, “Active management of soil microbial communities to limit soilborne disease development in strawberry production systems” California Strawberry Commission research grant. $44,475 (Mar. 2009 – Feb. 2010)


**Cohen MF** “Applied Environmental Microbiology Fund,” SSU Academic Foundation (established March 2007) $5,500 in donations received since fund established.


Publications

Peer-Reviewed


**Conference Proceedings**


† SSU Graduate Student

**Author of article:**


**Subject of report:**


* SSU Undergraduate student.
http://cbs5.com/video?id=26431@kpix.dayport.com


http://www.westerncity.com/Western-City/August-2007/California-Cities-Tackle-Climate-Change/


**Invited Seminars**


“Promotion of systemic disease resistance by resident *Streptomyces,*” 54th Annual Soil Fungus Conference, Hansen Agricultural Center, Santa Paula, CA, March 27, 2008.

“Biological suppression of diseases: From roots to leaves,” Department of Biology Colloquium, California State University, Chico, December 7, 2007.
“Integrated algae-based wastewater scrubbing and biofuel production,” Presented to the City of Santa Rosa Board of Public Utilities, Santa Rosa, CA, August 16, 2007.

“Effluent polishing by algae and aquatic plants,” Presented at a meeting of the City of Santa Rosa Utilities Department, Santa Rosa, CA, June 19, 2007.

“Phytophthora ramorum-consuming amoebas from Annadel State Park,” Workshop on forest management in western Sonoma County: Sudden Oak Death (Phytophthora ramorum) and other issues for small landowners, Guerneville, CA, July 20, 2006.

“Remediating contaminated environments with the water fern Azolla,” Sonoma State University Biology Department Colloquium, Stevenson 1002, September 29, 2005.


Professional Reviews

Grant Reviews:
CSUPERB 2010 Faculty-Student Collaborative Research Grant Program Seed Proposal Review Panel. April 10, 2010.


Editing:


Journal Reviews:
Plant Physiology
Plant Cell and Physiology
Water Science
Bioresource Technology
Journal of Plant Science
Journal of Phycology
Plant Pathology Journal
Journal of Plant Growth Regulation
Science
Functional Plant Biology
DANIEL E. CROCKER

ADDRESS
Department of Biology Phone: (707) 664-299
Sonoma State University Fax: (707) 664-4046
1801 E. Cotati Avenue crocker@sonoma.edu
Rohnert Park, CA 94928-3809 www.sonoma.edu/users/C/Crocker

EDUCATION
1995 Ph.D. in Biology
University of California, Santa Cruz, CA

1992 M.S. in Marine Sciences
University of California, Santa Cruz, CA

1987 B.S. in Applied Biology, with highest honors
Georgia Institute of Technology

PROFESSIONAL EXPERIENCE (postdoctoral only)
Graduate Coordinator, Department of Biology, Sonoma State University, 2006 – present
Professor, Sonoma State University, 2008 – present
Associate Professor, Sonoma State University, 2003 – present.
Research Associate, Department of Biology, University of California, Santa Cruz, 2004 – present.
Radiation Safety Officer, Sonoma State University, 2000 – present.
Assistant Professor. Sonoma State University, 2000 – 2003.
Assistant Research Ocean Scientist, University of California, Santa Cruz, 2001 – 2004.

GRANTS (last 5 years)
2006. CICORE. Real-time oceanographic observation of the near shore ocean environment using ARGOS based telemetry. $23,000 (PIs K.J. Nielsen, D.E. Crocker, 8/06-1/08).

PUBLICATIONS
Approaches to studying climatic change and its role on the habitat selection of Antarctic pinnipeds. Integrative and Comparative Biology (in press).


### COURSES TAUGHT (last 5 years)

<table>
<thead>
<tr>
<th>Semester</th>
<th>Number</th>
<th>Title</th>
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<tbody>
<tr>
<td>Spring 2010</td>
<td>BIOL 349</td>
<td>Animal Physiology (2 sections)</td>
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<tr>
<td>Fall 09</td>
<td>BIOL 485</td>
<td>Biometry</td>
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<td>BIOL 516</td>
<td>Bioenergetics</td>
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<td>Spring 09</td>
<td>BIOL 349</td>
<td>Animal Physiology (2 sections)</td>
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<td>Fall 08</td>
<td>BIOL 347</td>
<td>Environmental Physiology</td>
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<td>BIOL 485</td>
<td>Biometry</td>
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<td>Spring 08</td>
<td>BIOL 349</td>
<td>Animal Physiology (2 sections)</td>
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<td>Fall 07</td>
<td>BIOL 347</td>
<td>Environmental Physiology (2 sections)</td>
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<td>BIOL 485</td>
<td>Biometry</td>
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<td>Spring 06</td>
<td>BIOL 349</td>
<td>Animal Physiology (2 sections)</td>
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<td></td>
<td>BIOL 496 Senior Thesis Research - 30 students</td>
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### MANUSCRIPT REVIEW (last 5 years)

- American Journal of Physiology: Regulatory, Integrative and Comparative
- Antarctic Science
- Aquatic Mammals
- Canadian Journal of Zoology
- Comparative Biochemistry and Physiology B
- Ecology
- Functional Ecology
- Journal of Animal Ecology
- Journal of Comparative Physiology B
- Journal of Experimental Biology
- Journal of Experimental Marine Biology and Ecology
- Journal of Zoology, London
- Marine Ecology Progress Series
- Marine Mammal Science
- Marine Technology Society Journal
- Oecologia
- Physiological and Biochemical Zoology
- Polar Biology

### PROPOSAL REVIEW (last 5 years)

- National Science Foundation, Biological Oceanography
- National Science Foundation, Integrative Biology
- National Science Foundation, EEP
- National Science Foundation, Behavioral Systems
- National Science Foundation, Office of Polar Programs
- Australian Antarctic Research Division
- British National Environmental Research Council
- NOAA Office of Ocean Exploration

### SOCIETY MEMBERSHIPS

- Society for Integrative and Comparative Biology
American Physiological Society
Ecological Society of America
Society for Marine Mammalogy

INVITED SEMINARS OR WORKSHOPS (last 5 years)
Foraging and breeding ecology of elephant seals, Bodega Marine Lab, CA April 2010
Habitat use by northern elephant tseals. TOPP Scientific Steering Committee meeting, Monterey, CA, December, 2005.
From molecules to oceanography: integrating behavior and physiology in marine predators. Carpenter Lecture, San Diego State University, April, 2005.

SOCIETY MEMBERSHIPS
Society for Integrative and Comparative Biology
American Physiological Society
Ecological Society of America
Society for Marine Mammalogy
J. HALL CUSHMAN

ADDRESSES

Department of Biology 707/664-2142 (office)
Sonoma State University cushman@sonoma.edu
Rohnert Park, CA 94928-3609 www.sonoma.edu/users/c/cushman

EDUCATION

Northern Arizona University – Flagstaff, Arizona 1986-89
Ph.D. (1989), Biology
University of Arizona – Tucson, Arizona 1983-86
M.S. (1986), Ecology and Evolutionary Biology
Marlboro College – Marlboro, Vermont 1978-82
B.S. (1982), Honors in Biology

PROFESSIONAL EXPERIENCE (postdoctoral only)

1994-Present. Professor (2004-Present), Associate Professor (1999-04) & Assistant Professor (1994-99). Department of Biology, Sonoma State University, Rohnert Park, CA.
1998-Present. Board of Directors, Sonoma Land Trust, Santa Rosa, CA.
2004-09. Founding Director of the Galbreath Wildlands Preserve. School of Science & Technology, Sonoma State University, Rohnert Park, CA.
1993-1994. Program Coordinator & Fellow. Scientific Committee on Problems of the Environment, Department of Biological Sciences, Stanford University, Stanford, CA.
1992-93. Bing Postdoctoral Fellow. Center for Conservation Biology, Department of Biological Sciences, Stanford University, Stanford, CA.
1989-92. University Research Fellow. School of Biological Sciences, Macquarie University, Sydney, New South Wales, Australia.

AWARDS & HONORS

2010. Goldstein Award for Excellence in Scholarship, Sonoma State University.
2009. Post-Promotion Salary Increase, Sonoma State University.
1999. Early Promotion to Associate Professor, Sonoma State University.
1996. Faculty Merit Award, Sonoma State University.
**GRANTS (last 5 years)**


2004-06. USDA Forest Service. $147,156. Vertebrates as dispersal agents of *Phytophthora ramorum*, the pathogen that causes Sudden Oak Death (PI: J. H. Cushman; co-PI: R. Meentemeyer).


**PUBLICATIONS**


RESEARCH SEMINARS (last 5 years)

2007. 2nd Science Symposium on Sudden Oak Death. Santa Rosa, CA.

COURSES TAUGHT (last 5 years)

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<td>BIOL 390</td>
<td>Biology Colloquium</td>
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PROFESSIONAL REVIEWS (last 5 years)


PROFESSIONAL ASSOCIATIONS/SOCIETIES MEMBERSHIP
Ecological Society of America (since 1984)
NICHOLAS R. GEIST

Address:
Department of Biology, Sonoma State University
Rohnert Park, CA 94928-3609
Phone: (707) 664-3056; FAX: (707) 664-3012
Email: nick.geist@sonoma.edu

Education:
Ph.D. 1999: Oregon State University (Zoology)
B.A. 1992: University of California, Santa Barbara (Zoology)

Employment History
2004-Present: Associate Professor, Department of Biology, Sonoma State University
1999-2004: Assistant Professor, Department of Biology, Sonoma State University
1998-1999: Graduate Teaching Assistant; Instructor, Human Anatomy and Physiology, Department of Zoology, Oregon State University
1997-1998: Instructor and Course Coordinator, Human Anatomy and Physiology, Department of Zoology, Oregon State University
1995-1997: Graduate Teaching Assistant, Department of Zoology, Oregon State University
1995: Graduate Research Assistant, Department of Zoology, Oregon State University
1992-1994: Graduate Teaching Assistant, Department of Zoology, Oregon State University

Honors
2004 SSU Order of Omega Teacher Appreciation Award
1996 Oregon State University Government scholarship (campus-wide, competitive, $2,000 scholarship from Oregon Sports Lottery funds).

Grants
2010 Sonoma County Fish and Wildlife Commission Grant. Habitat use by the Western Pond Turtle, *Emys marmorata*, in an Urban Stream. ($4,795)
2008 SSU RSCAP Research Grant. “Habitat Effects on Reproductive Behavior of the Western Pond Turtle” ($2,315)
2008 AZA CEF Research Grant. “Western Pond Turtle Recovery - Sex Determination and Head-starting Studies” ($19,694)
2007 Sonoma County Fish and Wildlife Commission research grant, “Reproductive Biology and Conservation of the Western Pond Turtle, *Clemmys marmorata*” ($6,355)
SSU ORSP Mini-grant, “Reproductive Biology of Local Populations of Western Pond Turtles” ($2,240)
2004 SSU RSCAP Research Grant. “Paleobiology of Basal Archosaurs and Mosasaurs.” ($1,500)
Private Benefactor Research Grant “Osteological Correlates of Soft Tissue Anatomy in Fossil Archosaurs: Clues to the Mesozoic Dominance of Dinosaurs and their Relatives.” ($5,000)

**Publications**

1.) Gordon, R., N.R. Geist, A. Dallara. Effects of Incubation Temperature on the Embryonic Development and Hatching Success of the Western Pond Turtle. *In preparation*


**Invited Seminars (last 5 years):**


2009: Reproductive and Conservation Biology of the Western Pond Turtle. Santa Rosa Jr. College seminar series. Santa Rosa CA


2008: The Plight of the Pond Turtle: Collaborative Efforts to Save a Species in Decline. Laguna foundation Stakeholders Regional Meeting. May


2006: The Case of the Feathered Dinosaur: Science or Scientific Fiction? SSU Biology Colloquium Series

2005: Respiratory Adaptations in Pterodactyloid Pterosaurs. Second Latin American Congress of vertebrate Paleontology, Rio de Janeiro, Brazil, August

Physiological Clues to the Dominance of Mesozoic Archosaurs. SSU Geology Dept. Seminar Series


Respiratory and Metabolic Physiology of the Archosaurs: Insights into the Dominance of Mesozoic Ruling Reptiles. Cal State Hayward Dept of Biology. May

**Other Seminars**


**Courses Taught**

Biol. 515: Macroevolution

Biol. 385: Biology of the Dinosaurs
Biol. 370: Field Herpetology
Biol. 224: Human Physiology
Biol. 121: Diversity, Structure and function
Biol. 122: Genetics and Evolution

Professional Reviews (last 5 years)
  MacArthur Foundation
  Comparative Physiology and Biochemistry
  National Science Foundation
  The Ostrich
  The Condor
  Indiana University Press
  National Fish and Wildlife Foundation
DEREK J. GIRMAN

PERSONAL DATA
Born: August 8, 1966
Male, Married
Phone: (707) 664-3055
E-mail: girman@sonoma.edu

ADDRESS
Dept. of Biology
Sonoma State University
1801 East Cotati Avenue
Rohnert Park, CA 94928

EDUCATION
B.S. 1989 The University of California, Los Angeles. (Biology).

PROFESSIONAL EXPERIENCE
Professor, Department of Biology, Sonoma State University 2007-present
Director, DNA Analysis Facility, Sonoma State University 1999-present
Associate Professor, Department of Biology, Sonoma State University 2002-2007
Assistant Professor, Department of Biology, Sonoma State University 1998-2002
Research Associate, Romberg Tiburon Center for Environmental Research, San Francisco State University. 1996-1998
Research Associate, Center for Population Biology, UC Davis 1996-1997
Research Assistant, Dept. of Biology, University of California, Los Angeles. 1991-1995
Teaching Assistant, Dept. of Biology, University of California, Los Angeles. 1989-1995

TEACHING EXPERIENCE
Courses Taught at SSU
Biology 110 Biological Inquiry (Lecture/Lab) 2004-2007
Biology 121 Diversity, Structure, and Function (Lecture/Lab) 2000-2003
Biology 122 Genetics, Evolution, & Ecology (Lecture/Lab) 2003-present
Biology 341 Evolution (Lecture/Lab) 2003-present
Biology 320 General Genetics – SSU (Lecture/Lab) 1998-2000
Biology 327 Vertebrate Biology (Lecture/Field/Lab) 2000-present
Biology 370 Vertebrate Morphology and Evolution (Lecture/Lab) 1999
Biology 468 Mammalogy (Lecture/Field/Lab) 1999
Biology 497 Systematics and Conservation Genetics -SSU (Lecture/Discussion) 1998
Biology 500s Animal Speciation (lecture/discussion) 2010
Biology 510 Life Science for Rural Teachers, Masters Program in Education 2005
Biology 511 Conservation Genetics – SSU (lecture/discussion) 2001-present
Biology 5111 Biological Systematics- SSU (lecture/discussion) 2000
Life Science for K-7 Teachers, North Bay Science Project, Sonoma State University, (Lecture/Lab/Field) 2000-2004

Prior Teaching Experience
NSF Undergraduate Faculty Enhancement Course, Conservation Genetics: Techniques and Applications, San Francisco State University 1997 – 1999
Dept. of Biology, SFSU, Metapopulation Biology, Speciation. 1996-1997

Undergraduate Students Supervised at SSU
Kristy Deiner, Melanie Hachmeyer, Kim Illian, Marjorie Johnson, Raina Chazankin, Wayne Dossett, Tegner Weiseth, Adam Glatt, and Kristen Graham, Anne Rose, Chris Brown, Mike Westphal, Alisa Pauk, Elaine Hards, Michelle Boone, Jessica Boone, Marianne Tucker, Tami Coan, Bridgette Schneider, Mike Bennett, Brandy Vandermaele, Margaret NcBride. Kristy Deiner, Roni Rogers, Amy Logan, Jeff Amaral, Kim Illian, Holly Skolones, Katie Simms, Kara Corona, Nicole Alfaro, Roxanne Sechler, Sarah Wredberg, Brittany Winder, Rebecca Olphant, Emily Harvey, Nicole Christie, Octavio Cervantes, Tiffany Swarmer, Katie Boylan,

Post Graduate Students Supervised at SSU
Jeanine Phillips, Kiera Adams, Diantha Nielsen, Petra Stoyanof

Graduate Students Supervised at SSU
Laura Shaskey, Master’s student (Fall 2008 –present)
Briana Callahan, Master’s student (Spring 2008 –present)
Diana Humple, Master’s student (Fall 2007- 2010)
Kiera Adams, Master’s student (Spring 2003 – 2009)
Kristy Deiner, Master’s student (Spring 2002 – 2004)
Gary Ouellette, Master’s Degree Candidate (Spring 2001 –2003)
Joshua Hull, Master’s Degree Candidate (Fall 2000 – 2002)
Diana Outlaw-Cummings, Master’s Degree (Spring 1999 - 2001)
Jennifer Michaud, Master’s Degree (Spring 1999 - 2001)
Molly Stephens, Master’s Degree (Spring 1999 - 2001)

SSU Graduate Committee Member
Committee Member, Blake Foster, Department of Biology, J. Christmann- Advisor
Committee Member, Segal Boaz, Department of Biology, D. Crocker- Advisor
Committee Member, Brieanna Richards, Department of Anthropology, K. Jaffe- Advisor
Committee Member, Joe Ward, School of Education, C. Ayala - Advisor
Committee Member, Curtis Stone, Department of Biology, R. Whitkus - Advisor
Committee Member, Eric Hawk, Department of Biology, C. Kjeldsen - Advisor
Committee Member, Trish Tatarian, Department of Biology, P. Northen - Advisor
Committee Member, Shannon Fearnley, Department of Biology, N. Rank Advisor
Committee Member, Gary Neargarder, Department of Biology, N. Rank- Advisor
Committee Member, Kasey Yturralde, Department of Biology, N. Rank - Advisor
Committee Member, Mandy Foster, Department of Biology, P. Northen - Advisor

Post-doctoral Research Associates Supervised
Dr. Carolina Pickens (2007-2009)
RESEARCH EXPERIENCE

Grants and Awards at SSU (last 5 years):

09-10  Mid-Peninsula Regional Open Space District – “Genetic Distinction and Population Structure of the California Giant Salamander in the Midpeninsula Regional Open Space District.” **PI** - with Diana Humple. Awarded $4,915.00.

07-08  SeaDoc Society - “Matching wintering and breeding populations of Western Grebes (*Aechmophorus occidentalis*) using genetic markers.” PI – with Diana Humple – **Awarded $33,560**

03-08  National Science Foundation grant, Major Research Instrumentation program. "MRI/RUI: Acquisition of genetic analyzer and DNA detection system for Sonoma State University Core DNA Analysis Facility." PI - with N. Rank, J. Sakanari, and R. Whitkus, **Awarded $340,000.**

04-06  California Department of Fish and Game - Salmonid Restoration Program. Proposal titled " Ancestry and Gene Flow of *O. mykiss* Populations in Southern California" PI. **Awarded $111,844.**

Publications


2002 Kimura, M; Clegg, SM; Lovette, IJ; Holder, KR; Girman, DJ; Mila, B; Wade, P; Smith, TB. Phylogeographical approaches to assessing demographic connectivity between breeding and overwintering regions in a Nearctic-Neotropical warbler (Wilsonia pusilla). Molecular Ecology, V11:1605-1616.


**Laboratory Experience**

Director of the Core DNA Analysis Facility, Sonoma State University 1999-present

Director of the Molecular Genetics Laboratory, Romberg Tiburon Center for Environmental Research, San Francisco State University. 1996-1998

Conservation Genetics Laboratory, San Francisco State University, Dr. Frank Bayliss - Director 1996-1998

Department of Biology, University of California, Los Angeles, Dr. Robert Wayne - Supervisor. 1988-1996

Institute of Zoology, Zoological Society of London, Dr. Robert Wayne and Dr. Mike Bruford - Supervisors. 1991

National Cancer Institute, Fort Detrick, Frederick, Maryland, with Dr. Stephen J. O’Brien - Director. 1989

Diabetes Research Lab, Dept. of Endocrinology, University of California, Los Angeles, Dr. Yoko Mullen - Director 1986-1988

**Field Experience**

Pacific Newt Surveys and collecting 2009-present

Avian banding - Palomarin Field Station, Point Reyes Bird Observatory, California, USA 2009

California Giant Salamander Surveys – Northern California 2008-present

Sandhill Crane Surveys – Central California – w/ Joe Silviera USWS 2008

Herpetological surveys (Annual) – Mojave Desert – w/ Dr. Nick Geist 2003-present

Ant collecting/studies – Madagascar – w/ Dr. Brian Fisher 2002

Steelhead Genetic Sample collection (electrofishing) – Russian River watershed Sonoma/Mendacino counties – w/ Mr. Bob Coey (CDFG)2001-2002

Ant collecting/studies – Chirachua Mts., Arizona/New Mexico -
Steelhead Genetic Sample collection (electrofishing) – Russian River watershed
   Sonoma/Mendacino counties – w/ Mr. Bryan Freele (CDFG) 2000-2001
Raptor netting - Golden Gate Raptor Observatory, California 1999
Small mammal surveys - various localities, Sonoma County, California 1999
Avian mist-netting and Banding - various locations in California, with Point Reyes 1999
   Bird Observatory staff

Bat Mist-netting and Telemetry (assist)– Napa, California, with
   Mr. Greg Tatarian 1998-1999

Harbor Seal Tagging and Genetic Sample Collection (assist) - Point Reyes
   National Sea Shore, California; with Dr. Sarah Allen 1997

Avian Field Biology and Genetic Sampling - Las Joyas Research Station, Jalisco, Mexico: with Mr. Borja Mila 1997
Avian banding and genetic sample collection - southern Baja, Mexico; with Mr. Borja Mila 1997
Avian banding - Palomarin Field Station, Point Reyes Bird Observatory, California, USA 1996-1997

African wild dog genetic sample collection - Kruger National Park, Republic of
   South Africa; with Dr. M.G.L. Mills 1993
African wild dog genetic sample collection - Moremi Game Reserve, Botswana
   with Mr. J. Weldon McNutt 1993

Field Assistant, Channel Island Fox genetic sample collection - San Clemente Island, California, USA; with Mr. Dave Garcelon and Mr. Gary Roemer 1991

Field Assistant for National Park Service, collection of genetic samples for coyotes, grey fox, and bobcat - Santa Monica Mountains, California, USA, with Mr. Bob Plantrick and Dr. Robert Wayne 1988-1991

African wild dog genetic sample collection - Masai Mara Game Reserve, Kenya; with Dr. Pieter Kat and Dr. Todd Fuller 1989
Mongoose, genet, civet, and jackal sample genetic collection - Southern Kenya; with Dr. Robert Wayne 1989
Behavioral study of smooth-billed Ani - Osa peninsula, Costa Rica 1988
Small mammal survey (live trapping and collection) for National Park Service – Santa Monica Mountains, California, USA 1988
JOSEPH LIN

Personal Information
Sonoma State University
Department of Biology
1801 East Cotati Avenue
Rohnert Park, CA 94928

Office Phone: (707) 664-2931
E-mail: joseph.lin@sonoma.edu

Education
1998 - 2003  University of California at San Francisco (UCSF)
San Francisco, California
Degree: Ph.D., Biomedical Sciences

1996 - 1998  University of California at San Diego (UCSD)
The Salk Institute for Biological Studies
La Jolla, California
Degree: M.S., Biology

1994 - 1997  University of California at San Diego (UCSD)
La Jolla, California
Degree: B.S., Biochemistry/Cell Biology
Minor: Music

Employment History
2009 - Present  Assistant Professor
Sonoma State University

2007 - 2008  Adjunct Assistant Professor
University of Missouri - St. Louis

2004 - 2009  Postdoctoral Research Fellow
Washington University in St. Louis

Honors and Awards
2006 - 2009  Cancer Research Institute Postdoctoral Fellowship Award
1994 - 1997  Robert C. Byrd Scholar
1994 - 1997  University of California Reagent’s Scholar

Funding
2009 - 2010  Sonoma State University RSCAP-Characterization of the Proximal
Tyrosine Kinases in the Lymphocytes of Jawless Fish. $2536.00

Publications
Par1b/EMK/MARK2 regulates T cell receptor-induced microtubule-organizing


**Courses Taught:**

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<td>Immunobiology</td>
<td>University of Missouri – St. Louis</td>
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<td>Bio 424</td>
<td>Immunology</td>
<td>Washington University in St. Louis</td>
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<td>Bio 5051</td>
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**KARINA J. NIELSEN**

**Personal Information:**
Sonoma State University  
Department of Biology  
1801 E Cotati Ave  
Rohnert Park, CA 94928  
email: karina.nielsen@sonoma.edu  
mobile: 707.479.0999  
voicemail: 707.664.2962  
fax: 707.664.4046  
webpage: http://www.sonoma.edu/users/n/nielseka/

**Education – Degree/Institution:**

Ph.D., Oregon State University 1998.  
B.S., *Summa Cum Laude*, with honors in Biology, Brooklyn College - City University of New York 1992  
Hampshire College 1979 – 1982

**Employment History:**

2009 – present Faculty Research Associate, Academic Affairs, Sonoma State University  
2008 – present Associate Professor, Department of Biology, Sonoma State University  
2008 – present Courtesy Associate Professor, Department of Zoology, Oregon State University  
2007 – present Senior Research Associate, Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)  
2003 – 2008 Assistant Professor, Department of Biology, Sonoma State University  
2003 – 2008 Courtesy Assistant Professor, Department of Zoology, Oregon State University  
2000 – 2003 Postdoctoral Research Associate, Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) & Department of Zoology, Oregon State University.  
2000 Instructor, Hatfield Marine Science Center, Oregon State University  
1998 – 2000, National Science Foundation International Postdoctoral Fellow, Estación Costera de Investigaciones Marinas (ECIM), Universidad Católica de Chile.  
1993 – 1998 Research Assistant, Department of Biology, Oregon State University  
1992 – 1993 Research Assistant, Department of Biology, Brooklyn College, City University of New York

**Honors/Awards:**

2009 – present CA Marine Life Protection Act Initiative, Science Advisory Team  
2008 – present CA Ocean Protection Council, Science Advisory Team
1999 David and Lucile Packard Foundation, Hopkins Marine Station Scholarship
1997 Western Society of Naturalists, Best Paper Award, honorable mention
1994 – 1997 OSU - Department of Zoology, Research Fund Awards
1993 Phycological Society of America, Croasdale Fellowship
1993 University of Washington, Friday Harbor Labs Scholarship
1992 Sigma Xi
1991 Phi Beta Kappa
1991 Merck Summer Research Scholars Fellowship
1991 Philip Gisses Memorial Scholarship
1990 – 1992 Libby Kohl Banks Scholarship
1990 Rose Weinstein Scholarship
1990 Saul Lyons Scholarship

Grants (last 5 years):

2010 – 2013 California Ocean Protection Council $4,000,000 ($288,667 for sandy beaches and surf-zone ecosystems component) Baseline Monitoring of Ecosystem and Socioeconomic Indicators for MPAs along the North Central Coast of California. **Sandy Beach Component PIs: Karina J Nielsen (Sonoma State University), Steven Morgan (UC-Davis, Bodega Marine Lab), Jenifer Dugan (UC-Santa Barbara, Marine Science Institute).** Additional PIs on full grant: Mark Carr (UC-Santa Cruz) kelp and shallow rock ecosystems; Amy Dean (Farallones Marine Sanctuary Association) analysis of citizen-science data from rocky shores and sandy beaches collected by LiMPETS (Long-term Monitoring Program and Experiential Training for Students); Gregor Hodgson and Cyndi Dawson (Reef Check California) citizen-science scuba surveys of rocky reefs; James Lindholm, (CSU Monterey Bay) & Dirk Rosen (Marine Applied Research and Exploration) ROV surveys of deep-water habitats; Shannon Lyday (Farallones Marine Sanctuary Association) analysis of citizen-science data collected through Beach Watch; Gerry McChesney (U.S. Fish and Wildlife Service) & Dan Robinette (PRBO Conservation Science) seabird distributions and ecology; Peter Raimondi (UC -Santa Cruz) rocky intertidal ecosystems; Astrid Scholz (Ecotrust) & Christopher LaFranchi (NOAA National Marine Sanctuaries) socioeconomics and demographics of coastal use; Jan Svejkovsky & Jamie Kum (Ocean Imaging Corporation) aerial kelp surveys and intertidal habitat mapping; William Sydeman (Farallon Institute for Advanced Ecosystem Research) integrated ecosystem assessment.

2008 – 2011 National Oceanographic and Atmospheric Administration $80,000 (Subcontract to K.J. Nielsen; total awarded $2,281,529 through 2010). CeNCOOS: Long-term monitoring of environmental conditions in support of protected marine area management in central and northern California. PI: Steven Ramp (Monterey Bay Aquarium Research Institute (MBARI)); Co-PIs: Francisco Chavez (MBARI), Frank Shaughnessy &
Greg Crawford (Humboldt State University), Toby Garfield (San Francisco State University), Mitchell Craig (CSU – East Bay), Mark Moline (California Polytechnic State University), Kenneth Coale (Moss Landing Marine Lab), Raphael Kudela (UC- Santa Cruz), John Largier (UC-Davis, Bodega Marine Lab), et al.

2007 – 2010 **National Science Foundation** $678,398 ($188,511 to SSU);
Collaborative Research: Scaling up from community to meta-ecosystem dynamics in the rocky intertidal - a comparative-experimental approach; PIs: Karina Nielsn (Sonoma State University) & Bruce Menge (Oregon State University); Co-PIs: Sally Hacker (Oregon State University) & Francis Chan (Oregon State University)

2006 – 2009 **California Sea Grant** $128,000; Collecting Sea Palms: planning for sustainable use in a variable environment; Co-PI: Carol Blanchette (University of California, Santa Barbara)

2006 – 2007 **Center for Integrative Coastal Observation, Research and Education (CICORE)** $50,000; Sonoma State University intertidal zone water quality monitoring; Co-PI: Dan Crocker (Sonoma State University)

**Publications:**


Submitted:

* Indicates co-author is a student

Invited Seminars (last five years):

**SCIENTIFIC MEETINGS**


**UNIVERSITY SEMINARS**

Nielsen, K.J. 2006. Macroalgae reveal the underappreciated role of resources in structuring benthic marine communities. Romberg-Tiburon Center, San Francisco State University, October 2006.


PUBLIC LECTURES


SCIENTIFIC MEETINGS


Nielsen, K.J., F. Chan, B.A. Grantham, D. Fox, M. Amend, R. Davis-Born, J. Lubchenco & B. A. Menge. Unusual Die-Off off Oregon’s Coast Associated with a Persistent Low-Oxygen Zone.


- International Temperate Reef Symposium, Santiago, Chile, July 1997.
- Western Society of Naturalists, La Paz, Mexico, January 1997.
- Ecological Society of America, Providence, RI, August 1996.


**Courses Taught (last five years):**

**UNDERGRADUATE COURSES**

**Sonoma State University, Department of Biology, Rohnert Park, CA**
- Biology 322 Marine Ecology (Spring 2004 – 2008)
- Biology 335 Invertebrate Biology (Fall semesters 2003 – 2009)
- Biology 121 Diversity, Structure & Function (Fall 2003 – 2008; co-taught with Dr. Nathan Rank, Sonoma State University, Department of Biology)
- Biology 312 Biological Oceanography (Spring 2005, 2006)
- Biology 400 Ocean Science Literacy for School & Society (Spring 2006, 2007; co-taught with Dr. Paula Lane, Sonoma State University, School of Education)
- Biology 495 & 496 Special Studies & Senior Research; Supervised research experiences for biology majors (Spring 2004 – present; 2-7 students every semester)

**GRADUATE COURSES**

**Sonoma State University, Department of Biology, Rohnert Park, CA**
- Applied Data Analysis using SAS (Spring 2009); Graduate Seminar
- Professional Skills (Fall 2008); Graduate Seminar
- Philosophy of Science (Fall 2006); Graduate Seminar
- Sound Science and Sound Bites: Ecology in the News (Fall 2004); Graduate Seminar
**Professional Reviews (last 5 years)**

California Sea Grant  
California Ocean Protection Council  
Deep Sea Research  
Ecology  
Ecological Monographs  
Ecology Letters  
Journal of Phycology  
Journal of Experimental Marine Biology and Ecology  
Limnology and Oceanography  
Limnology and Oceanography Methods  
Marine Ecology Progress Series  
National Science Foundation  
National Estuarine Research Reserve  
Revista Chilena de Historia Natural

**Professional Associations/Societies Membership (current)**

Ecological Society of America  
Western Society of Naturalists  
Phycological Society of America  
American Institute of Biological Science  
Sigma Xi
MURALI C. PILLAI

Personal Information:

Professor of Biology
Sonoma State University
1801 E. Cotati Ave
Rohnert Park, California 94928
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Fax: (707) 664-4046
e-mail: murali.pillai@sonoma.edu
Home page: http://www.sonoma.edu/biology/pillai

Education:

1988 Ph.D., University of California, Davis
1982 M.Phil., University of Calicut, India
1980 M.Sc., University of Poona, India
1977 B.Sc., University of Kerala, India

Professional Positions:

2003-present Professor of Biology, Sonoma State University
2001-present Director, Health Professions Advisory Program, Sonoma State University
2002-present Co-Director, Keck Microanalysis Laboratory, Sonoma State University
1998-2003 Associate Professor of Biology, Sonoma State University
1998-present Research Associate, University of California Davis, Bodega Marine Laboratory
1994-1998 Assistant Professor of Biology, Sonoma State University
1992-1998 Assistant Research Biologist, University of California Davis, Bodega Marine Laboratory
1993 Lecturer, Sonoma State University
1990-1992 Post-doctoral Fellow, University of California, Bodega Marine Laboratory
1989 NIH Post-doctoral Fellow, Department of Human Anatomy and Cell Biology, School of Medicine, University of California, Davis
1988 Research Assistant, University of California, Davis
1987-1988 Teaching Assistant, University of California, Bodega Marine Laboratory
1983-1987 California Sea Grant (NOAA) Trainee, University of California, Davis
Honors, Awards and Fellowships:

2009  Sabbatical Leave Award for the fall semester of 2009
2003  Visiting Professor, University of Tokyo, Japan. Taught an
       International Summer Course in Developmental Biology. University
       of Tokyo, Japan.
2000  Sabbatical Leave Award for the fall semester of 2001
1998  Nominated for Excellence in Teaching Award, Sonoma State
       University
1995  Invited Speaker, UC Toxic Substances Teaching and Research
       Program
1994  Andrew Mellon Research Fellowship, University of California, Davis
1993  Invited Speaker, Gamete Research Conference, University of
       California, Davis
1993  Invited Speaker, Gordon Research Conference on Fertilization and
       Activation
       Of Development, Plymouth, New Hampshire
1989  Invited Speaker, 5th International Congress of Invertebrate
       Reproduction, University of Nagoya, Japan

Research Grants Funded:

- 2001-2008: Sonoma State University Undergraduate Research Grants (Total
   # of undergraduate students sponsored: 13). $4,750.00

- Total research funding (1992-2003): $1,110,000.00. Funding agencies
   included: Sonoma State Research, Scholarship, and Creative Activity
   Program, California Sea Grant, California Department of Fish & Game, US
   Environmental Protection Agency, US Department of Interior and the
   National Science Foundation

Grants Submitted but not funded:

- 2006: Philip Morris Research Foundation. Developmental Defects Induced by
  Polycyclic Aromatic Hydrocarbons: Studies Using a Vertebrate Model, the
  Zebrafish Danio rerio, $500,000

  Mechanisms of Teratogenesis Induced by Polycyclic Aromatic Hydrocarbons.
  $120,000

- (Grant proposal currently in preparation for submission to NIEH): Environmental
  Stress on Animal Development: Effect of Polycyclic Aromatic Hydrocarbons on
  Embryonic Axis Specification
Publications

- Young, J., Amend, C.A. and Pillai, M.C. Nitric oxide signaling during muscle cell differentiation in the zebra fish *Danio rerio* (in preparation for submission to *Biological Bulletin*).


**Invited Seminars, Lectures and other Presentations;**

• Lecture (panel member) presented at the Pre-medical advisor’s meeting, Sacramento, CA (2005)

• Seminar presented at the Misaki Marine Biological Station, University of Tokyo, Japan (2004)

• Seminar presented at the University of California, Davis Bodega Marine Laboratory (2004)


• Nelson, J., Christmann, J.L., Cherr, G.N. and Pillai, M.C. Cloning and sequencing of the gene for the sperm motility initiation factor from the pacific herring. *Annual Meeting of the Association for the North Bay Scientists*, Sonoma State University, Rohnert Park, CA (2004)

**Manuscript Reviews:**

**Text Book Review:** Introductory Biology by Purves et al., Sinauer Publishers, Inc., Sunderland, MA

**Courses Taught:**
SCI 150, Introduction to Careers in the Health Professions
BIOL 115, Introduction to Biology
BIOL 123, Molecular and Cell Biology
BIOL 344, Cell Biology
BIOL 390, Biology Colloquium
BIOL 472, Developmental Biology
BIOL 495, Independent Studies
BIOL 496, Senior Research
BIOL 498, Biology Practicum
BIOL 544, Advanced Cell Biology
BIOL 595, Graduate Independent Studies
BIOL 598, Graduate Practicum
BIOL 599, M.A. Thesis

**Professional Associations:**

- American Society for Cell and Molecular Biology
- California Consortium for Marine Biotechnology
- National Association of Advisors for the Health Professions
- California State University Program for Education and Research in Biotechnology (CSUPERB) Faculty Consensus Group
NATHAN E. RANK

Addresses:
Department of Biology
Sonoma State University 559 Cleveland Avenue
Rohnert Park, CA 94928 Sebastopol, CA 95472
tel. 707-664-3053, fax 707-664-3012
e-mail: rank@sonoma.edu
tel. 707-823-3765

Education:
1987-1990 University of California-Davis, Ph.D. in Zoology.
1983-1987 University of California-Irvine, Ph.D. cand. in Ecology & Evolutionary Biology
1985 Organization of Tropical Studies course in Tropical Agricultural Ecology, Costa Rica
1979-1983 Kalamazoo College, Kalamazoo, Michigan, B.A. in Biology

Positions:
1995-2004 Assistant (1995-1999), Associate (1999-2004), and Professor & Director of Fairfield Osborn Preserve (since June 2000), Department of Biology, Sonoma State University
1992-1995 Assistant Professor, Group of Experimental Ecology, Swiss Federal Institute of Technology-Zurich
1990-1992 Post-doctoral Fellow, Laboratory of Animal Biology, Free University of Brussels, Belgium and Zoological Institute of the University of Basle, Switzerland

Honors and Awards:
1990-1991 NSF-Program for Long and Medium-term Research at Foreign Centers of Excellence. Postdoctoral Fellowship to the University of Basle, Switzerland and to the Free University of Brussels, Belgium.
1990-1991 Fulbright/Swiss Government Fellowship to the Zoological Institute of the University of Basle, Switzerland (not accepted)
1990 Merton Love Award for best dissertation research at UC-Davis in ecology and evolution
1988-1990 Regent's and Storer Fellowship, University of California-Davis
1986 Steinhouse Teaching Award, University of California-Irvine
1983-1984 Regent's Fellowship, University of California-Irvine
1979-1983 Heyl Scholarship for undergraduate study at Kalamazoo College
Grants (last five years):


Publications:


Invited Seminars (past 5 yrs):


2010. Evolution of enzyme polymorphisms in a montane insect herbivore. Department of Biology, Santa Rosa Junior College.


2009. Evolution of enzyme polymorphisms in a montane insect herbivore. Department of Biology, University of Turku, and

2009. Ecology of an invasive pathogen in California woodlands. Department of Biology, University of Eastern Finland.
2009. Evolution of enzyme polymorphisms in a montane insect herbivore. Department of Biology, University of Eastern Finland.

2009. Evolutionary significance of an enzyme polymorphism in a mountain leaf beetle. Department of Biology, University of Hamburg, Germany. Language- GERMAN.


2008 Bay Area Biosystematists. Evolutionary consequences of an invasive woodland pathogen. Sonoma State University


Contributed seminars (last 5 yrs):

2009 Sudden Oak Death Science Symposium (one poster and one co-authored paper)

2008 5th White Mountain Research Station regional research symposium: "Climate, Ecosystems and Resources in Eastern California" in Bishop, California November 5-8, 2008. (one paper and two co-authored papers)

2007 Pacific Climate Workshop [one coauthored paper (co-authors J. Smiley, E. Dahlhoff)]


2006 California Oak Foundation [one paper, one coauthored paper (B. Anacker, D. Huberli, M. Garbelotto, S. Gordon, R. Whitkus, R. Meentemeyer), and one poster (M. Cohen, E. Condeso, B. Anacker, M. Mazzola)]

2006 Pacific Climate Workshop [one coauthored paper (co-authors J. Smiley, E. Dahlhoff)]

2006 American Geophysical Union [one coauthored paper (co-authors J. Smiley, E. Dahlhoff)]

2005 Society of Integrative and Comparative Biology, Anaheim, CA [one paper + one coauthored poster, (S.L Tarpley, P.J. Hayes, E.P. Dahlhoff)]
### Courses taught

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Format</th>
<th>Level</th>
<th>Times taught</th>
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<tr>
<td>Diversity, Structure &amp; Function</td>
<td>Lecture¹</td>
<td>LD</td>
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<tr>
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<td>Laboratory¹</td>
<td>LD</td>
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<td>Genetics, Evolution &amp; Ecology</td>
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<td>LD</td>
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<td>Evolution</td>
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<td>Entomology</td>
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<td>Biometry</td>
<td>Lecture + Laboratory⁴</td>
<td>UD &amp; graduate</td>
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<td>Darwin Seminar</td>
<td>Seminar³</td>
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<td>Adaptation</td>
<td>Seminar⁴</td>
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<td>Biology of Climate Change</td>
<td>Seminar⁵</td>
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<td>Biological Experiments</td>
<td>Seminar⁶</td>
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<td>Ecology and Evolution</td>
<td>Seminar⁵</td>
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<td>Topics in Evolution</td>
<td>Seminar⁷</td>
<td>Graduate</td>
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### Professional Reviews (list journals and agencies, not numbers, last 5 years):

- Grant proposal reviews- National Science Foundation (7); California Program in Education and Research in Biotechnology (served on panel in 2005)
- Manuscript reviews- Chemoecology (2); Ecology (2); Ecology Letters (1); Evolution (1); Journal of Experimental Biology (1); Oecologia (1); Oikos (1);
- Textbook reviews- Biometry text by Whitlock and Schluter (2 chapters, 2007); Evolution text by Stearns and Hoekstra (2 chapters, 2005)

### Professional Associations/Societies Membership (current):

- Bay Area Biosystematists- I have participated in this group since 1995 and have served on the Steering Committee since 2007. The group has hosted two public lectures at SSU since 2007 under my sponsorship. Talks were given by Professors Peter Wainwright, Kevin Rice, and Brad Shaffer (UC-Davis) and Professors Elizabeth Dahlhoff and Justin Whittall of Santa Clara University
RICHARD WHITKUS

Department of Biology
Sonoma State University
1801 E. Cotati Avenue
Rohnert Park, CA 94928
(707) 664-2303
whitkus@sonoma.edu

EDUCATION

Ph.D., Botany, Ohio State University, OH, 1988
M. S., Botany, University of Alberta, Canada, 1981
B. A., Botany, Rutgers University, Newark, NJ, 1978

PROFESSIONAL EXPERIENCE

CALIFORNIA BOTANICAL SOCIETY
Editor, MADROÑO – A West American Journal of Botany, 2008 to present

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
Science & Technology Policy Fellow, placement in U.S. Environmental Protection
Agency, Office of Science Coordination and Policy, Washington, DC, 2006 to
2007

BOTANICAL SOCIETY OF AMERICA, GENETICS SECTION
Chair, Graduate Student Research Award Committee, 2000 to 2009

SONOMA STATE UNIVERSITY
Chair, Dept. of Biology, 2008 to present
Professor, Dept. of Biology, 2003 to present
Graduate Program Coordinator, 2000 to 2006
Associate Professor, Dept. of Biology, 1999 to 2003
Curator, North Coast Herbarium of California, Sonoma State University, 1999 to
present

UNIVERSITY OF CALIFORNIA, RIVERSIDE
Assistant Professor of Botany and Assistant Botanist, Dept. of Botany and Plant

UNIVERSITY OF MINNESOTA
Postdoctoral Associate, Dept. of Plant Biology, 1989-1990

OHIO WESLEYAN UNIVERSITY
Visiting Assistant Professor, Dept. of Botany and Microbiology, 1989
HONORS/AWARDS
Sabbatical leave, Sonoma State University, 2006 to 2007
Margaret Y. Menzel Award (outstanding paper in plant genetics), 47th annual meeting of the American Institute of Biological Sciences, 1996

RECENT MAJOR GRANTS
NSF, Major Research Initiative/Research at Undergraduate Institutions, $340,000 (with D. Girman [PI], N. Rank, and J. Sakanari), 2003-2006
NSF, Collaborative Research at Undergraduate Institutions, $810,656 (with R. Meentemeyer [PI], H. Cushman, N. Rank, and D. Rizzo), 2002-2006

PUBLICATIONS


SELECTED SEMINARS (last 5 years)
2008  “Science-Based Policy for Genetically Engineered Plants at the U.S.
Environmental Protection Agency,” March 20, California Botanical Society, Berkeley,
CA.
2008  “Building Science-Based Policy for Genetically Engineered Plants at the U.S.
Environmental Protection Agency,” March 14, CSU Stanislaus, CA.
2007  “Agricultural Biotechnology at the U.S. Environmental Protection Agency,”
October 23, Sonoma State University, CA.

PAPER/POSTER PRESENTATIONS (last 5 years)
2006  Gordon, S. and R. Whitkus.  Genetic structure of a dominant forest tree,
Umbellularia californica (Hook. & Arn.) Nutt.  Botanical Society of America,
Annual Meeting, Chico, CA.

RECENT COURSES (last 5 years)
   Biological Inquiry (undergraduate, non-majors)
   Diversity, Structure and Function (undergraduate, lower division)
   Plant Biology (undergraduate, upper division)
   Plant Taxonomy (undergraduate, upper division)
   Biology Colloquium (undergraduate, upper division)
   Speciation (graduate)

PROFESSIONAL REVIEWS (last 5 years)
   Agencies:
       Austrian Science Fund
       Natural Sciences and Engineering Research Council of Canada
       National Science Foundation
       Organisation for Economic Co-operation and Development – through USDA
       U.S. Department of Agriculture

   Journals:
       American Journal of Botany
       Australian Journal of Botany
       Canadian Journal of Botany
       Genetics
       Molecular Ecology
       New Phytologist
       Taxon

PROFESSIONAL ASSOCIATIONS
   American Association for the Advancement of Science
   American Society of Plant Taxonomists
   Botanical Society of America
   California Botanical Society
   Genetics Society of America
   Society for the Study of Evolution